Roads & Maritime

M1 Pacific Motorway replacement and widening: Tuggerah to Doyalson

Supplementary review of environmental factors

May 2016

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Roads and Maritime Services

M1 Pacific Motorway Widening: Tuggerah to Doyalson

Supplementary review of environmental factors
May 2016

Document Control				
Rev No.	**Date**	**Revision details**	**Author**	**Checker**
A	13/05/2016	Final	Zoe Wood and Sam Brown	Todd Brookes

Executive summary

The Proposal

A Project Review of Environmental Factors (original Project REF) was prepared by Roads and Maritime Services (Roads and Maritime) under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the replacement of the existing pavement and widening of around 12.3 km of the M1 Pacific Motorway from two lanes in each direction to three lanes in each direction between Wyong Road, Tuggerah, and Doyalson Link Road, Kiar (the original Project). Roads and Maritime Services determined to proceed with the original Project on 31 October 2014 based on the M1 Pacific Motorway Replacement and Widening: Tuggerah to Doyalson Review of Environmental Factors (August, 2014) and the subsequent M1 Pacific Motorway Replacement and Widening Tuggerah to Doyalson Submissions Report (October, 2014) (Submissions Report).

Following the determination to proceed with the original Project, detailed design has been carried out by Hyder Consulting. The detailed design process has identified a number of design amendments (the Proposal) which are the subject of this Supplementary Review of Environmental Factors (Supplementary REF). The Proposal includes the following design amendments:

- New ancillary sites
- Doyalson Link Road bridge over M1 Pacific Motorway entry ramp
- Widening Sparks Road overbridge
- Revised staging strategy and horizontal alignment
- Revised pavement type
- Revised original Project boundary
- Wyong River spill containment
- Landscape area
- Warnervale Interchange lane/ramp reconfigurations
- Variable message signs (VMSs)
- Directional signs
- Revised vertical alignment.

Need for the Proposal

The Proposal is required to facilitate construction of the M1 Pacific Motorway Replacement and Widening: Tuggerah to Doyalson (the original Project). The proposed design amendments have been identified as a routine part of detailed design and, in general, would improve safety for road users during construction and operation, improve safety for maintenance crews during operation, improve drainage and water quality outcomes, ensure the upgrade can be efficiently constructed (i.e. sufficient ancillary sites and construction space) and decrease construction timeframes.

Proposal objectives

The Proposal is consistent with, and supports the achievement of, the original Project objectives (established in the original Project REF). These objectives are to:

- Reduce travel times and congestion and provide for future predicted local and regional traffic growth by increasing capacity of the M1 Pacific Motorway from two to three lanes in each direction between Tuggerah Interchange and Doyalson Link Road Interchange
- Reduce the crash rate of the subject section of the M1 Pacific Motorway particularly with regard to the high number of crashes that occur when the road surface is wet
- Widen within the existing M1 Pacific Motorway corridor road reserve with a view to reducing the construction footprint and impact on remnant vegetation and biodiversity in general
- Maintain or improve the visual driving experience and amenity in this section of the M1 Pacific Motorway so as to be consistent with the styles and themes of the sections to the north and south forming a continuous corridor from an urban design and landscape design perspective
- Minimise disruptions and delays to traffic during construction and ensure that road users are keep informed of travel conditions during works
- Minimise the broader social and environmental impacts of the development.
- Achieve an overall Proposal result that provides the best value for money for the entire project lifecycle.

Options considered

The detailed design process considered a range of options to improve the outcomes of the proposed upgrade during both construction and operation. Where relevant, alternatives and options, or a justification, specific to each of the proposed design amendments is discussed herein.

A number of potential sites were considered for use as new construction ancillary sites. Three sites were ultimately selected as preferred options and these have been considered as part of the Proposal. These preferred sites are referred to in this report as Sites W8, W9 and E5.

Statutory and planning framework

This Proposal is assessed under Part 5 of the *Environmental Planning and Assessment Act 1979*. As part of this Supplementary REF, Roads and Maritime have also considered clause 228 of the Environmental Planning and Assessment Regulation 2000 and matters of national environmental significance (MNES) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) applies to this Proposal. Clause 94 of the 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.

Community and stakeholder consultation

The original Project was first displayed for public comment between 18 October 2013 and a public comment period was undertaken from 18 October 2013 and 13 December 2013.

The original Project REF was publicly displayed between 6 August 2014 and 3 September 2014 and two community information sessions were held on 21 and 23 August 2014. A Submissions Report was prepared to summarise the issues raised, provide responses to each issue, identify additional assessments required and summarise the changes to the management measures from the original Project REF.

During the development of the Supplementary REF, consultation was carried out with utility owners, service providers, selected property owners, the Civil Aviation Safety Authority (CASA) and Wyong Shire Council (WSC).

Roads and Maritime has carried out targeted consultation with local residents and property owners, especially where the Proposal would result in changes to the operational noise management measures that were proposed in the original Project REF.

Environmental impacts

A number of detailed technical investigations were carried out to assess the potential impacts of the Proposal, and to identify safeguards and management measures to mitigate these impacts. The key environmental impacts associated with the Proposal are related to:

- Noise during construction
- Traffic noise during operation
- Biodiversity.

Noise during construction
The three new ancillary sites have the potential to result in noise impacts during the construction phase of the Proposal. Noise modelling has been carried out to determine the potential impact from these sites on sensitive receivers located nearby. Based on the construction activities, plant and equipment that would be used at these sites, construction noise is expected to exceed noise management levels at some sensitive receivers located near ancillary site W9.

Roads and Maritime is planning a range of mitigation measures aimed at reducing construction noise. Roads and Maritime will communicate directly with residents who are predicted to experience construction noise impacts from the new ancillary sites.

Traffic noise during operation

Assessment of operational noise for the Proposal was carried out for the years 2019 and 2029. The Proposal has resulted in an overall decrease in the number of sensitive receivers predicted to exceed the applicable operational noise criteria compared to the original Project (the number of receivers expected to exceed criteria has reduced from 170 to 106 receivers).

In 2029, noise at 106 sensitive receivers is predicted to exceed the applicable operational noise criteria but none of these would have an increase in noise level of more than 2 dB. Of these, 32 sensitive receivers would be acutely affected by operational traffic noise. Impacts at residences would be addressed through the implementation of feasible and reasonable noise management measures. Consideration of noise barriers has been carried out, which showed that the provision of these would not be feasible and reasonable. As such, mitigation would include architectural treatment of houses that have been assessed to be acutely affected and have not already been previously treated under the Roads and Maritime Noise Abatement Program.

Biodiversity

The Proposal would require clearing of an additional 5.07 ha of native vegetation compared to the original Project, bringing the net total to 24.37 ha. The Proposal would slightly reduce the area of threatened ecological communities (TECs) to be cleared, from 7.03 ha under the original Project to 5.67 ha under the Proposal (a reduction of 1.36 ha), partially as a result of the reclassification of some areas of Narrabeen Spotted Gum Ironbark Forest and Lower Hunter Spotted Gum – Ironbark Forest.

The Proposal would directly impact the threatened flora species *Angophora inopina* (Charmhaven Apple), listed as Vulnerable under the *Threatened Species Conservation Act 1995* (TSC Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Two other threatened flora species identified in the original Project REF, *Grevillea parviflora* subsp. *parviflora* and *Melaleuca biconvexa*, may be subject to additional indirect impacts as a result of the Proposal. Assessments of Significance prepared to assess impacts to threatened flora species found that the impacts of the Proposal would not be significant.

The Proposal would impact 54.26 ha of fauna habitat and would result in the removal of up to 12 additional hollow-bearing trees which would have impacts to foraging, shelter and breeding resources for a range of fauna species including threatened species, however, impacts would not be significant.

The Proposal would potentially impact 15 additional threatened and/or migratory fauna species that were not assessed in the original Project REF. Assessments of Significance found that the impacts of the Proposal would not be significant.

Justification and conclusion

The Proposal involves a number of design amendments that would facilitate the construction of the original Project.

A number of potential environmental impacts from the Proposal have been avoided or reduced during the detailed design process. The Proposal as described in this Supplementary REF best meets the original Project objectives but would still result in some impacts including temporary noise impacts during the construction period as well as long term noise and biodiversity impacts. Safeguards and management measures as detailed in this Supplementary REF would ameliorate or minimise these expected impacts.

The Proposal would improve safety for road users during construction and operation, improve safety for maintenance crews during operation, improve drainage and water quality outcomes, ensure the upgrade can be efficiently constructed and decrease construction timeframes. Importantly, the Proposal would facilitate construction of the original Project which would replace an existing asset to improve road safety, alleviate existing traffic congestion and provide additional capacity for projected traffic growth. On balance the Proposal is considered justified.

This Supplementary REF finds the Proposal is unlikely to have a significant impact on the environment and therefore an environmental impact statement (EIS) is not required.

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1 Introduction

1.1 Proposal identification

A Project Review of Environmental Factors (original Project REF) was prepared by Roads and Maritime Services (Roads and Maritime) under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the replacement of the existing pavement and widening of around 12.3 km of the M1 Pacific Motorway from two lanes in each direction to three lanes in each direction between Wyong Road, Tuggerah, and Doyalson Link Road, Kiar (the original Project). Roads and Maritime Services determined to proceed with the original Project on 31 October 2014 based on the M1 Pacific Motorway Replacement and Widening: Tuggerah to Doyalson Review of Environmental Factors (August, 2014) and the subsequent M1 Pacific Motorway Replacement and Widening Tuggerah to Doyalson Submissions Report (October, 2014) (Submissions Report).

Following the determination to proceed with the original Project, detailed design has been carried out by Hyder Consulting. The detailed design process has identified a number of design amendments (the Proposal) which are the subject of the Supplementary Review of Environmental Factors (Supplementary REF). These design amendments are summarised in Table 1-1 and shown on Figure 1-1 and Figure 1-2. Further detail regarding each design amendment is provided in Section 3.

Table 1-1 Summary of proposed design amendments (the Proposal)

#	Design amendments	Summary description
1	New ancillary sites	Provision of three additional construction ancillary sites being: Site E5 (adjacent to the Warnervale Airport), Site W8 (on Kiar Ridge Road) and Site W9 (on Hue Hue Road).
2	Doyalson Link Road bridge over M1 Pacific Motorway entry ramp	Alterations to the horizontal and vertical alignment of the ramps. The Doyalson Link Road bridge over the M1 Pacific Motorway entry ramp would be shortened to a two span super T bridge.
3	Widening Sparks Road overbridge	Widening the existing Sparks Road overbridge to incorporate the pedestrian/cyclist path into the same structure and address drainage issues on Sparks Road.
4	Revised staging strategy and horizontal alignment	The revised construction staging strategy would involve asymmetrical widening into the median (i.e. widening of the road to be wider on one side than the other), the result of which would be a narrower median along some parts of the M1 Pacific Motorway when compared to the original Project. Provision of 3.1 m wide off-side shoulders to facilitate maintenance access along the majority of the upgrade would result in changes to the horizontal alignment. The change would move the southbound lanes east by around 1.4 m between about chainage 88,500 and chainage 93,200.

#	Design amendments	Summary description
5	Revised pavement type	Provision of Stone Mastic Asphalt (SMA) along the full length of the upgrade in lieu of Plain Concrete Pavement (PCP) north of the Wyong River and Open Grade Asphalt (OGA) to the south of the Wyong River.
6	Revised original Project boundary[1]	Modifications to the original Project boundary to accommodate the design and provide sufficient construction working space. The revised boundary is referred to herein as the Proposal boundary.
7	Wyong River spill containment	Capturing and diverting runoff from the Wyong River northbound bridge to a spill containment basin to be installed within the median to the south of the bridge.
8	Landscape area	The provision of a landscape area for the re-use of excess virgin excavated natural material (VENM), excavated natural material (ENM) and suitable topsoil likely to be generated during construction.
9	Warnervale Interchange lane/ramp reconfigurations	Reconfigurations to the northbound exit ramp, northbound entry ramp and southbound entry ramp at the Warnervale Interchange to resolve merging and weaving issues.
10	Variable message signs (VMSs)	Installation of two variable message signs (VMSs) on the northbound and westbound approaches to the Warnervale Interchange.
11	Directional signs	Installation of three additional directional signs (outside of the Proposal boundary) on the southbound and westbound approaches to the Doyalson Interchange.
12	Revised vertical alignment	An increase in vertical height of up to 700 mm in sections of the road surface is necessary to address aquaplaning issues identified during detailed design.

[1] The modifications to the original Project boundary are shown on Figure 1-2. For a finer scale map showing these changes refer to the figures in Appendix B.

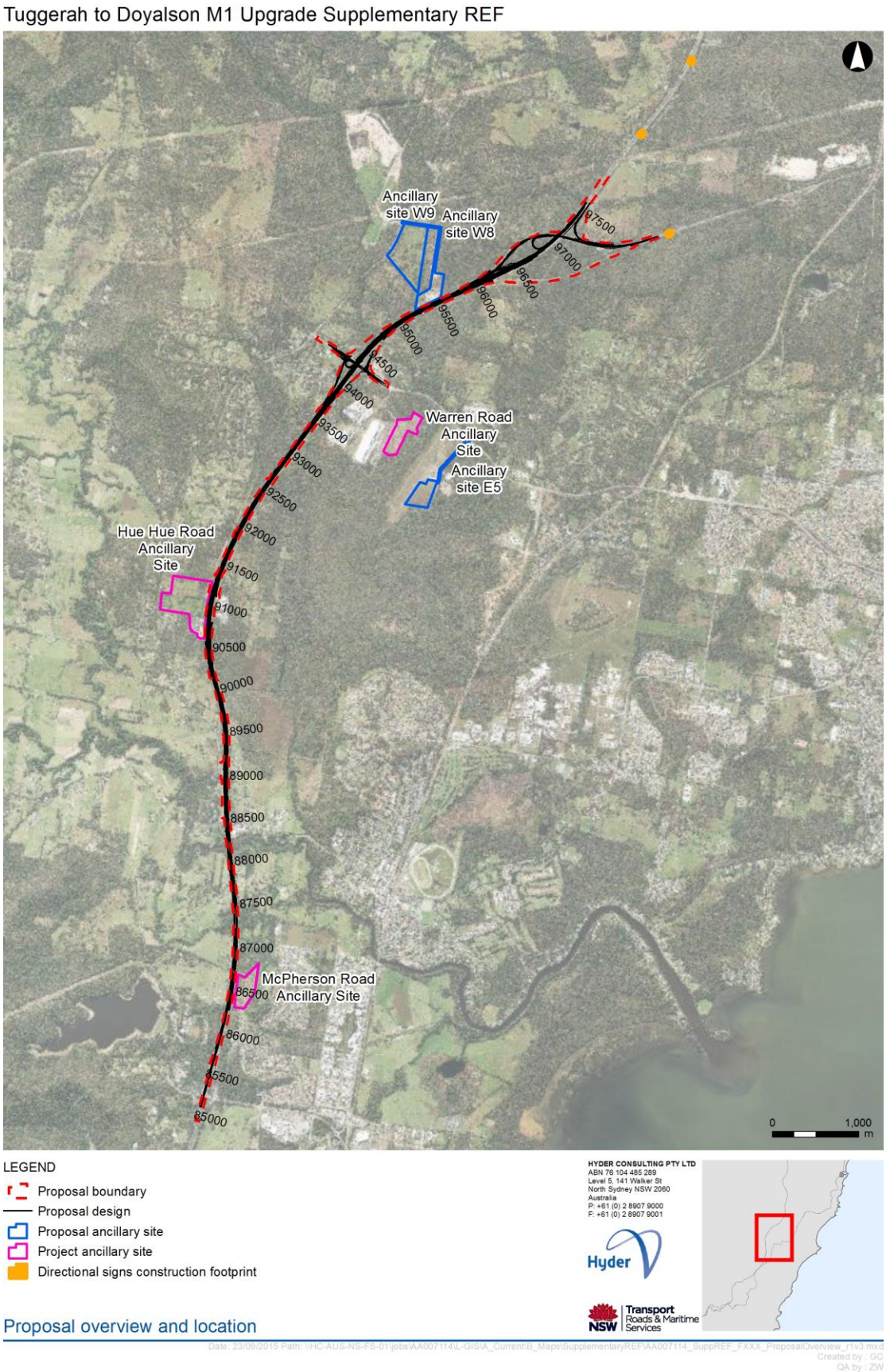
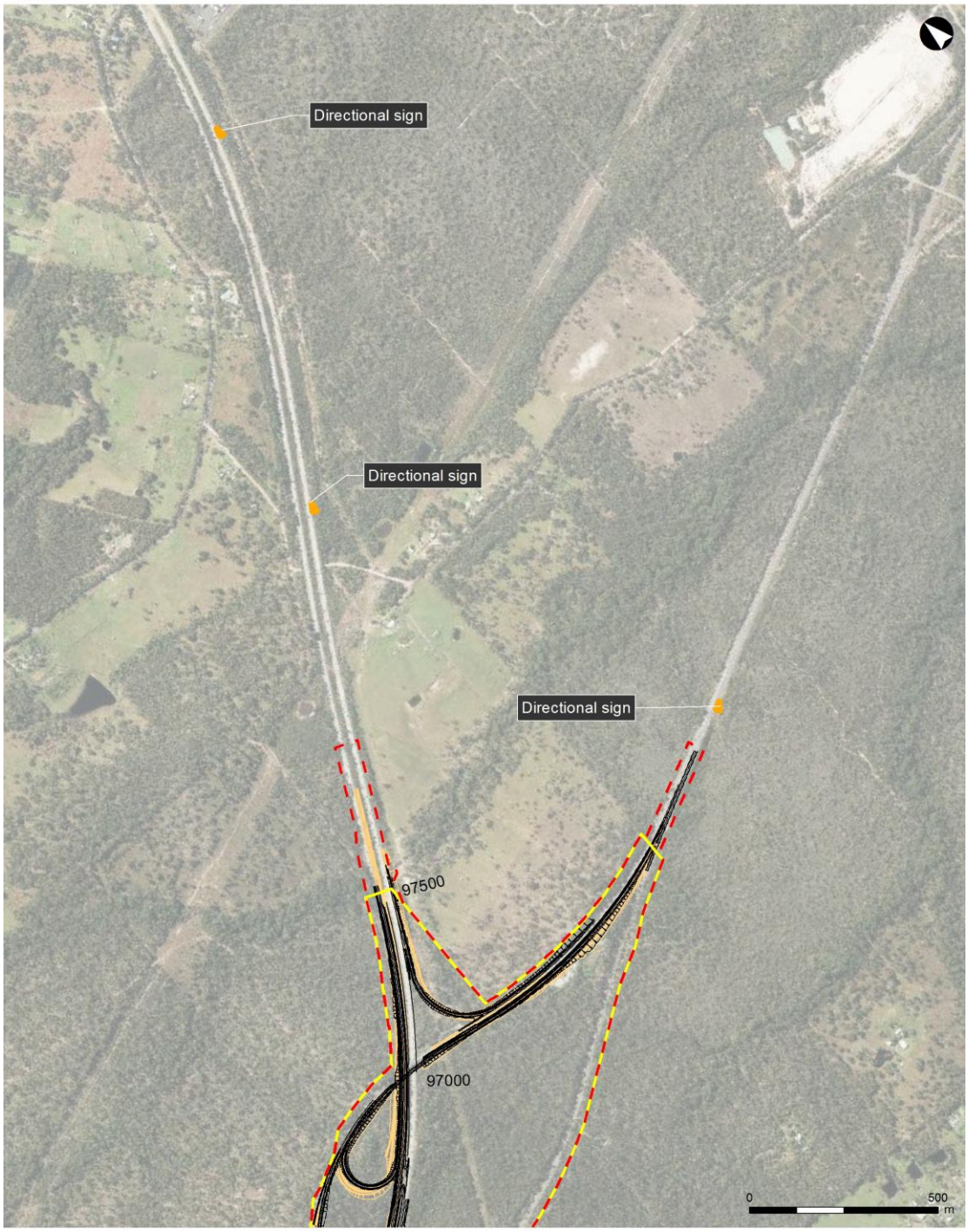


Figure 1-1 Proposal overview and location



LEGEND

- Proposal boundary
- Proposal design
- Project boundary
- Project design
- Proposal ancillary site
- Project ancillary site

Comparison of the Project and the Proposal showing key features

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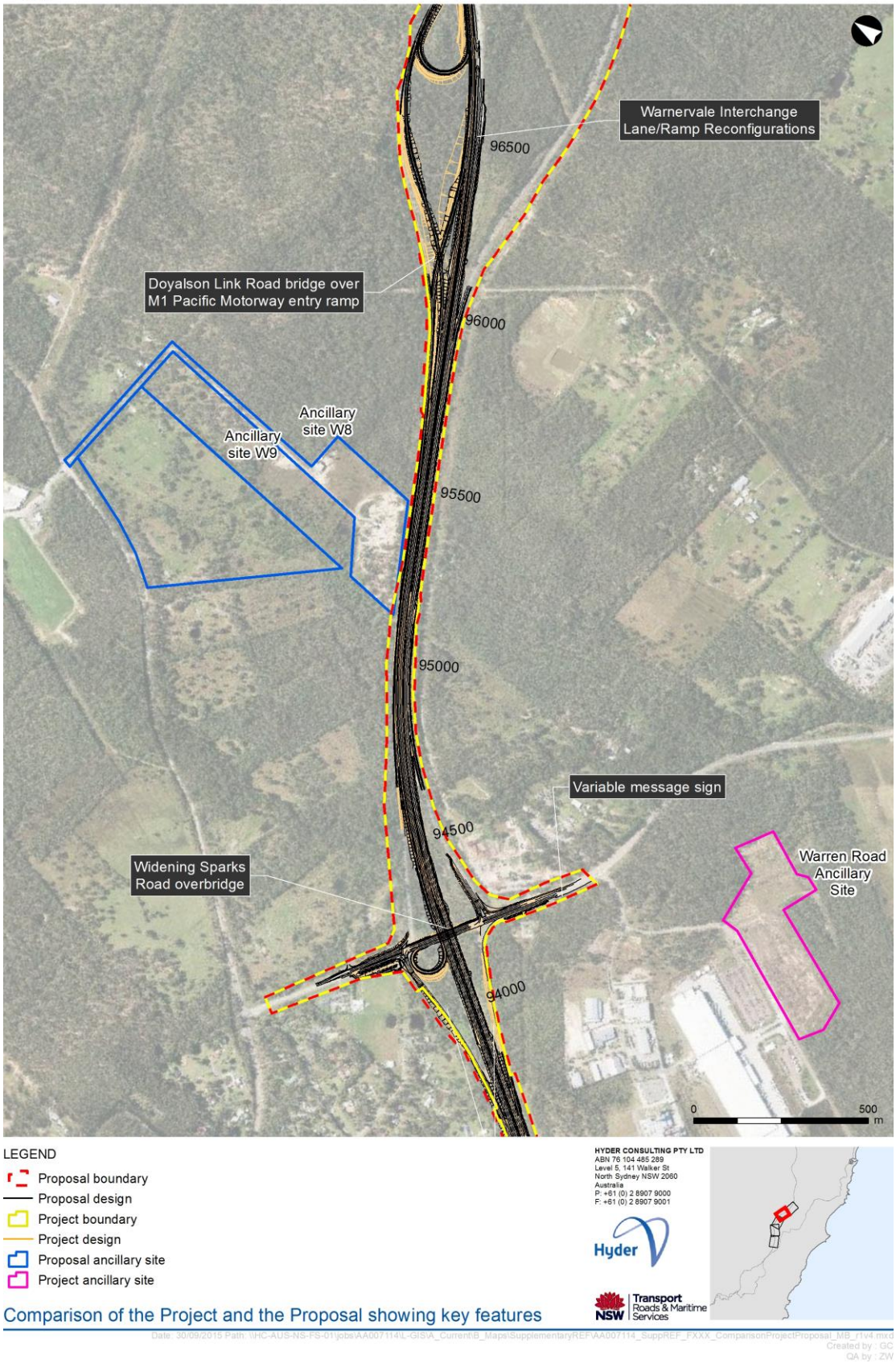
QA by : ZW

Figure 1-2a Comparison of the original Project and the Proposal showing key features



Comparison of the Project and the Proposal showing key features

Figure 1-2b Comparison of the original Project and the Proposal showing key features

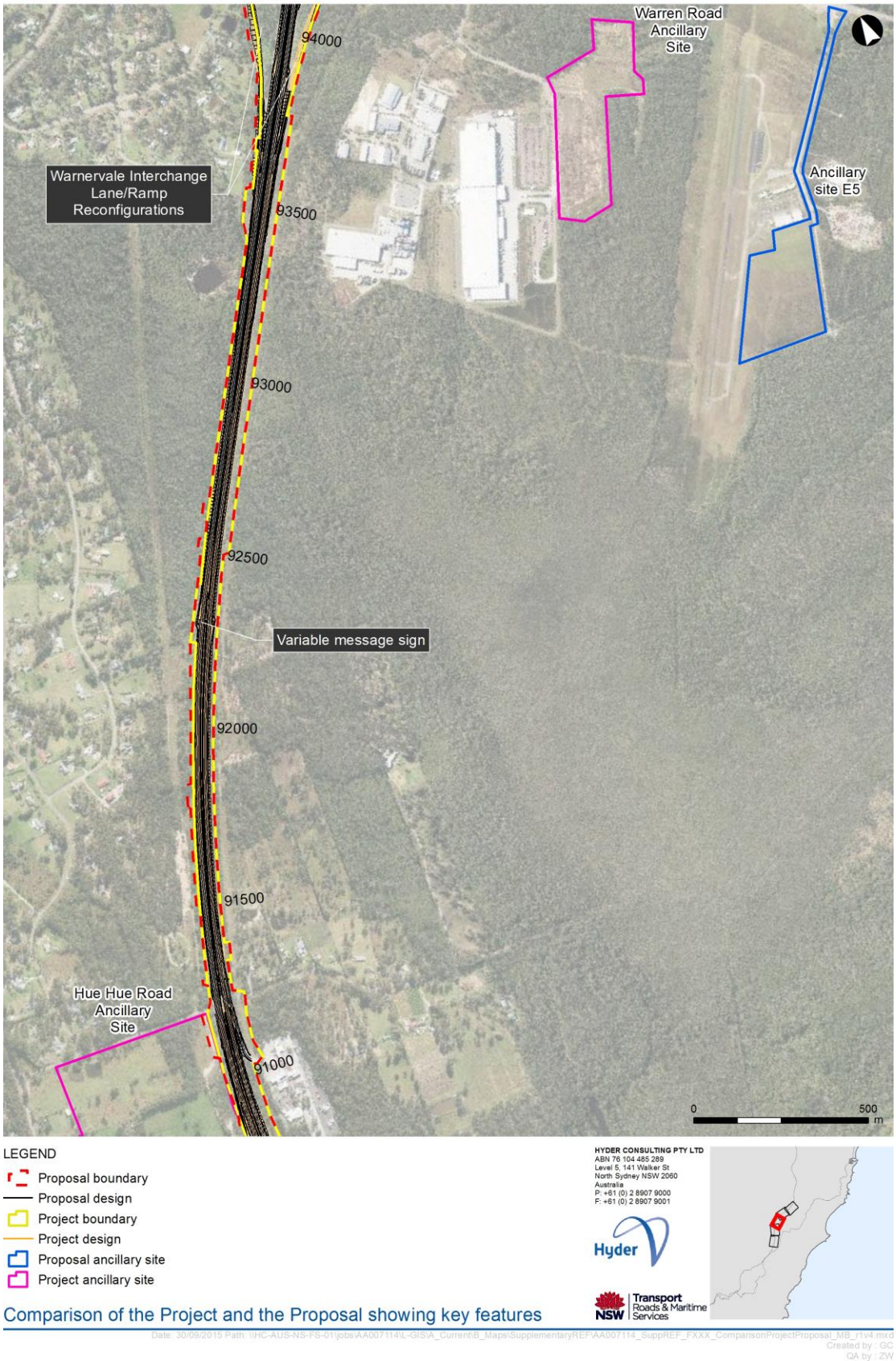


Figure 1-2c Comparison of the original Project and the Proposal showing key features

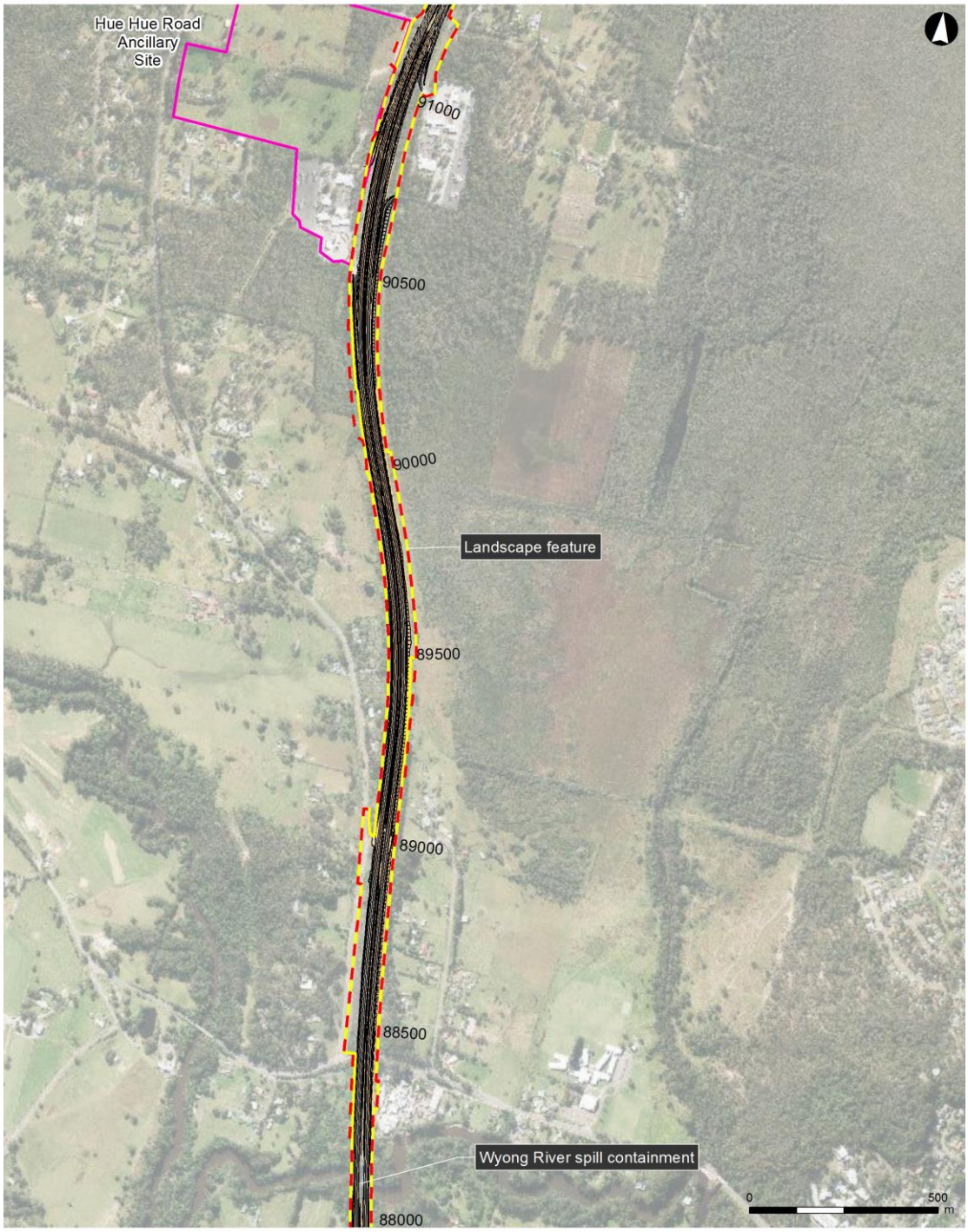
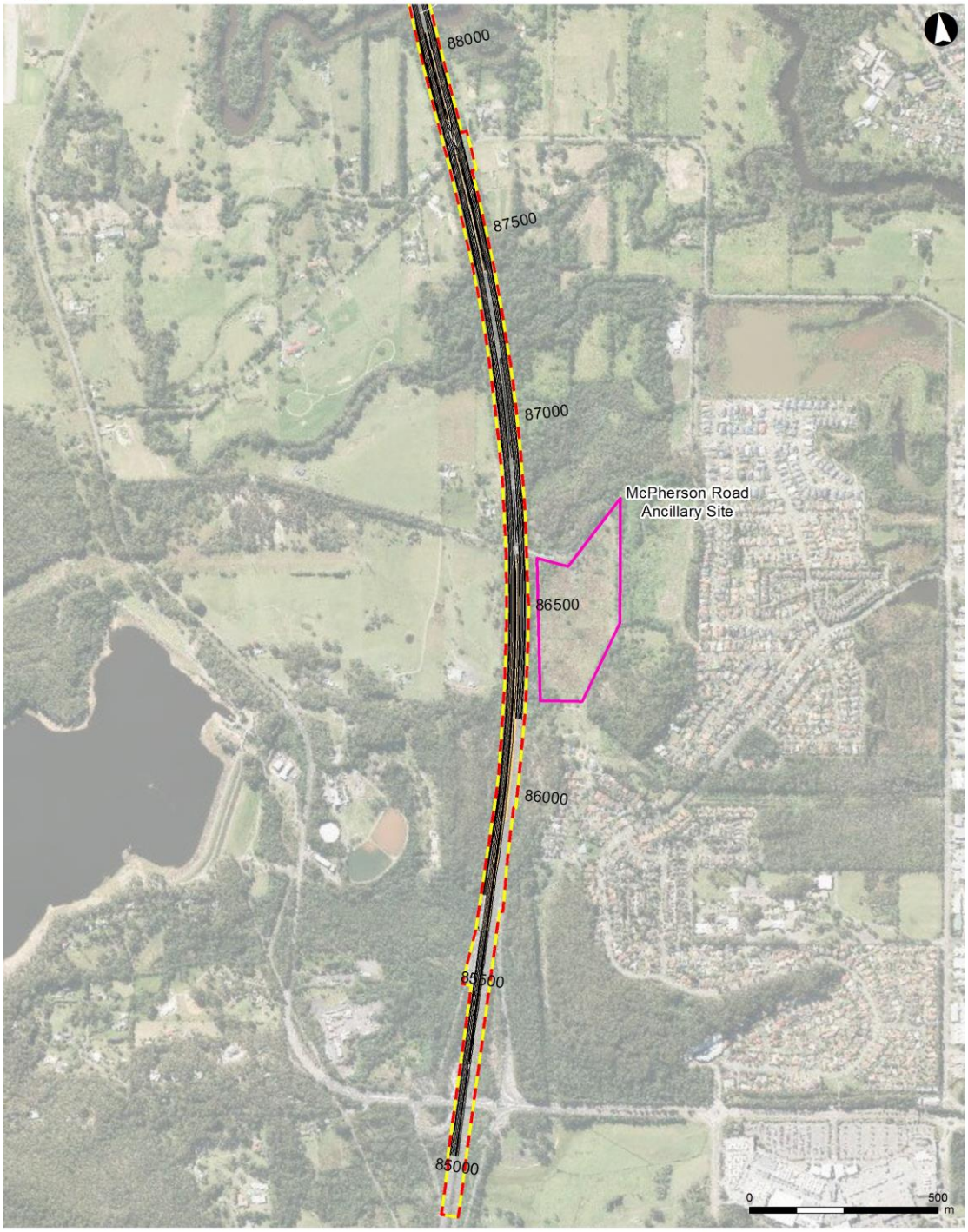


Figure 1-2d Comparison of the original Project and the Proposal showing key features



LEGEND

- Proposal boundary
- Proposal design
- Project boundary
- Project design
- Proposal ancillary site
- Project ancillary site

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Comparison of the Project and the Proposal showing key features

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Created by : GC
QA by : ZW

Figure 1-2e Comparison of the original Project and the Proposal showing key features

1.2 Purpose of the report

This Supplementary REF has been prepared by Hyder Consulting on behalf of Roads and Maritime, Hunter Region to supplement the original Project REF (SMEC, 2014a) and Submissions Report (SMEC, 2014b) for the original Project and address the design amendments (the Proposal) identified in Section 1.1. 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).

The purpose of the Supplementary REF is to describe and assess the Proposal, to document the likely impacts of the Proposal on the environment, and to detail management measures and safeguards to be implemented. The Supplementary REF re-examines and reassesses where changes to an activity are proposed, where there have been changes to the applicable legislative or policy framework or where additional information becomes available.

The description of the Proposal and associated environmental impacts have been carried out 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). In doing so, the Supplementary 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 Supplementary REF would be considered when assessing:

- Whether the Proposal is likely to have 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 Proposal to significantly impact a matter of national environmental significance or Commonwealth land and 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

2.1 Strategic need for the Proposal

The Proposal is required to facilitate construction of the M1 Pacific Motorway Replacement and Widening: Tuggerah to Doyalson (the original Project). The proposed design amendments have been identified as a routine part of detailed design and, in general, would improve safety for road users during construction and operation, improve safety for maintenance crews during operation, improve drainage and water quality outcomes, ensure the upgrade can be efficiently constructed (i.e. sufficient ancillary sites and construction space) and decrease construction timeframes.

2.2 Existing road and infrastructure

The M1 Pacific Motorway corridor is the principal road corridor linking Sydney with Newcastle and areas further north including the north coast of NSW and on to Brisbane. It is currently used by more than 70,000 vehicles per day servicing long distance freight transport, a relatively large proportion of heavy vehicles, commuters travelling between the Central Coast and Sydney and tourist traffic during holiday periods.

The original Project aims to address capacity constraints which have been identified along the motorway and to address the poor condition of the concrete pavement along the motorway north of the Wyong River. The Proposal would better enable the construction and operation of the original Project.

2.3 The original Project objectives

The objectives of the original Project were established in the original Project REF and are to:

- Reduce travel times and congestion and provide for future predicted local and regional traffic growth by increasing capacity of the M1 Pacific Motorway from two to three lanes in each direction between Tuggerah Interchange and Doyalson Link Road Interchange
- Reduce the crash rate of the subject section of the M1 Pacific Motorway particularly with regard to the high number of crashes that occur when the road surface is wet
- Widen within the existing M1 Pacific Motorway corridor road reserve with a view to reducing the construction footprint and impact on remnant vegetation and biodiversity in general
- Maintain or improve the visual driving experience and amenity in this section of the M1 Pacific Motorway so as to be consistent with the styles and themes of the sections to the north and south forming a continuous corridor from an urban design and landscape design perspective
- Minimise disruptions and delays to traffic during construction and ensure that road users are keep informed of travel conditions during works
- Minimise the broader social and environmental impacts of the development
- Achieve an overall Proposal result that provides the best value for money for the entire project lifecycle.

The Proposal is consistent with, and supports the achievement of, the original Project objectives.

2.4 Alternatives and options considered

The alternatives and options for the original Project were considered and documented in Section 2.4 of the original Project REF. Where relevant, alternatives and options, or a justification, specific to each of the proposed design amendments are discussed below.

2.4.1 New ancillary sites

Identified options

Section 3.5 of the original Project REF identified the use of three construction ancillary sites: the Warren Road site; the Hue Hue Road site; and the McPherson Road site. The Warren Road and McPherson Road sites may no longer be available so a number of additional construction ancillary sites are required.

Analysis of options

Seventeen potential additional ancillary sites have been identified for consideration. A desktop assessment was carried out to shortlist sites for further investigation. This desktop assessment identified five shortlisted sites (referred to as sites E5, W6, W7, W8 and W9) which best met the ancillary site criteria established in the original Project REF (see below). Consultation with the property owner of site W7 confirmed that the site would not be available for use and therefore it was not considered further. Additional field surveys were carried out to ground truth potential constraints for the remaining four sites (sites E5, W6, W8 and W9). A number of constraints were identified on each of the sites. Table 2-1 provides a summary of these constraints and the consideration given to avoidance of impacts.

Table 2-1 Summary of shortlisted ancillary site assessment[2]

Site ID	Potential constraints	Discussion
E5	• Part of the site within the 100 year average recurrence interval flood level • Part of the site contains an Endangered Ecological Community (EEC).	• The majority of the area within the 100 year average recurrence interval flood level can be excluded from use • The areas containing an EEC can be excluded from use.
W6	• Almost the entire site is within the 100 year average recurrence interval flood level • Potential threatened fauna habitat.	• These constraints would be unavoidable.

[2] 1 in 20 year average recurrence interval flood extents were not available electronically. Therefore the sites were assessed against the more conservative 1 in 100 year average recurrence interval flood extents.

Site ID	Potential constraints	Discussion
W8	• Potential koala habitat, threatened flora species, mature trees, hollow-bearing trees.	• The majority of potential koala habitat can be avoided however removal of some potential koala habitat (0.17 ha), some threatened flora species and mature trees would be required to facilitate use of the site. Hollow-bearing trees can be avoided.
W9	• Potential threatened fauna habitat, hollow bearing trees, mature trees, raptor nest (potential threatened species), EECs, threatened flora species.	• Many of these features can be protected by excluding these areas from use however removal of some areas of EEC, and some threatened fauna habitat including hollow-bearing trees, would be required to facilitate use of the site.

Site W6 was excluded from further consideration based on the significance of potential ecological impacts that would result from use of the site. Sites W8, W9 and E5 were identified as the preferred locations for the additional ancillary sites and are proposed for use as part of the Proposal.

The ancillary site criteria adopted by Roads and Maritime in the original Project REF which were used to carry out the desktop assessment are:

- Be located more than 50 m from a waterway
- Have ready access to the road network or direct access to the construction corridor
- Be located in areas of low ecological significance and require minimal clearing of native vegetation (not beyond that already required by the original Project)
- Be located on relatively level land
- Be separated from the nearest residences by at least 200 m (or at least 300 m for a temporary batching plant)
- Not unreasonably affect the land use of adjacent properties
- Be above the 20 year average recurrence interval (ARI) flood level unless a contingency plan to manage flooding is prepared and implemented
- Provide sufficient area for the storage of raw materials to minimise, to the greatest extent practical, the number of deliveries required outside standard construction hours
- Be located in areas of low heritage conservation significance (including identified Aboriginal cultural value) and not impact on heritage sites beyond those already impacted by the original Project.

Preferred options

Based on the outcome of the desktop and field based assessment, sites W8, W9 and E5 were identified as the preferred locations for the additional ancillary sites. These sites are identified on Figure 1-1.

In addition to the three additional ancillary sites, the detailed design process identified the need to clear a small amount (about 0.03 ha) of an Endangered Ecological Community (EEC) on the Hue Hue Road ancillary site (approved for use under the original Project REF) to provide access from the southern boundary via the northbound service centre.

2.4.2 Doyalson Link Road Bridge over M1 Pacific Motorway entry ramp

The original design proposed the construction of a bridge to facilitate the grade separation of the Doyalson Link Road northbound exit ramp and the Sparks Road northbound extended entry ramp. This design involved a long overlap of the two ramps, requiring a complex tunnel like structure with high reinforced soil walls and a large number of transverse plank girders.

The road alignment was refined during detailed design to make a simpler bridge structure viable. The revised design is a two span bridge formed from precast concrete super T girders and a cast in-situ reinforced concrete deck slab. The proposed design amendment would reduce the span from about 100 m to about 56 m in length.

2.4.3 Widening Sparks Road overbridge

The original Project proposed to remove the safety barrier and footpath from the existing eastbound Sparks Road overbridge to accommodate an additional eastbound lane; a new adjacent bridge structure was proposed to accommodate pedestrians and cyclists. It was identified during detailed design that adequate drainage could not be retrofitted to the existing structure to drain stormwater from the new eastbound slow lane without widening the structure.

To address the drainage issue, it was determined that widening of the existing Sparks Road overbridge would be required. Based on the need to widen the overbridge, the shared pedestrian/cyclist path would be incorporated into the widened structure rather than being provided as a separated structure.

2.4.4 Revised staging strategy and horizontal alignment

The detailed design process identified the need to alter the staging strategy proposed under the original Project REF to reduce construction timeframes. The detailed design process identified a need to increase the width of the median side shoulders to improve safety during operational maintenance activities.

The original staging strategy involved a widening approach using a contraflow arrangement which is only permitted for 4.5 km at a time (meaning the nine kilometre section north of Wyong River would have to be constructed in two parts). The detailed design process proposed a solution to avoid contraflow by altering the staging strategy and adopting an asymmetrical widening approach. This altered staging strategy would reduce the overall construction timeframe and provide traffic safety benefits by avoiding the need for long contraflow length arrangements.

2.4.5 Revised pavement type

The detailed design process involved investigating the most suitable pavement types. The investigation considered the use of open grade asphalt (OGA) to the south of the Wyong River and plain concrete pavement (PCP) north of the Wyong River (the design considered in the original Project REF) and also investigated the use of stone mastic asphalt (SMA) along the full length of the upgrade. SMA was adopted for the entire length of the Proposal because of its superior structural performance in resisting traffic loads, its longer life which requires less frequent maintenance and the reduced construction timeframes associated with installation of SMA. An assessment of potential noise impacts associated with the design amendments (see Appendix A) identified that adoption of SMA along the full length of the upgrade would also have the benefit of reducing overall operational noise levels associated with the Proposal.

2.4.6 Revised original Project boundary

During detailed design, it was identified that the original Project boundary nominated in the original Project REF did not accommodate the footprint of the design or provide sufficient construction working space. As a result, the Proposal boundary has been amended to incorporate all aspects of the design and provide sufficient working space to safely construct the original Project.

2.4.7 Wyong River spill containment

The original Project involves new line marking on the Wyong River Bridge (northbound) to alter the current shoulder to a third traffic lane. The detailed design process identified the need to improve drainage on the bridge, through the provision of additional scuppers (holes in the bridge deck to remove water), to prevent water from pooling in the new traffic lane.

As the original Project would alter the drainage infrastructure, it was considered necessary to provide additional infrastructure to reduce the potential for a spill on the motorway entering Wyong River. The Proposal would pipe the scuppers and provide a containment basin in the median to prevent spilled liquids entering Wyong River.

2.4.8 Landscape area

The detailed design process considered new onsite locations for landscape areas constructed out of suitable excess construction material (VENM, ENM and suitable topsoil). Development of landscape areas would avoid disposal of surplus or unsuitable materials to offsite locations and maximise opportunities for their re-use onsite.

One suitable site inside the Proposal boundary was identified that did not result in any additional environmental impacts, did not impact important views and would meet the urban design principles. Additional suitable sites may be identified during the construction period and may be used provided they meet the criteria established in Section 3.2.8 of the Supplementary REF.

2.4.9 Warnervale Interchange lane/ramp reconfigurations

The detailed design process identified an opportunity to improve safety for motorists by reducing traffic 'weaving' between the Warnervale Interchange and the Doyalson Link Road Interchange.

The design solution is to reconfigure the lanes and ramps associated with the Warnervale Interchange, primarily by replacing complex and non-standard 'lane drop' and 'lane gain' merging arrangements with standard merge and diverge arrangements. This design change provides consistency of merging and diverging arrangements with the majority of the rest of the motorway, reduces the potential for motorist confusion and improves operational traffic safety.

2.4.10 Variable message signs

The detailed design process identified the need for two variable message signs (VMSs) to be installed on the northbound and eastbound approaches to the Warnervale Interchange to provide directional advice for motorists using the M1 Pacific Motorway.

2.4.11 Directional signs

The detailed design process identified the need for three directional signs to be installed on the southbound and westbound approaches to the Doyalson Interchange to provide directional advice for motorists using the M1 Pacific Motorway.

2.4.12 Vertical alignment

During detailed design it was identified that the vertical alignment would need to be modified in some locations to resolve potential aquaplaning issues and provide a safer outcome for road users. The amended design would increase the vertical alignment by up to 700 mm over the original Project design at discrete locations.

3 Description of the Proposal

3.1 The Proposal

An original Project REF was prepared by Roads and Maritime under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the replacement of the existing pavement and widening of around 12.3 km of the M1 Pacific Motorway from two lanes in each direction to three lanes in each direction between Wyong Road, Tuggerah, and Doyalson Link Road, Kiar (the original Project). Roads and Maritime determined to proceed with the original Project in October 2014.

Following the determination to proceed with the original Project, the detailed design process has identified a number of design amendments (the Proposal) which are the subject of this Supplementary REF and are described in detail in Section 3.2.

3.2 Design amendments

The proposed design amendments are described below including a comparison to the design under the original Project REF and the changes involved in the Proposal. The potential change in environmental impacts, compared to the original Project REF, resulting from the design amendments are outlined in Section 6.

3.2.1 New ancillary sites

Three new ancillary sites have been identified for use as part of the Proposal. These sites are E5, W8 and W9 as shown on Figure 1-1. Table 3-1 outlines the activities proposed for each of the additional ancillary sites.

Table 3-1 Activities proposed at additional ancillary sites

Ancillary site	Site use	Approximate size
E5	• Site compound • Asphalt batching plant • Stockpile site • Precast barrier storage site • Laydown area.	5 hectares
W8	• Site compound • Asphalt batching plant • Concrete re-processing plant • Stockpile site • Precast barrier storage site • Laydown area.	7.5 hectares
W9	• Site compound • Asphalt batching plant • Concrete re-processing plant • Stockpile site • Precast barrier storage site • Laydown area.	21 hectares

Ancillary site E5 is owned by Wyong Shire Council (WSC), ancillary site W8 is privately owned and siteW9 is owned by Warner Business Park Pty Ltd.

Access to ancillary site E5 would be via the Warnervale Interchange, then along Sparks Road and Jack Grant Avenue. Access to ancillary site W8 would be via the Warnervale Interchange (an all-movements interchange), then along Sparks Road, Hue Hue Road and Kiar Ridge Road (about four kilometres by road from the site to the interchange). Access to ancillary site W9 would be via the Warnervale Interchange, then along Sparks Road and Hue Hue Road. The proposed entrance location would be at the southwest corner of the site on Hue Hue Road. Kiar Ridge Road and Jack Grant Avenue are unsealed roads. These roads may be re-sealed/sealed and widened as part of the Proposal in order to appropriately cater for construction traffic.

The additional ancillary sites are proposed to be used prior to and during construction of the Proposal for a period of about three and a half years. The construction hours for the Proposal apply to the ancillary sites and are described in Section 3.3.2. Potential traffic and land use impacts associated with the proposed ancillary sites are described in Sections 6.1 and 6.6.

Water would be required for the activities to be carried out at the additional ancillary sites, with about 36 ML estimated to be required for concrete reprocessing. A range of water supply options may be implemented including rainfall capture from roofs, trucking in water, connection to the town water supply[3], accessing groundwater and/or surface water (which may require approvals under the *Water Management Act 2000* (WMA) (see Section 4.3.5) or collection and re-use of water used for onsite activities.

Prior to vacation of the ancillary sites, unless otherwise agreed to in writing by the property owner, the following works would be carried out:

- Removal of sheds, structures, plant and equipment and surplus construction materials
- Smoothing of the land surface and filling of ruts (if any) arising from the use and occupation of the sites
- Remediation of any contamination arising from the use and occupation of the site
- Removal of any hardstand areas and concrete pads
- Filling of holes from removal of hardstand area and concrete pads and properly compact the land
- Reinstate internal fences and pipes removed during use and occupation of the sites
- Reinstate perimeter fences removed during use and occupation of the sites (reinstatement would be done in a manner that avoids or minimises clearing of native vegetation)
- Cleaning out and infilling any water quality or sediment basins constructed during use and occupation of the sites
- Reinstate appropriate vegetative cover in consultation with the property owner.

[3] Should a connection to the town water supply be required to be established by Roads and Maritime or the construction contractor as part of the Proposal, a separate assessment would be undertaken to determine the impacts of such works and any necessary approvals obtained.

In addition to the three additional ancillary sites, the detailed design process identified the need to clear a small amount (about 0.03 ha) of an Endangered Ecological Community (EEC) on the Hue Hue Road ancillary site (approved for use under the original Project REF) to provide access from the southern boundary via the northbound service centre.

3.2.2 Doyalson Link Road Bridge over M1 Pacific Motorway entry ramp

The original Project involved grade separation of the Doyalson Link Road northbound exit ramp and the Sparks Road northbound extended entry ramp. The original Project involved a long overlap of the two ramps. The Proposal would alter the horizontal and vertical alignment of the ramps to shorten the length of overlap, reducing the span from about 100 m to 56 m (see Figure 3-1). The Doyalson Link Road northbound exit ramp bridge over the Sparks Road northbound entry ramp would be a two span bridge formed from precast concrete super T girders and a cast in-situ reinforced concrete deck slab. The construction of the structure would take place entirely within the existing Roads and Maritime road corridor.

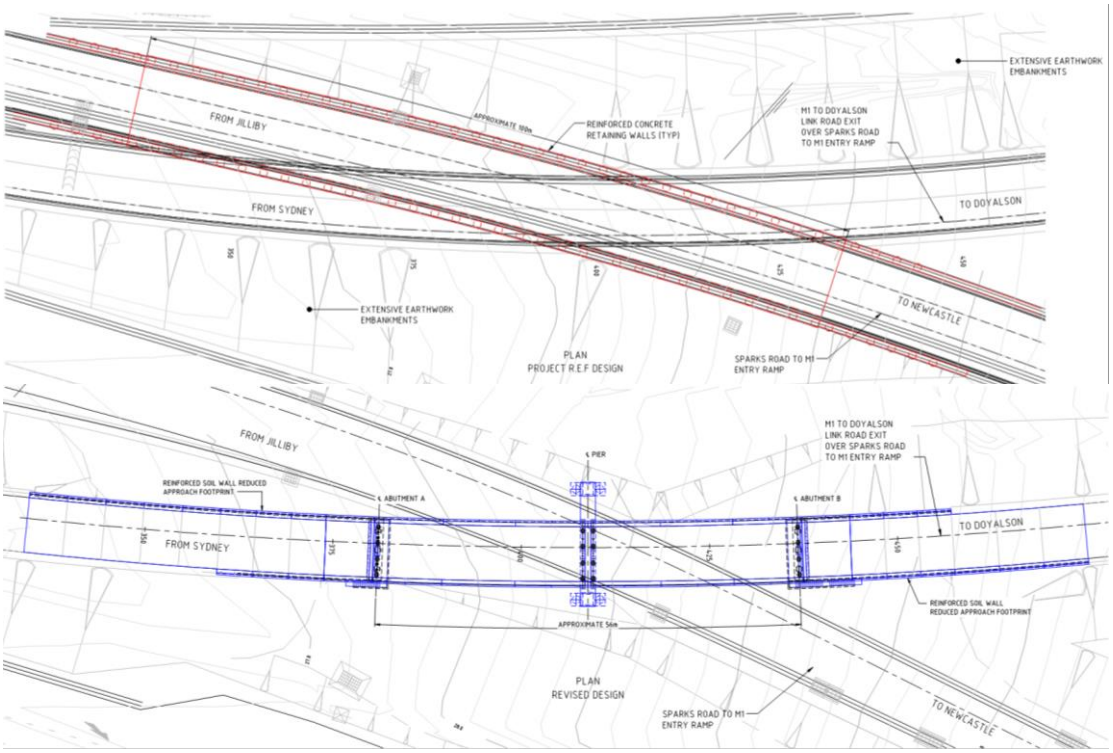


Figure 3-1 Comparison of the Doyalson Link Road Bridge over the M1 entry ramp under the original Project REF (above) and the Proposal (below)

3.2.3 Widening Sparks Road overbridge

The original Project involved a separate pedestrian/cycle bridge adjacent to the Sparks Road overbridge on the northern side. The Proposal would involve widening the existing Sparks Road overbridge to address drainage issues identified in the location during detailed design and to incorporate the pedestrian/cyclist path (see Figure 3-2). Additionally, a conduit would be incorporated into the design of the bridge to provide for future installation of water and sewer infrastructure proposed in the vicinity by Wyong Shire Council. Pedestrian and cyclist access across the overbridge would be maintained throughout construction.

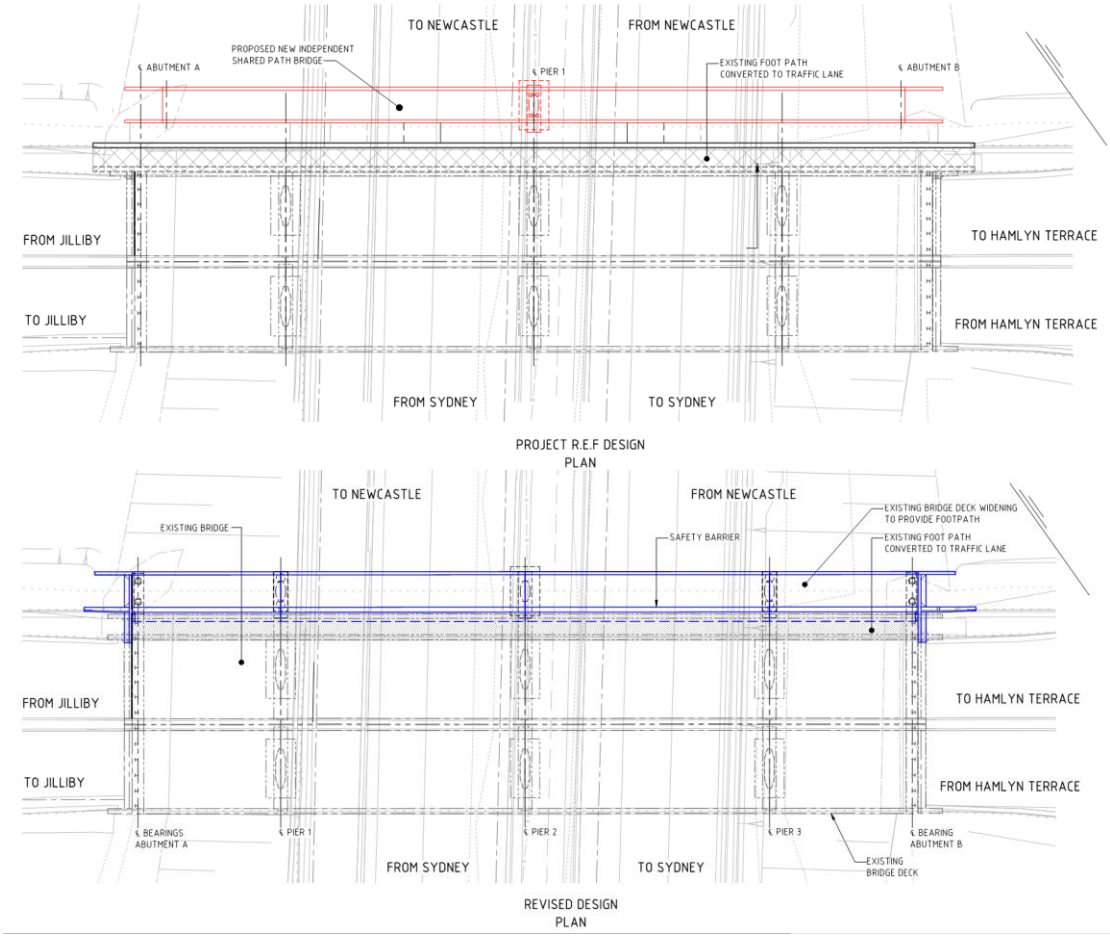


Figure 3-2 Comparison of Sparks Road overbridge between the original Project REF (above) and the Proposal (below)

3.2.4 Revised staging strategy and horizontal alignment

Revised staging strategy

The construction staging strategy proposed under the original Project REF involved widening one carriageway to four lanes to accommodate all lanes (northbound and southbound) during construction of the other carriageway (and vice versa). This would have involved a symmetrical approach into the median (i.e. where lanes are widened evenly on each side of the M1 Pacific Motorway) and would have been facilitated by installing a single central barrier between the northbound and southbound traffic, known as a contraflow arrangement. Contraflow is only permitted for 4.5 km at a time, meaning the nine kilometre section north of Wyong River would have to be constructed in two separate stages.

The Proposal would avoid contraflow arrangements by using two central barriers between the northbound and southbound traffic and revising the staging strategy. The amended staging strategy would involve an asymmetrical widening approach into the median (i.e. widening would be wider on one side of the M1 Pacific Motorway than the other). The initial widening would be permanent pavement, significantly reducing redundant temporary pavements. This would result in a narrower median when compared to the original Project in the area north of the Wyong River and south of Warnervale Interchange.

Figure 3-3 and Figure 3-4 depicts the strategy now proposed in the area north of the Wyong River where the strategy has been revised during detailed design.

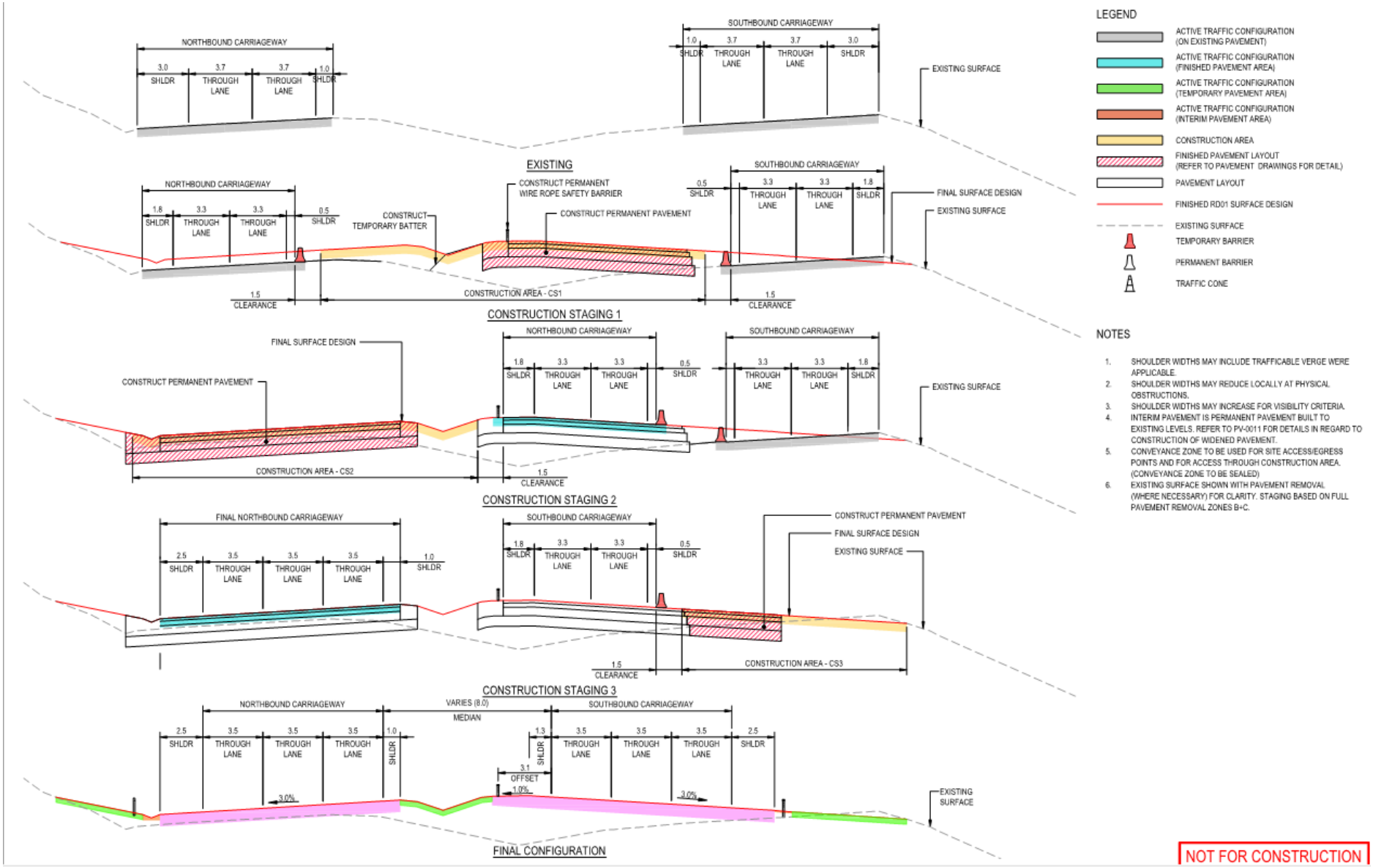


Figure 3-3 Staging strategy under the Proposal (cross section)

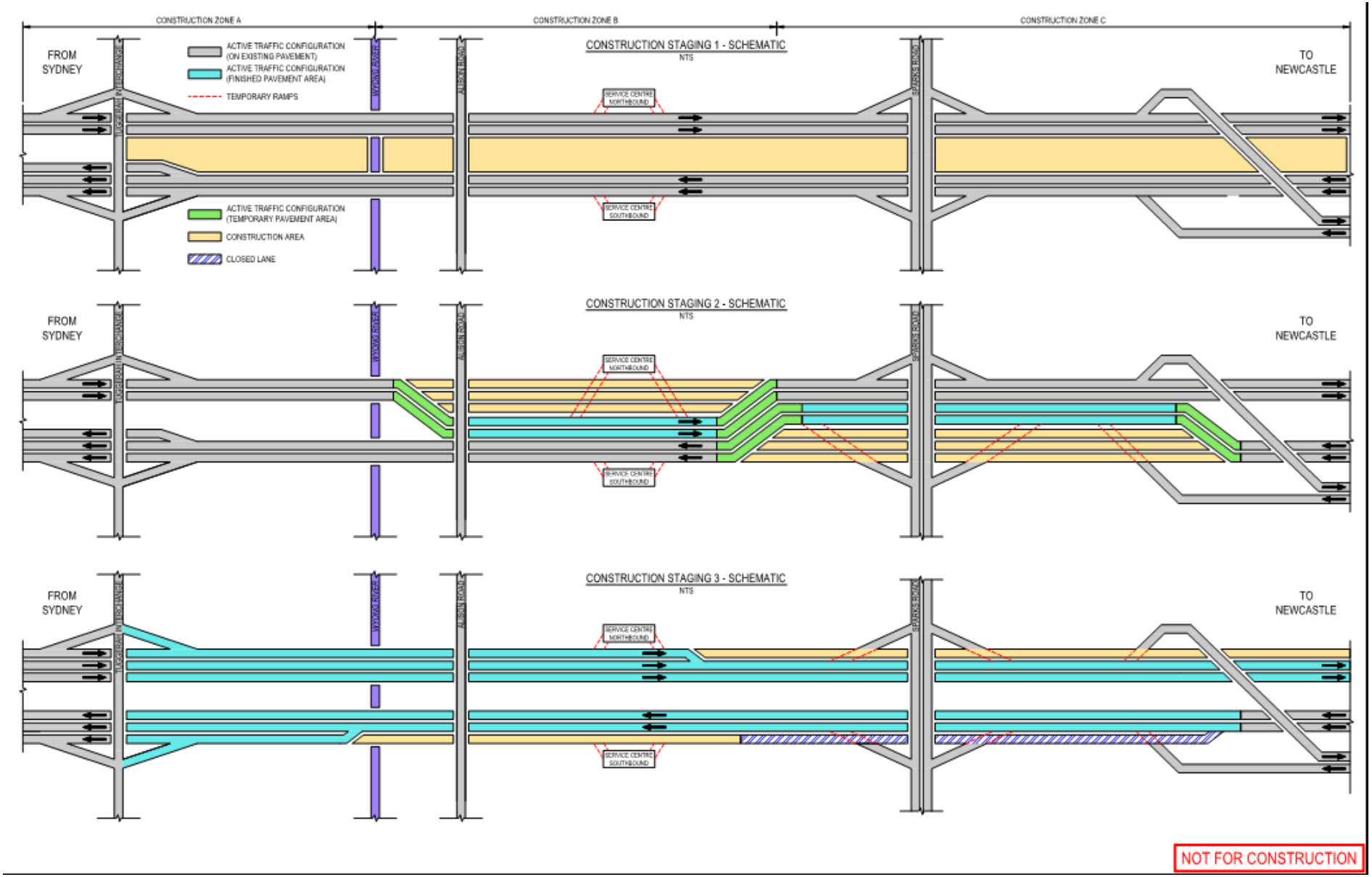


Figure 3-4 Staging strategy under the Proposal (plan)

Revised horizontal alignment
Under the original Project, the median shoulders were proposed to be one metre wide. The Proposal would modify the width to provide 3.1 m wide off-side shoulders to facilitate maintenance access along the majority of the upgrade (see final configuration in Figure 3-3). The revised horizontal alignment would result in the southbound lanes moving east by about 1.4 m between about chainage 88,500 and chainage 93,200. The detailed design process also identified the need for minor adjustments to the horizontal alignment in other discrete locations along the length of the upgrade, including at the Warnervale Interchange northbound G-loop entry ramp. The revised horizontal alignment is depicted on Figure 1-1 and Figure 1-2 above.

3.2.5 Revised pavement type

The original Project involved a like for like replacement of the pavement along the length of the upgrade; that is, replacing the existing plain concrete pavement (PCP) with new PCP north of the Wyong River and replacing the existing open grade asphalt (OGA) with new OGA to the south of the Wyong River. The Proposal would instead use stone mastic asphalt (SMA) along the full length of the upgrade. Asphalt road pavements are generally considered to be quieter than concrete road pavements and therefore the proposed design amendment would provide operational noise benefits when compared to the original Project design.

3.2.6 Revised original Project boundary

The Proposal involves modifying the original Project boundary to accommodate the design and provide sufficient construction working space. The revised boundary is shown as the Proposal boundary on Figure 1-1 and Figure 1-2.

The revised boundary accommodates:

- The tie-in with M1 Pacific Motorway at the northern end of the Proposal
- The tie-in with Doyalson Link Road
- Installation of scour protection at existing culverts (if required based on site inspections)
- Sufficient space for construction of the upgrade
- Revised horizontal alignments as part of the design amendments described elsewhere within this Supplementary REF.

3.2.7 Wyong River spill containment

The original Project involves the conversion of the current shoulder on the northbound Wyong River Bridge to a trafficable lane, necessitating additional scuppers (drainage holes) on the bridge. The original Project maintained the existing drainage arrangement at the Wyong River Bridge which involves the scuppers draining directly to the Wyong River.

The Proposal involves piping the scuppers on the northbound Wyong River Bridge to divert runoff from the Wyong River northbound bridge to a spill containment basin to be installed within the median to the south of the bridge (see Figure 1-2). The spill containment basin would comprise of an inlet pipe, an outlet pipe and one sump, with a capacity to hold about 18.5 kilolitres (see Figure 3-5). The primary purpose of the spill containment basin is to capture any spills which occur on the bridge (chemicals or hazardous substances). The basin is designed to outlet from the invert so hydrocarbons would be stored in the basin until emptied as part of a spill response. This would reduce the potential for hydrocarbon spills to enter the Wyong River.

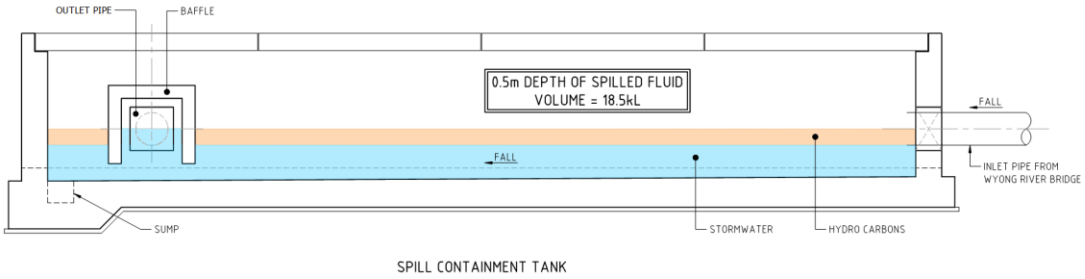


Figure 3-5 Cross section of the proposed spill containment basin

3.2.8 Landscape area

The original Project REF identified construction activities would generate substantial volumes of stripped topsoil and large volumes of excavated and demolished pavement materials. It is suggested these would be stockpiled prior to re-use or removal offsite. This Proposal provides clarification relating to how the material would be reused onsite and the potential re-use of the material at offsite locations.

This Proposal identifies a suitable location for onsite re-use of some of these materials as part of the development of a landscape area. This would be limited to the re-use of any excess virgin excavated natural material (VENM), excavated natural material (ENM) and suitable topsoil (to enable landscape plantings). The landscape area would be located within the road corridor, on the eastern side of the M1 Pacific Motorway, about one kilometre south of the southbound service centre, as shown on Figure 1-2.

The formation of the landscape area would maintain views over the Porters Creek Wetland to the east of the M1 Pacific Motorway (i.e. would not extend above view line) and would be revegetated with low growing native vegetation to enhance urban design outcomes. Onsite re-use of materials would reduce haulage distances and would improve the resource recovery outcomes for the Proposal.

There may be additional opportunities to construct landscape areas from excess materials within the Proposal boundary, through integrated solutions such as batter widening. Re-use sites would be selected on the basis of the following criteria:

- Be located within the Proposal boundary
- Be located in areas of low ecological value and require minimal clearing of native vegetation (not beyond that already required by the original Project)
- Be above the 20 year average recurrence interval (ARI) flood level unless a review of potential flooding (afflux) implications has been carried out by a qualified hydrologist
- Be located in areas of low heritage conservation value and not impact on heritage sites beyond those already impacted by the original Project.
- Comply with the requirements of the *Protection of the Environment Operations Act 1997* (PoEO Act)
- Comply with any relevant NSW Resource Recovery Exemptions when applying waste to land
- Consider visual impact and appearance as viewed from the highway and/or neighbouring properties.

The potential re-use of materials within landscape areas would be managed through the Materials Management Plan and the landscape character and visual amenity environmental safeguards identified in the original Project REF. In addition vegetation selection and treatment would assist in slope stabilisation and reduce visual impacts.

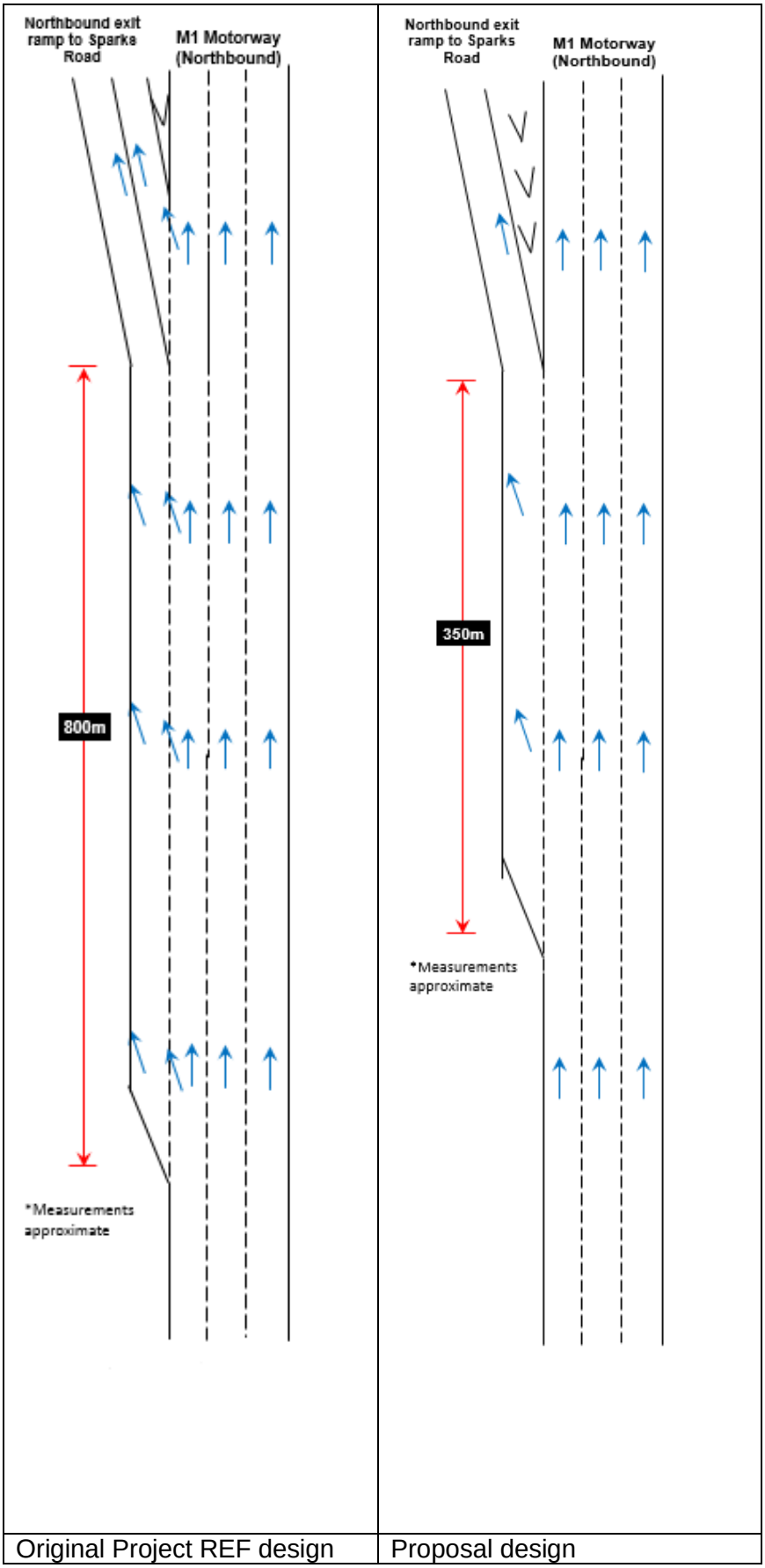
Excess materials may also be reused on other nearby construction and development projects where appropriate approvals are in place to receive these materials.

3.2.9 Warnervale Interchange lane/ramp reconfigurations

The Proposal would alter the lane/ramp configurations at Warnervale Interchange in three locations as identified in Table 3-2 and shown on Figure 3-6 to Figure 3-8.

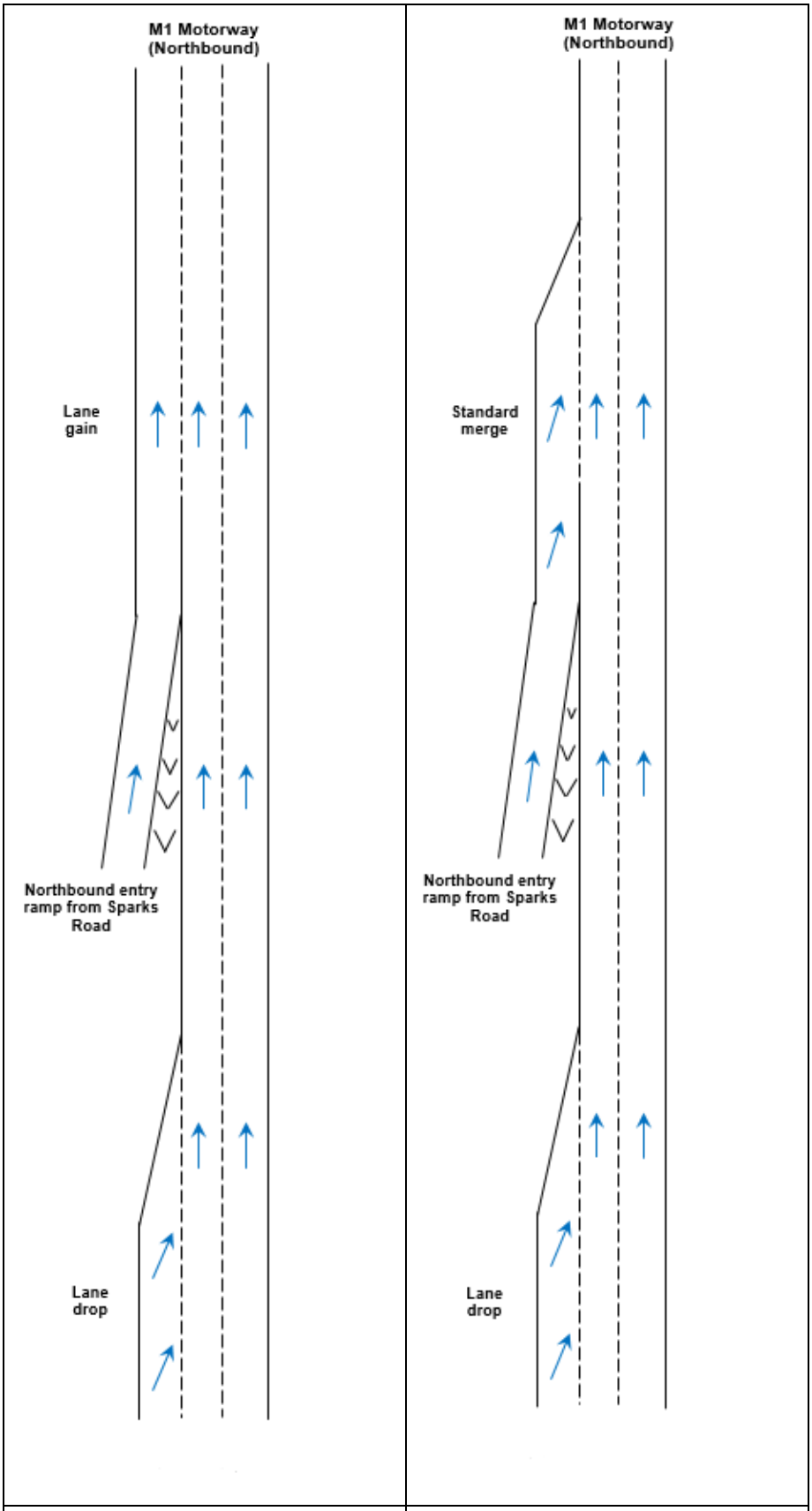
Table 3-2 Warnervale Interchange lane/ramp reconfigurations

Lane/ramp	Original Project design	Proposal design*
Northbound exit ramp to Sparks Road	800 m long deceleration lane for the northbound exit to Sparks Road	350 m long deceleration lane for the northbound exit to Sparks Road
Northbound entry ramp from Sparks Road	Lane drop on the M1 Pacific Motorway and then a lane gain to provide three northbound lanes.	Retains the lane drop and replaces the lane gain with a standard merge. North of the merge, there would be only two northbound lanes. This change affects the design in the vicinity of the Doyalson Interchange as the northbound entry from the Warnervale Interchange is an extended entry ramp which merges with the M1 Pacific Motorway north of the northbound exit ramp to Doyalson Link Road.
Southbound entry ramp from Sparks Road	Lane drop on the M1 Pacific Motorway before the Warnervale Interchange and then a lane gain to facilitate the entry to the M1 Pacific Motorway from Sparks Road	Removes the lane drop and replaces the lane gain with a standard merge. This would result in a widening from three lanes to four lanes (including the southbound entry ramp and the three mainline lanes) for about 500 m.



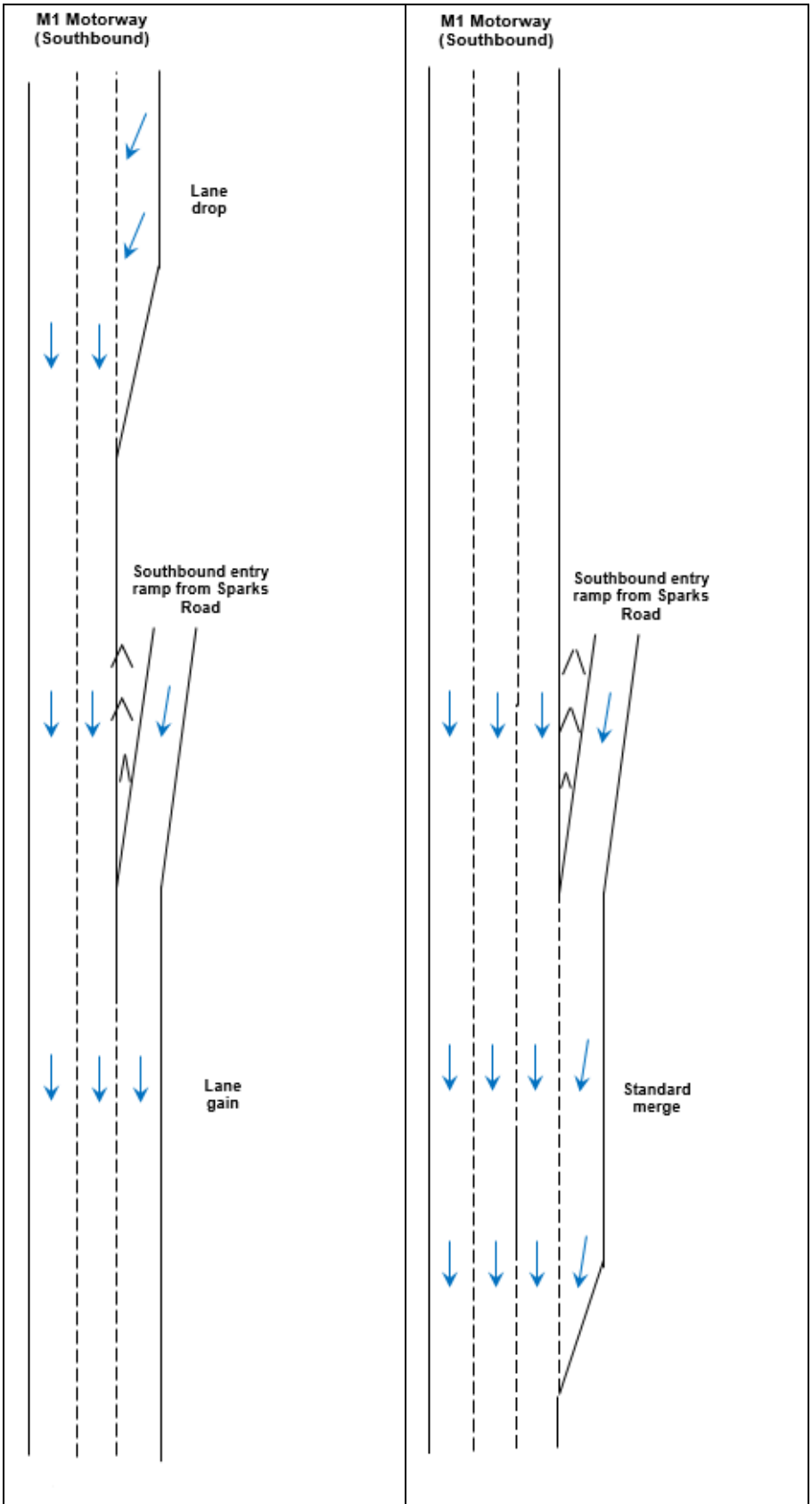
Original Project REF design | Proposal design

Figure 3-6 Change in deceleration lane length along the northbound exit ramp to Warnervale Interchange



Original Project REF design	Proposal design

Figure 3-7 Comparison of the lane drop and lane gain along the northbound lanes from the Warnervale Interchange between the original Project REF and the Proposal



Original Project REF design	Proposal design

Figure 3-8 Comparison of the lane drop and lane gain along the southbound lanes from the Warnervale Interchange between the original Project REF and the Proposal

3.2.10 Variable message signs

The original Project identified the potential need for installation of VMSs, and stated that the specific location(s) would be determined during detailed design. The following two locations, as shown on Figure 1-2, have subsequently been identified for installation of VMSs:

- On the western side of the M1 Pacific Motorway, south of the Warnervale Interchange, providing information for northbound motorists
- On the southern side of Sparks Road, east of the Warnervale Interchange, providing information to westbound motorists.

The dimensions of the VMSs would be about 8.5 m wide by about two metres tall. A typical cross section of a VMS is shown in Figure 3-9 below.

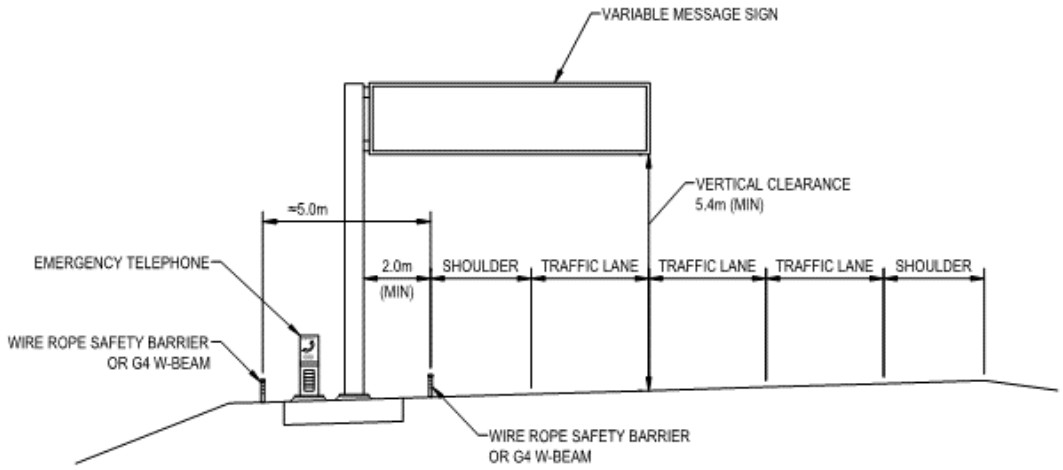


Figure 3-9 Typical cross section of a variable message sign

3.2.11 Directional signs

The detailed design process has identified the need to provide three additional directional signs to be installed on the southbound and westbound approaches to the Doyalson Interchange to provide directional advice for motorists using the M1 Pacific Motorway in the locations shown on Figure 1-1. The dimensions of the directional signs would be about six metres wide by six metres tall.

3.2.12 Vertical alignment

The vertical alignment would be raised, by up to 700 mm when compared to the original Project design, in some discrete locations to resolve potential aquaplaning issues and provide a safer road traffic outcome for motorists.

3.3 Construction activities

3.3.1 Work methodology

Construction is anticipated to commence in 2016. The design amendments have enabled a reduction in the predicted construction timeframes, primarily as a result of the revised staging strategy associated with the narrowing of the medians (described in Section 3.2.4). This would reduce the construction timeframe from about three and a half years to about three years (weather permitting).

As identified in the original Project REF, development of the Project has considered a range of construction techniques and methods to provide:

- Flexibility in the final choice of design and delivery
- Flexibility in construction methods.

Typical methods and sequencing of construction for the Project were described in Section 3.4.1 of the original Project REF. Where design amendments have changed the construction methods, a description of the proposed methodology is provided below. Construction of the Project would likely adopt standard techniques employed on motorway upgrade projects and would generally use conventional plant and machinery.

Motorway pavement widening

As discussed in Section 3.4.1 of the original Project REF, widening of the motorway carriageways would be carried out on sections of the motorway consistent with the staging plan. The staging strategy has been revised as part of detailed design and is described in Section 3.2.4. Construction activities under the Proposal would be broadly consistent with those identified in the original Project REF however the following description is provided to clarify the process and activities involved under the revised design:

- Identify and protect environmentally sensitive areas
- Set up traffic and safety controls for relevant stage of construction
- Establish erosion and sediment controls
- Remove existing barrier or wire rope (if applicable)
- Clear and grub existing median vegetation
- Establish haul road and temporary drainage within median
- Excavate median and box out carriageway widening and contra-flow crossovers
- Stabilise and compact the existing sub-grade material
- Place and compact select material zone
- Construct new pavement layers within the median (Stage 1 works)
- Line-mark widened section and place concrete or wire rope safety barriers outside the median side edge line
- Divert one carriageway (two lanes) of traffic onto the new median pavement works
- Full access to one carriageway is then available for complete removal of existing pavement and rebuilding as per similar sequence to that listed above (Stage 2 works)
- On completion of new carriageway works traffic diverted off new median pavement works back onto newly rebuilt complete carriageway

- Alternative carriageway traffic (two lanes) diverted onto new median pavement works (built as Stage 1 works)
- Removal of final section of old pavement and widening of new works (built in Stage 1 works) to complete the full width required for the second carriageway (Stage 3 works)
- Concurrent with the above would be extension/replacement/augmentation of the existing cross drainage, pavement drainage and new entry and existing ramps along with ramps to service centres.

Removal of existing pavement

Under the original Project, areas of existing pavement (concrete and asphalt) were to be replaced in a like for like manner. While the majority of the existing concrete pavement would need to be removed to enable new pavement to be constructed, there was an area in the vicinity of the Doyalson Link Road where the concrete pavement was of a good standard and therefore removal was not proposed under the original Project (i.e. the road would simply be widened).

Under the revised design, stone mastic asphalt would be installed along the full length of the upgrade. Therefore the concrete pavement in the vicinity of the Doyalson Link Road would also be removed.

The detailed design process has investigated and identified the following materials types/volumes to be demolished and removed under the revised design:

- About 500 m^3 of asphalt
- About 32,000 m^3 of lean mix concrete sub-base
- About 49,000 m^3 of plain concrete base.

As identified in the Section 3.4.1 of the original Project REF:

- The plain and lean mix concrete on the existing carriageways would be broken up by a combination of saw cutting and rock hammers. The resulting slabs of concrete would be loaded into dump trucks and hauled to a designated ancillary facility for stockpiling and processing. Concrete slabs would be separated from the steel elements such as dowels and tie bars. The concrete would then be able to be crushed and reprocessed
- A reprocessing plant may be located within an ancillary site (refer to Section 3.2.1) to process the material. Materials would be stockpiled for re-use on this Proposal or on other Roads and Maritime proposals where reasonably practicable, in preference to disposal to landfill or similar. Should a decision be made to carry out reprocessing offsite, relevant procedures and consultation with relevant stakeholders would be carried out
- Due to the limited space available within the existing median, stockpiling is not anticipated within the median work zone.

The detailed design process has identified that crushed concrete may be used as one or more of the following: select material, bound subbase material or trafficable verge material.

Pavement construction/reconstruction

The anticipated pavement construction activities under the revised design are broadly consistent with those described in Section 3.4.1 of the original Project REF, with the exception of no longer requiring construction of concrete pavement on the mainline. The detailed design process has provided further information/clarification regarding the depth of pavement works and this updated information is included below.

The existing natural sub-grade consists of Patonga Claystone and is likely to require stabilisation. This process could be carried out in-situ with spreaders and mixers, or the sub-grade material may be excavated and hauled to a designated site compound facility to be mixed in a pug-mill prior to hauling back for placing and compaction. The existing sub-grade would be stabilised to a depth of about 300 mm.

For mainline flexible pavement, typically a 300 mm Select Material Zone (SMZ) would be placed on the stabilised sub-grade. Potentially, the concrete removed from the existing concrete carriageways could be crushed and processed for re-use as this select material.

The new asphalt pavement would be constructed with a select material layer, a bound granular sub-base layer and deep lift asphalt layer. The deep lift asphalt pavement would typically be constructed with conventional asphalt pavers and rollers. Asphalt layers would be constructed sequentially, to a total thickness of about 450 mm (including bound granular subbase and asphalt layers).

Widening and reconstruction of entry and exit ramps for interchanges and the service centres would be constructed in asphalt pavement with short sections of hand placed concrete where they connect to the existing concrete roads.

Sparks Road bridge over the motorway (Warnervale Interchange)

As discussed in Section 3.3.2 of the original Project REF, the existing Sparks Road overbridge would be retained and reconfigured to provide additional turning lanes required for the new interchange arrangement. The original Project involved converting the footpath on the northern side of the bridge into a traffic lane and construction of a separate pedestrian/cyclist bridge. The revised design would involve widening the existing Sparks Road overbridge to incorporate the pedestrian/cyclist path into the same structure. This design amendment would result in some alterations to the construction methodology described in the original Project REF and the updated methodology is provided below. The existing bridge would be widened to provide a new dedicated pedestrian/cyclist path on the northern side of the existing bridge.

Construction of the western abutment would be carried out in conjunction with the construction of the new northbound on ramp G-loop and northbound carriageway while traffic is under contra-flow on the southbound carriageway. Construction of the eastern abutment would be carried out in conjunction with the reconstruction of the southbound carriageway while traffic is relocated to the new pavement built in the median.

It is envisaged that the main construction activities carried out for the Sparks Road bridge would be as described below, although the sequence of works may vary depending on the construction contractors proposed sequence:

- Identify and protect environmentally sensitive areas
- Set up site fencing and delineation, erosion and sediment controls
- Relocate existing services clear of the works area
- Excavate existing batter slopes and provide temporary support for existing overbridge abutment
- Install piles at abutment and pier locations
- Form and pour side abutments, side pile cap and median pile cap
- Form and pour piers and extend existing headstocks
- Install bearings pads onto the headstocks
- Install girders over carriageway spans and cast in-situ deck section
- Construct new in-situ barrier
- Install fixings such as railings and screens to girder
- Demolish existing road/pedestrian barrier and footpath
- Complete expansion joints and deck resurfacing works.

Doyalson Link Road bridge over the motorway

Construction of the Doyalson Link Road bridge over the motorway would be as described in Section 3.4.1 of the original Project REF.

Motorway bridges

The existing motorway bridges are identified in Section 3.3.6 of the original Project REF. Works at the bridges would be as described in Section 3.4.1 of the original Project REF. In addition, there would be upgrades to bridge barriers along the mainline to improve operational road safety, involving removal of the existing steel railings and replacement with an extension of the existing concrete barrier upstand.

Drainage structures

Construction of drainage structures would as described in Section 3.4.1 of the original Project REF.

Wong River spill containment basin

Construction of the Wyong River spill containment basin would involve two key components: the retrofit of the scuppers and piping at the bridge, and construction of the holding tank. The likely construction works for these two elements are descried below.

Retrofit of scuppers piping at Wyong River Bridge to connect to holding tank

- Identify and protect environmentally sensitive areas
- Scupper piping suspended from Wyong River Bridge (northbound) to be installed using access from an underbridge unit or suspended scaffolding
- Excavate trench for drainage pipes running between the bridge and holding tank avoiding environmental exclusion zone
- Lay and bury pipes.

Construct holding tank

- Identify and protect environmentally sensitive areas
- Set up site fencing and delineation, erosion and sediment controls
- Excavate existing median batter slopes
- Excavate and bench for holding tank
- Form and pour base slab
- Form and pour walls
- Install precast roof slabs
- Install trafficable manhole covers
- Install inlet and outlet piping
- Backfill excavation around holding tank.

3.3.2 Construction hours and duration

Construction hours would remain the same as those assessed by the original Project REF:

- Standard construction hours (7am to 6pm Monday to Friday, 8am to 1pm Saturday)
- Extended work hours (6am to 8pm Monday to Friday, 7am to 5pm on Saturdays)
- No work on Sundays or public holidays
- Out-of-hours work (as restricted by the original Project REF).

An original Project priority was to undertake as much work as reasonably practicable during standard construction hours. Work carried out during extended construction hours or out-of-hours would be required to comply with the restrictions identified in the original Project REF. Construction is anticipated to commence in 2016. The design amendments have enabled a decrease in the predicted construction timeframes, primarily as a result of the revised staging strategy associated with the narrowing of the medians (described in Section 3.2.4). This would reduce the construction timeframe from about three and a half years to about three years (weather permitting).

3.3.3 Plant and equipment

The plant and equipment proposed in the original Project REF remain relevant for the Proposal, with the exception of an asphalt batching plant due to the revised pavement type. The proposed asphalt batching plant and related equipment would be used at one or more of the additional ancillary sites as discussed in Section 3.2.1. The asphalt batching plant is expected to be in use for about 36 months.

3.3.4 Earthworks and pavement reconstruction/source and quantity of materials

The original Project REF identified a deficit of around 20,000 m³ of site won materials therefore requiring importation of fill for general earthworks. The volume of site won/imported materials excavated/stored would vary depending on construction staging. The design amendments are expected to result in about 15,000 m³ of surplus site won material. This volume would change if the Doyalson Interchange North Facing Ramps (southbound exit and northbound entry ramps) (DINFR) are constructed in a separate stage after completion of the works along the mainline. This is because the mainline works require imported fill material and DINFR results in excess material being generated. If constructed separately, about 35,000 m³ of imported materials would be required for construction of the mainline and there would be an excess of about 50,000 m³ of site won material from works at DINFR. The volumes of other pavement materials required for the Project have not significantly changed as a result of the design amendments.

3.3.5 Traffic management and access

The traffic management and access arrangements identified in the original Project REF are not expected to significantly change as a result of the proposed design amendments, with the exception of additional haulage routes and traffic impacts associated with the additional ancillary sites.

The additional haulage routes would include:

- Sparks Road (east of the M1 Pacific Motorway) and Jack Grant Avenue (for access to ancillary site E5)
- Sparks Road (west of the M1 Pacific Motorway) and Hue Hue Road (for access to ancillary site W9)
- Sparks Road (west of the M1 Pacific Motorway), Hue Hue Road and Kiar Ridge Road (for access to ancillary site W8).

A construction traffic and transport assessment has been carried out for the new haulage routes (refer to Section 6.1). The construction trip generation used in the original Project REF was adopted for this assessment (i.e. construction ancillary facilities would generate up to 35 heavy vehicle trips per hour and up to 76 light vehicle trips per hour during peak construction periods).

3.4 Ancillary facilities

Three additional ancillary sites are proposed for use during construction of the Proposal. These sites are identified and described in Section 3.2.1 of this Supplementary REF.

3.5 Public utility adjustment

Public utility adjustments were considered in Section 3.6 of the original Project REF. The original Project REF identified the need for minor permanent utility adjustments to power and communication utilities for VMSs. These would require localised underground reconfiguration. Connections to these utilities would be made from the existing power and communications cables already located within the motorway corridor.

There may be a requirement for some additional adjustments to utilities due to the proposed ancillary sites including the provision of sewer, water and communications for site offices and amenities. Roads and Maritime would consult with the relevant utility providers regarding the provision of these services.

Approval from the relevant utility authorities and organisations would be obtained for any utility relocations or adjustments before the commencement of any works.

3.6 Property acquisition/lease

The original Project REF, in Section 3.7, identified that property acquisition would not be required for the original Project. The proposed design amendments would not require any permanent property acquisition, however the additional ancillary sites may require the following additional land to be either fully or partially temporarily leased:

- Ancillary site W8 – Lot 5 DP 259531
- Ancillary site W9 – Lot 7 and 8 DP 239704
- Ancillary site E5 – Lot 3 DP 1007500.

The sites would be leased from the relevant property owners prior to commencement of construction for the duration of the Proposal. The proposed activities at these sites are described in Section 3.2.1 and would be discussed in advance with each property owner.

4 Statutory and planning framework

An original Project REF was prepared by Roads and Maritime under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the replacement of the existing pavement and widening of around 12.3 km of the M1 Pacific Motorway from two lanes in each direction to three lanes in each direction between Wyong Road, Tuggerah, and Doyalson Link Road, Kiar (the original Project). Roads and Maritime determined to proceed with the original Project in October 2014.

Following the determination of the original Project REF, detailed design has been carried out by Hyder Consulting. The detailed design process has identified a number of design amendments (the Proposal) which are the subject of this Supplementary REF.

The original Project REF identified the statutory and planning framework relevant to the assessment of the original Project. The following sections provide a summary of the statutory and planning framework, including any necessary updates as a result of the design amendments.

4.1 State Environmental Planning Policies

4.1.1 State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to facilitate the effective delivery of infrastructure across the state, including for roads and road infrastructure facilities. Clause 94 of the 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 Proposal is appropriately characterised as development for the purposes of a road or road infrastructure facilities, and is to be carried out by or on behalf of Roads and Maritime Services, it can be assessed under Part 5 of the EP&A Act. Development consent from council is not required.

The Proposal 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* or *State Environmental Planning Policy (Major Projects) 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 Section 5 of the Supplementary REF.

4.1.2 State Environmental Planning Policy 44 Koala Habitat Protection

State Environmental Planning Policy 44 Koala Habitat Protection (SEPP 44) seeks to encourage the proper conservation and management of areas that provide habitat for koalas. SEPP 44 applies to the Wyong LGA.

The original Project REF identified that two eucalypt species listed as a Koala feed trees under Schedule 2 of SEPP 44 were recorded in the study area: *Eucalyptus robusta* (Swamp Mahogany) and *E. punctata* (Grey Gum). *E. robusta* was identified as comprising 15 per cent of vegetation at two locations: in the north-western corner of the intersection of Sparks Road and the M1 Pacific Motorway; and at the Hue Hue Road ancillary site. This habitat was therefore considered 'potential Koala habitat' in accordance with Clause 4 of SEPP 44. *E. punctata* was identified at Doyalson Road Interchange West, but it did not comprise 15 per cent of the canopy, so is not considered potential Koala habitat according to SEPP 44. The original Project REF identified that the original Project would not affect core Koala habitat.

During investigations for this Supplementary REF, E. robusta was also identified in patches of remnant vegetation at Ancillary Sites W8 and W9 in densities of about 15 per cent or more of the canopy. These remnant patches constitute potential Koala habitat in accordance with Clause 4 of SEPP 44. No core Koala habitat was identified in ancillary sites. The majority of potential Koala habitat would be protected through the establishment of exclusion zones. However, 0.27 hectares of potential Koala habitat would be cleared including 0.1 ha within the Proposal area at Sparks Road and 0.17 ha at ancillary site W8. The Proposal would not affect any core Koala habitat.

4.1.3 State Environmental Planning Policy 14 Coastal Wetlands

Section 4.1.2 of the original Project REF outlines the aims and objectives of *State Environmental Planning Policy 14 Coastal Wetlands* (SEPP 14) and the triggers which would necessitate consent from local council and concurrence of the Director for certain activities. The original Project REF identifies that the original Project can be carried out without consent from Council or the concurrence of the Director. The potential impacts to SEPP 14 wetlands associated with the Proposal would not change from those identified in the original Project REF and there remains no requirement for consent from Council or concurrence of the Director.

4.1.4 State Environmental Planning Policy 71 Coastal Protection

State Environmental Planning Policy 71 Coastal Protection (SEPP 71) aims to protect and manage the natural, cultural, recreational and economic attributes of the NSW coast, to protect and improve public access to and along coastal foreshores and to ensure the scenic quality of the surrounding area is maintained.

A section of the Proposal corridor, to the north (940 m) and south (1.23 km) of Alison Road around the Wyong River is subject to SEPP 71. The revised Proposal boundary incorporates a slightly larger area of SEPP 71, compared to the original Project REF.

Clause 8 details matters for consideration that need to be considered by a consent authority when it determines a development application to carry out development on land to which the policy applies. The matters for consideration and the Proposal response would not change to those stated in Table 4.1 of the original Project REF.

4.1.5 State Environmental Planning Policy (Major Development) 2005

State Environmental Planning Policy (Major Development) 2005 (Major Development SEPP) identifies major projects for the purpose of planning approval for State significant sites.

The original Project REF identified that the Major Development SEPP designates Council as the consent authority for development on land within the Wyong Employment Zone (WEZ). However, the WEZ has since been removed as a significant site under the Major Development SEPP (via amendments made following determination of the original Project REF). The Major Development SEPP therefore does not apply to the Proposal.

4.2 Local Environmental Plans

4.2.1 Wyong Local Environmental Plan 2013

The *Wyong Local Environmental Plan 2013* (Wyong LEP) was gazetted in December 2013. With the exception of the new ancillary sites, all proposed design amendments are located within the SP2 Infrastructure zone. Ancillary site W8 extends across E2 Environmental Conservation, IN1 General Industrial and RU6 Transition. Ancillary site W9 is located wholly with IN1 General Industrial and ancillary site E5 consists of IN1 General Industrial and SP2 Infrastructure.

The Proposal is permissible with consent in these zones, however 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.

Ancillary site E5 is located on land adjacent to the Warnervale airport, which is owned by Wyong Shire Council. The Wyong LEP outlines provisions relating to obstacle limitation surfaces (OLS) for the Warnervale airport. The OLS height restriction on ancillary site E5 ranges from six metres to 52.6 m, as shown on Figure 4-1. Roads and Maritime is carrying out consultation with Wyong Shire Council (WSC) and would ensure that the proposed activities at ancillary site E5 would not intersect the OLS.

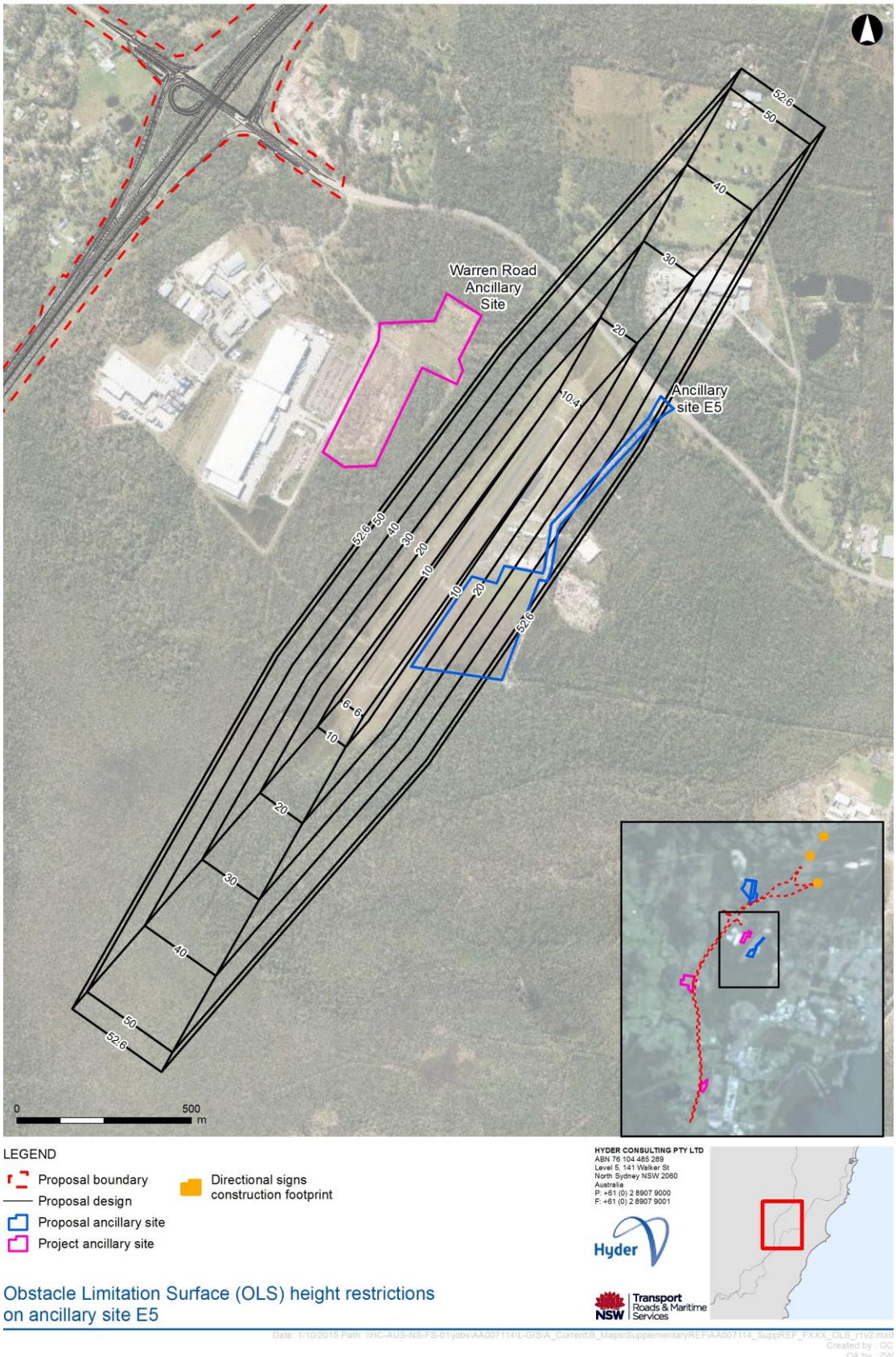


Figure 4-1 Obstacle limitation surface for the Warnervale airport

4.3 Other relevant legislation

4.3.1 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 1974* (NPW Act). 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 *National Parks and Wildlife Amendment Act 2010* made further provisions to include the protection of Aboriginal objects and places. The changes include new offences relating to harm or desecration of an Aboriginal object or declared Aboriginal place. Harm includes destroying, defacing damage or moving items or places without consultation.

No Aboriginal objects or places would be affected by the Proposal. An assessment of potential impacts to Aboriginal objects or places is included in Section 6.10. Consultation with Aboriginal stakeholders is addressed in Section 5.3.

4.3.2 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (PoEO Act) is administered by the NSW Environment Protection Authority (EPA). It provides an integrated system of licenses to set out protection of the environment policies and to adopt more innovative approaches to reduce pollution in the environment, having regard to the need to maintain ecologically sustainable development.

The PoEO Act requires an Environment Protection Licence (EPL) for scheduled development work and the carrying out of scheduled activities. As identified in the original Project REF, the original Project includes the widening of about 12.3 km of road in a non-metropolitan area and therefore is a scheduled activity and requires an EPL.

The construction contractor and Roads and Maritime are obliged to notify the EPA if a pollution incident occurs that causes or threatens material harm to the environment.

4.3.3 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) aims to conserve biological diversity by protecting and encouraging the conservation of threatened species, populations and ecological communities and their critical habitats.

An additional flora and fauna assessment has been carried out for areas not assessed in the original Project REF as part of the proposed design amendments (see Section 3.2). The assessment targeted threatened species, populations, ecological communities and critical habitat listed on the TSC Act and has been carried out in accordance with section 5A of the EP&A Act.

Assessments of Significance prepared for the Project REF have been updated for threatened species, populations and/or ecological communities listed under the TSC Act for which impacts may have changed due to the Proposal. This includes revised assessments of three threatened ecological communities, 20 threatened fauna species, nine threatened flora species and one endangered population. Fifteen additional threatened fauna species listed under the TSC Act were identified in updated database searches that have the potential to be impacted by the Proposal.

As such, Assessments of Significance have also been prepared to assess impacts to these species. Assessments of Significance are provided in Appendix B No significant impacts were identified in any of these assessments.

4.3.4 Noxious Weeds Act 1993

The *Noxious Weeds Act 1993* provides for a coordinated approach to the removal and control of scheduled noxious weeds across the NSW. No permits or approvals are required under the Act, although it is the responsibility of Roads and Maritime to provide for the removal and proper disposal of any listed weeds found within the proposed design amendments. Noxious weeds are discussed and management measures proposed in Section 6.8 of the Supplementary REF.

4.3.5 Water Management Act 2000

The WMA provides for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations. The Act controls the extraction of and use of water, the construction of works such as dams and weirs, and the carrying out of activities in or near water sources in NSW.

The proposed design amendments would involve work within 40 m of waterfront land and therefore meet the requirements for needing 'controlled activity' approval. However, as identified within the original Project REF, under section 38 of the Water Management (General) Regulation 2011 Roads and Maritime is exempt from the requirement to obtain a 'controlled activity' approval. Nevertheless, notification of the activity would be provided to the NSW Office of Water at least 30 days before the activity commences.

Water would be required for the activities to be carried out at the additional ancillary sites. Should Roads and Maritime determine to secure the supply from surface or groundwater sources, a water use approval (for surface water) or an aquifer interference approval (for groundwater) may be required under Sections 89 and 91(F) of the WMA.

4.3.6 Mine Subsidence Compensation Act 1961

The *Mine Subsidence Compensation Act 1961* provides for the proclamation of mine subsidence districts. Ancillary sites W8 and W9 lie wholly within the Wyong mine subsidence district (MSD). Consultation with the Mine Subsidence Board (MSB) was carried out during development of the original Project REF, has continued during detailed design and would be carried out in the future in relation to the proposed ancillary sites. Further information regarding consultation with the MSB is provided in Section 5.5.

4.4 Commonwealth legislation

4.4.1 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 (MNES) or the environment of Commonwealth land'.

The original Project REF considered these matters and found that there is unlikely to be a significant impact on relevant matters of national environmental significance as a result of the original Project. An updated assessment is provided in Appendix C for any potential additional impacts resulting from the Proposal. The assessment found that there is unlikely to be a significant impact on relevant MNES or the environment of Commonwealth land. Accordingly, the Proposal has not been referred to the Australian Government Department of the Environment.

4.5 Confirmation of statutory position

The proponent and determining authority for the Proposal is NSW Roads and Maritime Services. *State Environmental Planning Policy (Infrastructure) 2007* provides that the proposed design amendments may be carried out without the need for development consent and therefore is subject to assessment under Part 5 of the EP&A Act.

The matters prescribed by clause 228 of the Environmental Planning and Assessment Regulation 2000, for consideration by assessments under Part 5, have been re-assessed in relation to the design amendments and the revised Clause 228 checklist is provided in Appendix C.

Referral of the Proposal to the Australian Government Department of the Environment is not considered necessary.

All relevant licenses, permits, notifications and approvals needed to undertake the Proposal, as listed in Section 6.18 of the original Project REF, remain relevant for the Proposal.

5 Stakeholder and community consultation

5.1 Consultation strategy

The community and stakeholder consultation for the original Project REF was carried out in accordance with the Roads and Maritime *Community Involvement and Communications: A resource manual for staff.* The key objectives of consultation has been to involve, inform, seek ideas, advise and provide information to government agencies, community representatives, residents, and landowners about the original Project.

Consultation strategies and measures outlined in the original Project REF and Submissions Report would continue to be implemented for the Proposal.

5.2 Community involvement

5.2.1 Consultation for the original Project REF

Consultation was carried out with a range of key stakeholders including the local and surrounding community during the early stages of original Project development. Roads and Maritime developed a community update describing the proposed original Project, which was released to the community on 18 October 2013. A public comment period was provided from 18 October 2013 to 13 December 2013, while undertaking the environmental assessment that helped to inform the original Project REF. Community participation activities involved mail outs, information sessions, a designated original Project webpage, advertising, letters, surveys, and media activities. Submissions received during the public comment period were considered in the development of the original Project REF.

The original Project REF was publicly displayed between 6 August 2014 and 3 September 2014 and two community information sessions were held on 21 and 23 August 2014.

In addition, a community update and accompanying letter were distributed to potentially noise affected property owners at the start of the original Project REF display period. Twenty four submissions were received from the community and businesses and one submission from a government agency during the original Project REF display period. The main issues raised from the community and business included:

- Construction and operational noise impacts, including a request for further noise monitoring to be carried out and for reconsideration of noise barriers
- Potential drainage and flooding impacts
- Landscaping and concern about visual impacts during construction and operation
- Design considerations including suggestions relating to breakdown bays, the number of travel lanes and the road surface type proposed
- Traffic and transport considerations
- Requests for further consultation
- General enquiries about the Project.

After consideration of the submissions and as a result of additional investigations carried out by Roads and Maritime, some changes to the original Project including changes to proposed safeguards and management measures were made. A Submissions Report was prepared to summarise the issues raised, provide responses to each issue, identify additional assessments required and summarise the changes to the management measures from the original Project REF.

5.2.2 Consultation for the Supplementary REF

During the development of this Supplementary REF, Roads and Maritime has carried out targeted consultation with local residents, especially where the Proposal would result in changes to the operational noise management measures that were proposed in the original Project REF.

During the development of the Supplementary REF, consultation was carried out with the Civil Aviation Safety Authority (CASA) and WSC regarding potential restrictions on land use at the proposed ancillary site adjacent to the Warnervale Airport (site E5). CASA advised (pers. comms., 8 September 2015) that the Warnervale airport is a private airport owned by WSC and therefore the Wyong LEP should be consulted for information on the applicable land use restrictions. Section 4.2 discusses the provisions of the Wyong LEP and the applicability to the Proposal. Roads and Maritime has carried out consultation with WSC regarding the proposed use of the ancillary site adjacent to the Warnervale airport and would continue to consult with Council prior to commencement of construction.

Roads and Maritime will consult with potential noise and odour affected residents and property owners in the vicinity of the proposed ancillary sites prior to site establishment.

5.3 Aboriginal community involvement

5.3.1 Consultation for the original Project REF

Initial consultation for the original Project REF was carried out by Roads and Maritime with the Darkinjung Local Aboriginal Land Council (DLALC). DLALC were invited to, and participated, in a field survey carried out in accordance with Stage 2 of the *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI) (Roads and Maritime Services, 2011). Information provided by the fieldwork participants during the field survey was integrated into the original Project REF. Further information regarding the Stage 2 PACHCI process is provided in Section 5.2 of the original Project REF.

5.3.2 Consultation for the Supplementary REF

An additional Stage 1 PACHCI assessment was carried out by a Roads and Maritime Aboriginal Cultural Heritage Advisor (Hunter Region) to determine any potential additional impacts resulting from the Proposal (Appendix D). Section 6.10 of this Supplementary REF describes the Aboriginal heritage assessment carried out for the design amendments. The assessment concluded that the Proposal is unlikely to impact any known Aboriginal objects or places. Further consultation and/or assessment with the Aboriginal community is therefore not considered necessary.

5.4 ISEPP consultation

Section 5.4 of the original Project REF outlined the consultation requirements for the original Project under clauses 13 to 16 of ISEPP. The ISEPP consultation requirements have been reviewed and continue to apply in relation to the proposed design amendments. Where the design amendments have influenced the consultation required, this is discussed below.

The detailed design process has identified that about 36 ML of water may be required for concrete reprocessing activities at the additional ancillary sites. The ISEPP consultation requirements (Clause 13 (1) (d)) include the need to consult with the relevant local council when a development "Involves connection to, and use of a substantial volume of water from, any part of a water supply system owned by a council". Consultation has been carried out with WSC regarding the Proposal and, as stated in the original Project REF, consultation would continue to occur with WSC prior to and during construction of the Proposal.

The ISEPP consultation requirements (Clause 16 (2) (e)) include the need to consult with the "Maritime Authority of NSW" (now part of Roads and Maritime) where development comprises "a fixed or floating structure in or over navigable waters". The installation of the scupper piping on the Wyong River Bridge associated with the spill containment basin would involve temporary suspension of a platform under the bridge (e.g. an underbridge or suspended scaffolding) and consultation is therefore required with the maritime branch of Roads and Maritime.The under bridge clearance would be returned to the existing level following installation of the scupper piping.

5.5 Government agency and stakeholder involvement

Given the nature of the Proposal, further consultation with the government agencies and other stakeholders identified in Section 5.5 of the original Project REF is likely to be required.

The proposed ancillary sites W8 and W9 lie within the Hue Hue and Wyong Mine Subsidence Districts (MSD). The Mine Subsidence Board (MSB) would be consulted to determine if any measures are required in order to prevent/reduce potential impacts.

Consultation has been carried out with WSC and property owners which may be impacted by the Proposal, in particular in relation to the activities proposed at the additional ancillary sites. Consultation would continue to be carried out with relevant stakeholders prior to and during construction of the Proposal.

Installation of scour protection at existing culverts would constitute work within 40 metres of waterfront land and therefore meet the requirements for needing 'controlled activity' approval. However, as identified in the original Project REF, under section 38 of the *Water Management (General) Regulation 2011* Roads and Maritime is exempt from the requirement to obtain a 'controlled activity' approval. Nevertheless, a notification of the activity would need to be provided to the NSW Office of Water at least 30 days before the activity commences.

5.6 Ongoing or future consultation

Ongoing and future consultation would remain consistent with that described in Section 5.6 of the original Project REF.

6 Environmental assessment

This section of the Supplementary REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the Proposal. All aspects of the environment potentially impacted upon by the Proposal are considered. This includes consideration of the factors specified in the guidelines *Is an EIS required?* (DUAP 1999) and *Roads and Related Facilities* (DUAP 1996) as required under clause 228(1)(b) 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 C. Site-specific safeguards are provided to ameliorate the identified potential impacts.

6.1 Traffic and transport

This Section provides a review of the potential traffic and transport impacts associated with the proposed design amendments. This review is based on the assessment that was prepared for the original Project REF and the proposed design amendments as described in Section 3.

Table 6-1 identifies whether the design amendments have the potential to change the traffic and transport impacts identified in the original Project REF. Where the design amendments do not generate the potential for changes to traffic and transport impacts that design amendment is not discussed further below.

Table 6-1 Potential for changes to traffic and transport impacts

#	Design amendment	Potential for change in impacts?
1	New ancillary sites	Yes – The new ancillary sites would involve different haulage routes and intersections than those assessed in the original Project REF. An assessment of potential impacts is provided below.
2	Doyalson Link Road bridge over M1 Pacific Motorway entry ramp	No – This design amendment retains the grade separated movement of traffic to and from the M1 Pacific Motorway and therefore preserves the same operational traffic conditions as proposed in the original Project REF. This design amendment is unlikely to result in changes to the traffic and transport impacts identified in the original Project REF. No additional safeguards/management measures are considered necessary.
3	Widening Sparks Road overbridge	No – The widening of Sparks Road overbridge would continue to provide safe pedestrian and cyclist access during operation of the Proposal. Any impacts to pedestrian and cyclist movements during construction would be short-term and temporary, with access being provided on-road with traffic control if required. Therefore, no additional safeguards/management measures are considered necessary.

#	Design amendment	Potential for change in impacts?
4	Revised staging strategy and horizontal alignment	Yes – The revised staging strategy and horizontal alignment would influence traffic management during the construction phase of the Proposal and maintenance access for vehicles during the operational phase of the Proposal. Potential impacts are assessed below.
5	Revised pavement type	No – The revised pavement type is unlikely to result in changes to the traffic and transport impacts identified in the original Project REF. No additional safeguards/management measures are considered necessary.
6	Revised original Project boundary	No – The revised original Project boundary would provide sufficient space to enable construction however is unlikely to result in changes to the traffic and transport impacts identified in the original Project REF. No additional safeguards/management measures are considered necessary.
7	Wyong River spill containment	Yes – installation of scupper piping on the Wyong River bridge has the potential to temporarily reduce clearance for river traffic. Potential impacts are assessed below.
8	Landscape area	No – while construction of the landscape area would involve truck trips to deposit materials during construction, these materials would have been transported as part of the original Project and the trips do not represent additional movements. The landscape area location is directly adjacent to the construction zone for the Proposal and therefore trips to/from this location would not impact any additional roads/routes. No additional safeguards/management measures are considered necessary.
9	Warnervale Interchange lane/ramp reconfigurations	Yes – Warnervale Interchange lane/ramp reconfigurations would increase safety during operation and therefore there is the potential for changes in traffic and transport impacts. An assessment of potential impacts has been carried out and is included below.
10	Variable message signs (VMSs)	Yes – The VMSs and directional signs would improve traffic and transport safety and efficiency and an assessment of potential impacts has been carried out and is included below.
11	Directional signs	
12	Revised vertical alignment	No – As works would be contained wholly in the road corridor and no significant increase in construction traffic from the works is expected, the revised vertical alignment is unlikely to result in changes to the traffic and transport impacts identified in the original Project REF. No additional safeguards/management measures are considered necessary.

6.1.1 Existing environment

The existing traffic and transport environment was described in the original Project REF. This has been reviewed and, in general, remains relevant to the proposed design amendments.

The design amendments would impact some additional areas, for the Wyong River spill containment and the additional ancillary sites, to those described in the original Project REF.

Wyong River spill containment
Wyong River in the vicinity of the Proposal, experiences very low volumes of mainly recreational boating activity. The installation of the scupper piping on the Wyong River Bridge associated with the spill containment basin would involve temporary suspension of a platform under the bridge (e.g. an underbridge or suspended scaffolding) which could impact on river traffic. Potential impacts are discussed below.

New ancillary sites
An addendum to the original Construction Traffic Technical Note (prepared as part of the original Project REF) was carried out to address the potential impacts associated with the use of the three new ancillary sites that form part of the Proposal (Appendix E). A summary of this assessment is provided below.

The additional ancillary sites would require the use of roads/intersections not assessed in the original Project REF including: Hue Hue Road (north of Sparks Road), Kiar Ridge Road, and Jack Grant Avenue. The construction trip generation used in the original Project REF was adopted for this assessment (i.e. construction ancillary facilities would generate up to 35 heavy vehicle trips per hour and up to 76 light vehicle trips per hour during peak construction periods).

6.1.2 Methodology for assessment of the additional ancillary sites

The traffic and transport impact assessment has been carried out with consideration to:

- The capacity of the following intersections that would be impacted by the construction activities:
  - M1 Pacific Motorway/Sparks Road
  - Sparks Road/Hue Hue Road intersection
  - Hue Hue Road/Kiar Ridge Road intersection
  - Sparks Road/Jack Grant Avenue
- Mid-block capacity and thresholds
- Capacity of site access intersections
- Access and egress points to and from the ancillary sites
- Carriageway restrictions.

Intersection capacity
The “Level of Service” criteria set by Roads and Maritime: Guide to Traffic Generating Developments (RMS, 2002) are outlined in Table 6-2. In analysing intersection performance, a Level of Service “D” or better is generally considered to be acceptable.

Table 6-2 Level of Service criteria for intersections

Level of Service	Average delay (seconds/vehicle)	Traffic signals, roundabout	Give way and stop signs
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity, at signals incidents will cause excessive delays	At capacity, requires other control mode
F	More than 70	Roundabouts require other control mode	

Intersection performance was assessed using SIDRA software modelling for assessing intersection capacity. The intersection performance was assessed against the criteria presented in Table 6-2.

Mid-block capacity and thresholds

Mid-block capacity and thresholds are based on the particular road links or intersections to ensure a satisfactory Level of Service of D, or better. These thresholds represent the 'capacity' of specific road types as identified by Austroads: Roadway Capacity and summarised in Table 6-3.

Table 6-3 Typical one-way mid-block capacities for urban Roads with interrupted flow

Urban undivided road/inner lane with clearways and signal coordination	900
Outer or kerb lane with clearway conditions	900
Outer or kerb lane with occasionally parked vehicles	600
Two lane residential street with on-street parking	700

Source: Table 7.1: Austroads: Roadway Capacity

6.1.3 Potential impacts

Construction

Wyong River spill containment
The installation of the scupper piping on the Wyong River bridge associated with the spill containment basin would involve temporary suspension of a platform under the bridge (e.g. an underbridge or suspended scaffolding). This would reduce the clearance for marine traffic. As this area is mainly used for recreational boating activities and sees very low volumes, the impacts of the reduced clearance are anticipated to be minor. The under bridge clearance would be returned to the existing level following installation of the scupper piping.

New ancillary sites
The mid-block analysis found that the Level of Service for all mid-blocks assessed would be unchanged from existing Level of Service.

The intersection analysis indicates the use of the additional ancillary sites would:

- Not impact the Level of Service at the M1 Pacific Motorway/Sparks Road intersection
- Reduce the Level of Service at three intersections (the Sparks Road/Hue Hue Road, Hue Hue Road/Kiar Ridge Road and M1 Pacific Motorway/Sparks Road (East) intersections). While Level of Service would be reduced in these locations, it would remain within acceptable level, with the lowest Level of Service remaining at 'D' or better
- Reduce the Level of Service from B to F at the Sparks Road/Jack Grant Avenue intersection. The Level of Service F only relates to the right turn movement from Sparks Road into Jack Grant Avenue, due to the proposed right turn movement for construction vehicles to ancillary site E5 and the requirement for this traffic to give way to westbound through-traffic. This poor Level of Service would primarily impact construction vehicles. Other movements at this intersection, including the dominant through movement would maintain an acceptable Level of Service.

On this basis, the increase in traffic generated during peak periods on the surrounding road network during construction is unlikely to have a significant impact on the performance of the intersections.

Access and egress
Access and egress to the ancillary sites would be from the local road network. The ancillary site entrances would be designed in accordance with relevant road safety and Roads and Maritime requirements. As identified above, construction traffic associated with the new ancillary sites is not expected to have more than a minor impact on the surrounding road network.

If large vehicles are required to deliver materials, such as low loaders equipment and machinery, this would be specifically addressed in the Traffic Management Plan (TMP) to be developed for the Proposal.

Construction site parking
As identified in the Addendum Traffic Note, is anticipated that up to 76 management, supervisory and construction personnel would require car parking spaces within or nearby to ancillary sites. To minimise the impact of the Proposal on existing parking facilities, a temporary parking area would be provided for use by construction staff at ancillary sites. Additional construction vehicles associated with the Proposal are not expected to impact the capacity of existing parking facilities in the area.

Impacts on public transport
As identified in the original Project REF, the impact on existing passenger and school bus routes during construction would be negligible. Minor travel time increases may be experienced due to reduced speed limits. If bus stops require temporary relocation during construction a suitable location would be identified by the construction contractor in consultation with bus operators.

Impacts on local roads and properties
Construction traffic could cause short delays to people entering/exiting properties however access to properties would be maintained throughout the construction phase. As identified in the original Project REF, the roads used by heavy vehicles during construction may experience additional wear as a result of the additional use.

Impacts on pedestrians and cyclists
The potential impacts of construction on pedestrians and cyclists on the M1 Pacific Motorway and Sparks Road were considered in the original Project REF.

On the roads impacted by construction traffic due to the additional ancillary sites, there are minimal pedestrian and cyclist facilities, and low numbers of pedestrians and cyclists.

Considering the limited services for pedestrians and cyclists, and provided the safeguards outlined in Table 6-4 are implemented, negligible impacts to pedestrians and cyclists is expected during construction.

Impacts on emergency services
The potential impacts on emergency services from construction of the Project were assessed in the original Project REF. The additional ancillary sites would not significantly alter the expected impacts to these services. As outlined in the original Traffic Note and the original Project REF, a detailed traffic management plan (TMP) would be prepared and implemented as part of the Construction Environmental Management Plan (CEMP). The original Project REF indicated that the TMP would make provision for emergency services vehicles to pass through construction zones. Detailed design has found that such access arrangements are not feasible due to logistical and safety considerations. However, the detailed design process has resulted in provision of a minimum 1.8 m wide shoulder (up to 2.3 m wide wherever possible) along the alignment which would provide access for emergency service vehicles during the construction period. As identified in the original Project REF, the TMP would detail processes to update the local emergency services on the staging and progress of works that would affect their movement.

Impacts on safety
The potential impacts on safety from construction of the original Project were assessed in the original Project REF. The additional ancillary sites would not significantly alter the potential impacts. As outlined in the original Traffic Note and the original Project REF, a detailed TMP would be prepared outlining the control measures to be implemented during construction to address safety risks and mitigate impacts on safety.

Incident management
The potential impacts on incident management from construction of the original Project were assessed in the original Project REF. The additional ancillary sites would not significantly alter the expected impacts in relation to incident management. As outlined in the original Traffic Note and the original Project REF, the contractor would consult with Roads and Maritime Traffic Commanders, Traffic Emergency Patrols (TEP) and the Transport Management Centre (TMC) to plan the construction to allow for appropriate incident response plans to be implemented.

Revised staging strategy and horizontal alignment
The revised staging strategy and horizontal alignment would impact traffic and transport during construction of the Proposal. The original Project design involved a symmetrical widening approach, which involved a contraflow staging strategy and one metre wide off-side shoulders. The revised construction staging strategy would involve an asymmetrical widening approach into the median allowing nine kilometres of continuous construction. This would reduce construction times from around three and a half years to three years and thereby reduce construction traffic and transport impacts.

Operation

Revised staging strategy and horizontal alignment
The revised staging strategy and horizontal alignment would provide 3.1 m wide 'off-side' shoulders (those adjacent to the median) for maintenance access along the majority of the Proposal. This would provide safe and efficient access for maintenance, traffic control and emergency vehicles. The 3.1 m off-side shoulders would also provide shelter for activities such as mowing, vegetation trimming, drain cleaning and litter collection and to ensure vehicle access can be achieved for both mobile and static control methods. The widened shoulders would provide safe and unobstructed access to incidents and maintenance activities, resulting in an improved road safety environment during operation compared to the original Project.

Warnervale Interchange lane/ramp reconfigurations
During detailed design it was identified that reconfigurations of the Warnervale Interchange were necessary to reduce vehicle weaving conflicts and provide efficient levels of service compared to the original Project design. This would benefit operational traffic and transport by providing a better level of service and ultimately provide a safer environment for road users. Additional safeguards to those stated in the original Project REF are considered unnecessary.

Variable message signs (VMSs)
The VMSs would provide advanced notification of potential breakdowns, accidents, road condition updates, general updates and changes to traffic conditions to motorists and pedestrians. This design amendment is expected to increase traffic efficiency and safety. No additional safeguards other than those stated in the original Project REF are required.

Directional signs
Directional signs would provide clear directional guidance for road users, thereby reducing road user confusion and increasing safety. This design amendment is expected to increase traffic efficiency and safety. No additional safeguards other than those stated in the original Project REF are required.

6.1.4 Safeguards and management measures

The traffic and transport safeguards and management measures from the original Project REF and Submissions Report have been reviewed and would apply to the proposed design amendments. Additional safeguards and management measures for traffic and transport beyond those identified in these documents are outlined in below in **bold red text** with altered or deleted measures outlined in ~~strike through~~ text in Table 6-4.

Table 6-4 Additional traffic and transport safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Impacts on traffic during construction	Prepare and implement a detailed traffic management plan (TMP) as part of the Construction Environmental Management Plan (CEMP). The TMP is to include appropriate guidelines and procedures required to ensure the continuous, safe and efficient movement of construction and non-construction traffic in and around the project area. The TMP would be submitted in stages to reflect the progress of the work and would detail: • Signage requirements • Lane possession and approval process during periods of online construction • Measures to minimise disruption and inconvenience to road users during the construction period • Traffic control devices such as temporary signals • A local and regional communications strategy • Measures to provide adequate warning, information and guidance for road users during the construction period • Appropriate construction speed limits to be implemented in consultation with Roads and Maritime to facilitate safety of road users and construction personnel	Construction contractor	Pre-Construction and Construction

Impact	Environmental safeguards	Responsibility	Timing
	• Specific traffic management plans to address night works safety for motorists and for construction personnel • Temporary accesses, ancillary site entrances and exits and other traffic management measures to be designed in accordance with relevant road safety and Roads and Maritime requirements • Temporary accesses, ancillary site entrances and exits and other traffic management measures that do not impact upon the safety of the users of the existing road network • Safe pedestrian access for the public along Sparks Road during construction • Temporary parking for use by construction staff at a construction compound • Access to all properties including the motorway service centres to be maintained throughout the construction • ~~Make provision for emergency services vehicles to pass through construction zones and u~~**U**pdate the local emergency services on the staging and progress of works that would affect their movement • **Key safety issues that may arise due to heavy vehicle manoeuvres at major and minor road intersections.**		
Impacts on Wyong river traffic during construction	**The maritime section of Roads and Maritime would be consulted regarding reduced clearance under the Wyong River bridge. Consultation would include discussion of appropriate safeguards which may include:** • **Installation of signage up and downstream of the Wyong River bridge to warn river traffic of reduced clearance prior to installation of**	Construction contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
	structures under the bridge. **The clearance under the Wyong River bridge would be returned to the existing level following installation of the scupper piping.**		

6.2 Noise and vibration

This Section provides a review of the potential noise and vibration impacts associated with the proposed design amendments. This review is based on the assessment that was prepared for the original Project REF, additional assessments of construction and operational noise carried out by Wilkinson Murray for the proposed design amendments, and the description of the design amendments in Section 3.

Table 6-5 (below) identifies whether the design amendments have the potential to change the noise and vibration impacts identified in the original Project REF. Where the design amendments do not generate the potential for changes to noise and vibration impacts that design amendment is not discussed further below.

Table 6-5 Potential for changes to noise and vibration impacts

#	Design amendment	Potential for change in impacts?
1	New ancillary sites	Yes – The new ancillary construction sites would be located in areas not assessed as part of the original Project REF. There is the potential for changes in noise impacts during construction and an assessment of potential impacts has been carried out and is included below. The ancillary sites would be vacated once construction is complete and no operational noise impacts would occur.
2	Doyalson Link Road bridge over M1 Pacific Motorway entry ramp	Yes – The proposed design amendment would alter the vertical alignment of the northbound exit ramp to Doyalson Link Road and therefore has the potential to change the operational noise impacts associated with the Proposal. An assessment of potential impacts has been carried out and is included below. Changes to construction noise impacts are not expected from this design amendment.
3	Widening Sparks Road overbridge	Yes – The proposed design amendment would result in a minor change to the horizontal alignment of the Sparks Road overbridge and therefore has the potential to change the operational noise impacts. An assessment of potential impacts has been carried out and is included below. Changes to construction noise impacts are not expected from this design amendment.

#	Design amendment	Potential for change in impacts?
4	Revised staging strategy and horizontal alignment	Yes – The proposed design amendment would alter the horizontal alignment and therefore has the potential to change the operational noise impacts associated with the Proposal. An assessment of potential impacts has been carried out and is included below. Changes to construction noise impacts are not expected from this design amendment.
5	Revised pavement type	Yes – The proposed design amendment would change acoustic performance of the road surface and therefore has the potential to change the operational noise impacts associated with the Proposal. An assessment of potential impacts has been carried out and is included below. Changes to construction noise impacts are not expected from this design amendment.
6	Revised original Project boundary	No – The revised original Project boundary accommodates other design and constructability changes and would not, by itself, change the noise impacts as described in the original Project REF.
7	Wyong River spill containment	No – These proposed design amendments are unlikely to result in changes to the noise impacts identified in the original Project REF as they are contained within the original Project boundary and are not near sensitive receivers. No additional safeguards/management measures are considered necessary.
8	Landscape feature	
9	Warnervale Interchange lane/ramp reconfigurations	Yes –The proposed design amendment would result in a minor change to the horizontal alignment and therefore has the potential to change the operational noise impacts associated with the Proposal. An assessment of potential impacts has been carried out and is included below. Changes to construction noise impacts are not expected from this design amendment.
10	Variable message signs (VMSs)	No – This design amendment is unlikely to result in changes to the noise impacts identified in the original Project REF as it is contained within the original Project boundary and involves only minor works during the construction phase of the Proposal. No additional safeguards/management measures are considered necessary.
11	Directional signs	No – This design amendment is unlikely to result in changes to the noise impacts identified in the original Project REF as all three directional signs involve only minor works, with no sensitive receivers nearby. No additional safeguards/management measures are considered necessary.

#	Design amendment	Potential for change in impacts?
12	Revised vertical alignment	Yes – The proposed design amendment would alter the vertical alignment and therefore has the potential to change the operational noise impacts associated with the Proposal. An assessment of potential impacts has been carried out and is included below. Changes to construction noise impacts are not expected from this design amendment.

6.2.1 Assessment methodology

Construction

The construction noise assessment (Wilkinson Murray, 2016a) (Appendix A) considers potential impacts at the three additional ancillary sites put forward as part of the Proposal.

The activities proposed to be carried out at the additional ancillary sites are identified in Section 3.2.1. When modelling potential noise impacts at each site, additional consideration was given to the potential hours of each activity. The hours modelled for each of the activities is summarised below (Table 6-6) and is documented in detail in the construction noise assessment (Appendix A).

Table 6-6 Activities proposed at additional ancillary sites and hours modelled

Ancillary site	Site use	Hours modelled
E5	• Site compound • Asphalt batching plant • Stockpile site • Precast barrier storage site • Laydown area.	• All activities modelled 24 hours/day • Note: concrete reprocessing not permitted on this site
W8	• Site compound • Asphalt batching plant • Concrete re-processing plant • Stockpile site • Precast barrier storage site • Laydown area.	• 24 hours/day • 7am – 10pm • 7am – 10pm • 24 hours/day • 24 hours/day • 24 hours/day
W9	• Site compound • Asphalt batching plant • Concrete re-processing plant • Stockpile site • Precast barrier storage site • Laydown area.	• 24 hours/day • 24 hours/day • 7am – 10pm • 24 hours/day • 24 hours/day • 24 hours/day

The sound power level of the three loudest activities expected on the ancillary sites are:

- Concrete reprocessing plant – L_{Aweq} 120 dBA
- Concrete trucks and 15T tipper trucks – L_{Aweq} 108 dBA
- Asphalt plant – L_{Aweq} 116 dBA.

Maximum noise emission sound power levels from the individual items of construction equipment are typically some 4-5 dB higher than the L_{Aeq} sound power levels. A maximum noise emission sound power level of $L_{A1,1min}$ 120 dBA has been assumed for any item of equipment. Where there would be a steady noise from site, such as from concrete reprocessing, the maximum noise was added to the L_{Aeq} predictions. Therefore for assessment of sleep disturbance from concrete processing, a maximum noise emission $L_{A1,1min}$ 123 dBA was used.

The construction noise assessment considered potential impacts from up to 35 trucks and 76 light vehicles per hour at each of the ancillary sites during both the day and night time (i.e. 24 hours/day), except at site W8 where trucks would be restricted to the Daytime period (7am – 6pm). As part of the construction noise assessment, noise from trucks has been distributed from access points to plant and stockpile locations within the ancillary sites.

The construction ancillary sites are large and the location of plant has not yet been decided. To provide a worst case assessment, and to provide flexibility for the siting of equipment, concrete reprocessing and asphalt batching plants were modelled at 300 metres from the nearest receivers. The buffer zone is shown as a 300 metres radius circle around each receiver on Figure 6-1 (W8 and W9) and Figure 6-2 (E5). There is potential for this equipment to be located further than 300 metres from the receivers which would reduce the potential impacts reported below.

Operation

The operational noise assessment (Wilkinson Murray, 2016b) (Appendix A) involved modelling the revised road alignment resulting from the Proposal and was based on a 3D model which incorporated both the revised horizontal and vertical alignments. The assessment also considered the change in pavement type from OGA and concrete under the original Project REF to SMA under the Proposal. As such, the operational noise assessment covers all relevant design amendments as outlined in Table 6-5 above.

6.2.2 Existing environment

The existing environment was described in Section 6 of the original Project REF. This was reviewed and is relevant to the proposed design amendments.

The additional ancillary sites are outside the area assessed in the original Project REF and a brief description of the existing noise environment in the vicinity of these sites is provided below.

Ancillary sites W8 and W9 are located to the west of the M1 Pacific Motorway in primarily rural areas with small numbers of noise sensitive receivers nearby. The primary noise source in the vicinity of these sites is the M1 Pacific Motorway. The nearby receivers are residential in nature.

Ancillary site E5 is located to the east of the M1 Pacific Motorway in a primarily rural area directly adjacent to Warnervale airport. The primary source of noise in the vicinity of E5 is the M1 Pacific Motorway. Noise sensitive receivers are located over one kilometre to the northwest of the site. Two additional receivers, the Lakes Grammar School and the Warnervale suburban area, which were outside the scope of the original Project REF noise assessment were included for the assessment of Site E5 and are located over one kilometre to the east of the site.

Figure 6-1 and Figure 6-2 below provide an overview of the ancillary sites, noise sensitive receivers and receiver buffers that were assessed as part of the construction noise assessment.

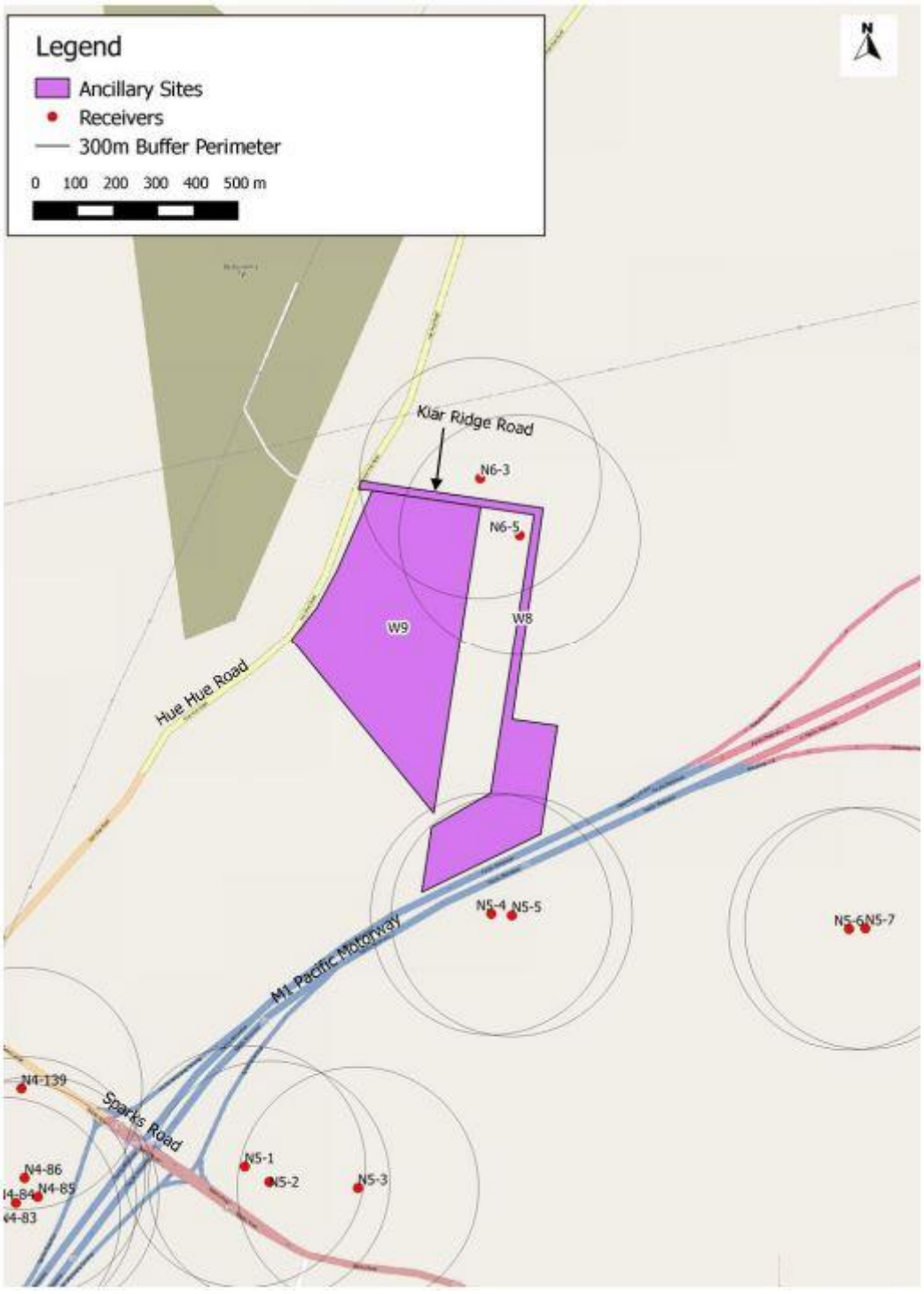


Figure 6-1 Ancillary sites W8 and W9, with noise receivers and associated 300 metre buffers. (Note: receiver N5-5, has subsequently been confirmed as a farm shed and is therefore not included in this assessment)

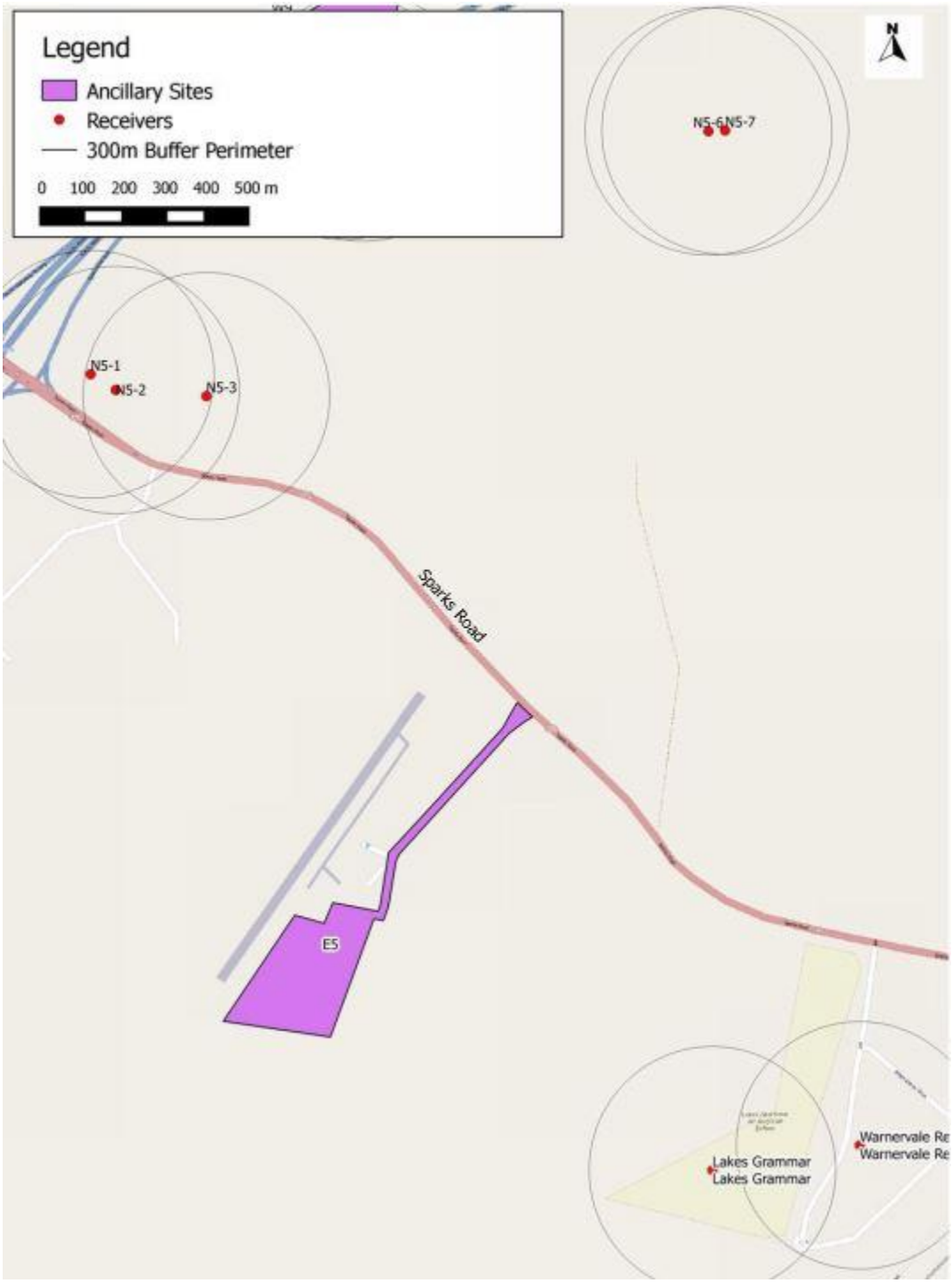


Figure 6-2 Ancillary site E5, with noise receivers and associated 300 metre buffers

The noise catchments areas (NCA's) and logger locations are shown in Figure 6-3. The NCA's were identified in order to facilitate labelling of receivers and to group receivers with a similar background noise environment. Logger numbers one to three represent locations which were monitored for the original Project REF. Logger number four (at 54 Hue Hue Road) represents the location of additional noise monitoring carried out between 14 and 25 June 2015 to inform the noise assessment for the Proposal. The monitoring consisted of simultaneous traffic counts on both the M1 Pacific Motorway (north of Alison Road) and Hue Hue Road. The results of the monitoring is shown in Table 6-7.

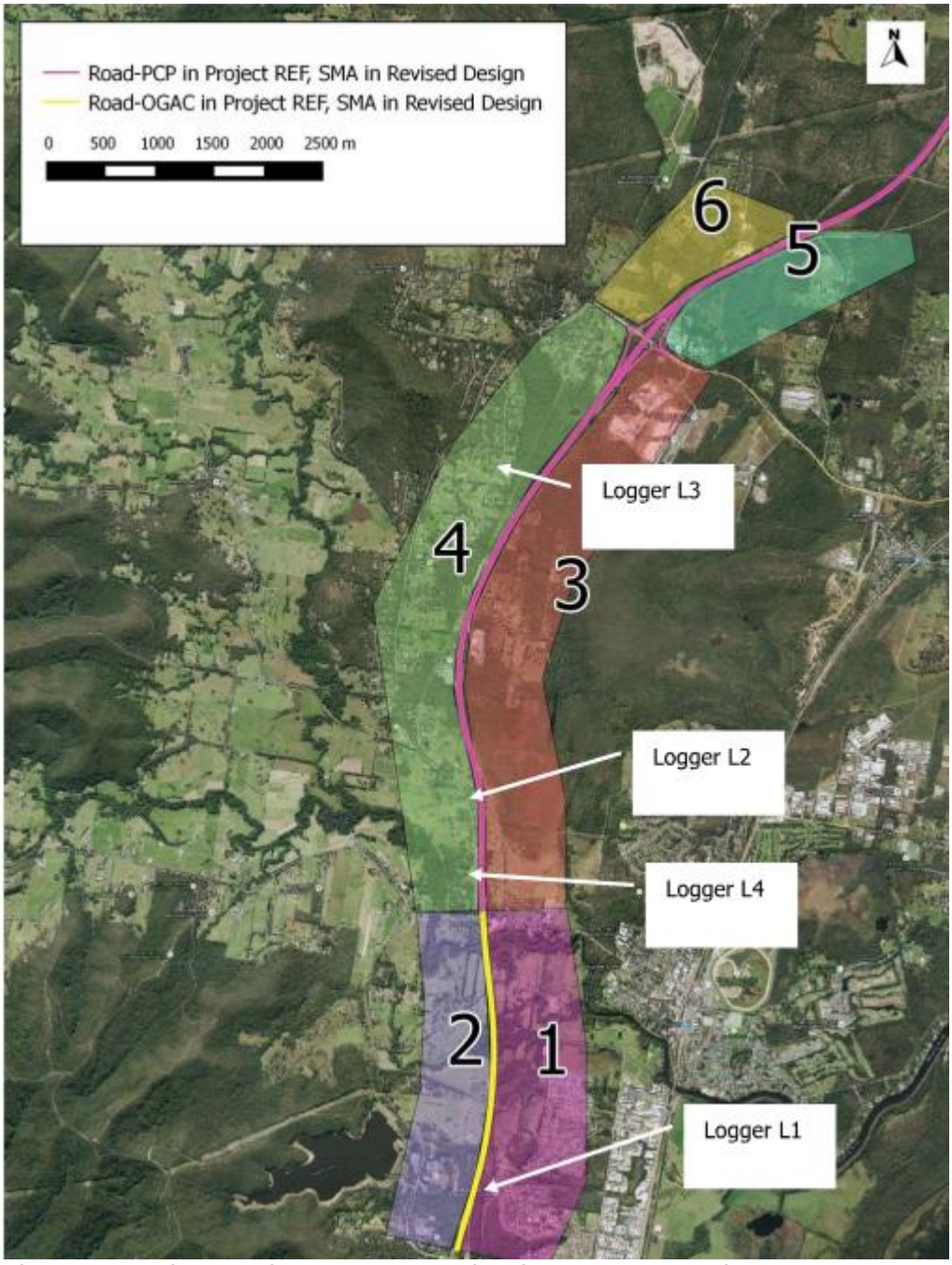


Figure 6-3 Noise Catchment Areas and Noise Logger Locations

Table 6-7 Existing noise levels, $L_{Aq, period,}$ dBA

Logger No.	Address	$L_{Aeq,15hr}$	$L_{Aeq,9hr}$	Measurement condition
L1 (2013)	10 Woolmers Crescent, Mardi	55.6	48.1	Free field
L2 (2013)	93 Hue Hue Road, Alison	73.8	69.4	Façade measurement
L3 (2013)	34 Holloway Drive, Jilliby	60.2	53.5	Free field
L4 (2015)	54 Hue Hue Road, Alison	67.1	64.3	Free field

Two non-residential noise-sensitive receivers were identified within the study area. These are the Woodbury Park Community Centre on Woolmers Crescent, Mardi (Figure 6-4) and a Childcare facility on Buttonderry Way, Jilliby (Figure 6-5). The Childcare Facility has been previously provided with architectural treatment under the Noise Abatement Program (NAP).

Figure 6-4 Location of Woodbury Park Community Centre

Figure 6-5 Location of Childcare Facility

6.2.3 Criteria

Construction

Noise Management Level's (NML) are based on noise measurements carried out for the original Project REF. The NMLs are provided for the additional ancillary sites in Table 6-8 below, with the inclusion of Warnervale suburban area and Lakes Grammar school.

Table 6-8 Construction Noise Management Levels (NML), $L_{Aeq, 15min}$ dBA

NCA	Receiver	Period				
		Day (7am 6pm)	Evening (8pm 10pm	Night (10pm 6am)	Early morning (6am 7am)	Early evening (6pm 8pm)
4	N4-139	69	61	48	54	48
5	N5-1	70	62	49	56	64
	N5-2	67	59	48	55	61
	N5-3	65	58	48	54	60
	N5-4	76	58	51	58	69
6	N6-3	64	57	48	54	59
	N6-5	64	57	48	54	59
Warnervale		64	57	48	54	59
Lakes Grammar		50[1]	-	-	-	-

[1]At Lakes Grammar School the NML is not dependent on the RBL, and applies only when the school is in use.

Sleep disturbance criteria

The $L_{AF1,1min}$ level of any noise should not exceed the ambient LAF90 noise level by more than 15 dBA as stated in the RNP, which references guidelines in the EPA's Environmental Criteria for Road Traffic Noise (ECRTN).

The RNP also notes for sleep disturbance that:

- Maximum internal noise levels below 50-55 dBA are unlikely to cause awakening reactions; and
- One or two noise events per night, with maximum internal noise levels of 65-70 dBA, are not likely to affect health and wellbeing significantly

Considering the above, a level of $L_{A1,1min}$ 60-65 dBA, for internal areas, would not cause awakening reactions. The $L_{A1,1min}$ 60 dBA was adopted in the construction noise assessment for sleep disturbance to provide a conservative assessment.

Construction traffic noise

The RNP provides noise criteria for 'freeway / arterial / sub-arterial roads' and 'local roads'. Of the roads used by construction traffic to access the additional ancillary sites, only Kiar Ridge Road would be considered a local road. All other roads would be considered 'freeway / arterial / sub-arterial roads'.

The criteria used for the construction traffic noise assessment are shown in Table 6-9.

Table 6-9 RNP Criteria for Traffic Noise

Road Category	Assessment Criteria dBA	
	Day (7am 10pm)	Night (10pm 7am)
Freeway / arterial / sub-arterial roads	$L_{Aeq15hr}$, 60 (external)	L_{Aeq9hr}, 55 (external)
Local Roads	L_{Aeq1hr}, 55 (external)	L_{Aeq1hr}, 50 (external)

When the predicted traffic noise levels exceed the relevant criteria, the predicted increase in noise levels should be considered. The RNP states that an increase of up to 2 dBA represents a minor impact that is considered barely perceptible to the average person. If noise levels are expected to increase by more than 2 dBA, then affected receivers should be considered for treatment.

Operation

Road Noise Policy (NSW EPA)

Noise criteria are assigned to sensitive receivers using the EPA's RNP. The assessment timeframe for the criteria are in the year of opening and 10 years after opening.

The motorway and all associated ramps are categorised as freeway for the purposes of the RNP. The proposal is considered to be a redevelopment under the RNP because M1 Motorway would not substantially realigned.

The RNP criteria for residences for the redevelopment of freeways is shown in Table 6-10 below.

Table 6-10 RNP Criteria for Redevelopment of Freeways

Road category	Assessment criteria dBA	
	Day (7am 10pm)	Night (10pm 7am)
Noise assessment criteria	$L_{Aeq15hr}$, 60 (external)	L_{Aeq9hr}, 55 (external)
Relative increase criteria	Existing traffic $L_{Aeq15hr}$ + 12 dBA (external)	L_{Aeq9hr} + 12 dBA (external)

For both Day and Night periods the more stringent criteria were adopted for the assessment in relation to residences for the redevelopment of freeways.

The criteria for non-residential sensitive receivers are summarised in Table 6-11 below. No night time criteria are shown as the facilities do not operate at night.

Table 6-11 Assessment criteria for operational traffic noise – non-residential receivers

Existing sensitive land use	Assessment criteria dBA
	Day (7am 10pm)
School classrooms	L_{Aeq1hr}, 40 (internal) when in use
Open space (active use)	Existing traffic $L_{Aeq15hr}$ 60 (external)
Open space (passive use)	Existing traffic $L_{Aeq15hr}$ 55 (external)

Existing sensitive land use	Assessment criteria dBA
	Day (7am 10pm)
Childcare facilities	Sleeping rooms $L_{Aeq,1hr}$ 35 (internal) Indoor play areas $L_{Aeq,1hr}$ 40 (internal) Outdoor play areas $L_{Aeq,1hr}$ 55 (external)

The operational noise assessment for the Woodbury Park Community Centre used the criteria for classrooms.

To predict internal noise levels in school classrooms and childcare facilities, it is assumed that internal noise is 10 dBA less than external noise. This is based on a façade facing the motorway with windows open for ventilation.

Commercial receivers are not considered noise-sensitive receivers and therefore have not been assessed for operational noise impacts.

6.2.4 Potential impacts

The potential noise impacts on nearby sensitive receivers were modelled as part of the construction and operational noise assessments carried out for the Proposal (Appendix A). The findings are summarised below.

Construction

Ancillary site W8

Under the worst case scenario for ancillary site W8, where all plant and equipment are located 300 metres away from receivers, noise levels are predicted to comply with the NMLs at all times. Construction noise from the site is not expected to exceed the 60 dBA $L_{A1, 1min}$ sleep disturbance criteria and is therefore unlikely to cause sleep disturbance at any receiver.

Ancillary site W9

Use of ancillary site W9 has the potential to impact on nearby sensitive receivers within NCA 6 during the Early Evening (6pm to 8pm), Evening (8pm to 10pm) and Early Morning periods (6am to 7am). Noise exceedances of up to 7 dBA are predicted to occur at nearby receivers under the worst case scenario (i.e. plant and equipment located up to as close as 300 metres from receivers). Noise exceedance of up to 7 dBA are also predicted to occur at the two receivers in NCA-6 (N6-3 and N6-5) during the Night Time (10pm to 6am).

Construction noise from the site is not expected to exceed the 60 dBA $L_{A1, 1min}$ sleep disturbance criteria and is therefore unlikely to cause sleep disturbance at any receiver.

Ancillary site E5

Ancillary site E5 is sufficiently distant from receivers that noise levels are predicted to comply with the NMLs at all times. Construction noise from the site is not expected to exceed the 60 dBA $L_{A1, 1min}$ sleep disturbance criteria and is therefore unlikely to cause sleep disturbance at any receiver.

Construction traffic noise

Construction traffic noise along Kiar Ridge Road is predicted to increase up to 5dBA; however, the total noise levels are predicted to comply with the RNP noise criteria for local roads, therefore consideration of mitigation measures is not required. Noise increases associated with construction traffic along Sparks Road are predicted to be less than 2 dBA, therefore no noise mitigation is required.

No construction traffic noise impacts would occur on Hue Hue Road north of Sparks Road as no residences are located on this section of road.

Operation

A summary of the number of residences impacted under the original Project REF (refer to Table 6-12) and under the Proposal (refer to Table 6-13) are shown below.

Table 6-12 Summary of noise impacts to receivers under the Project REF

NCA	Receivers in catchment	Year	Exceeds RNP Criterion		Residences where Predicted Levels are Acute	
			Day	Night	Day	Night
NCA 1	374	2019	9	13	1	2
		2029	13	13	2	2
NCA 2	29	2019	8	8	3	4
		2029	9	10	4	4
NCA 3	36	2019	23	24	7	8
		2029	25	26	9	10
NCA 4	158	2019	83	96	27	29
		2029	104	115	31	35
NCA 5	6	2019	3	3	2	2
		2029	5	6	2	2
NCA 6	0	2019	0	0	0	0
		2029	0	0	0	0
Total	603	2019	126	144	40	45
		2029	156	170	48	53

Table 6-13 Summary of noise impacts to receivers under the Proposal

NCA	Receivers in catchment	Year	Exceeds RNP Criterion		Residences where Predicted Levels are Acute	
			Day	Night	Day	Night
NCA 1	374	2019	17	24	4	6
		2029	19	25	4	8
NCA 2	29	2019	10	15	4	7
		2029	10	17	5	7

NCA	Receivers in catchment	Year	Exceeds RNP Criterion		Residences where Predicted Levels are Acute	
NCA 3	36	2019	6	15	1	3
		2029	8	18	1	3
NCA 4	158	2019	24	35	7	11
		2029	28	44	9	13
NCA 5	6	2019	2	2	1	1
		2029	2	2	1	1
NCA 6	0	2019	0	0	0	0
		2029	0	0	0	0
Total	603	2019	59	91	17	28
		2029	67	106	20	32

Table 6-14 below summarises the noise impact between the Project REF and the Proposal for the build scenario for 2029.

Table 6-14 Number of residences impacted between the Project REF and the Proposal for the build scenario for 2029

Impacts at residences	No. of residences exceeding noise criteria in Project REF	No. of residences exceeding noise criteria for the Proposal
Acute, increase by 2 dBA or less	36	32
Acute, increase by more than 2 dBA	17	0
Above the RNP Criteria (but not acute) and increase by 2 dBA or less	113	74
Above the RNP Criteria (but not acute) and increase by more than 2 dBA	4	0

An overview of the noise impacts from the original Project REF is shown in Figure 6-6. This can be compared with the overview of impacts due to the proposed design amendments shown in Figure 6-7. Each symbol on these figures represents the predicted noise impact at a sensitive receiver.

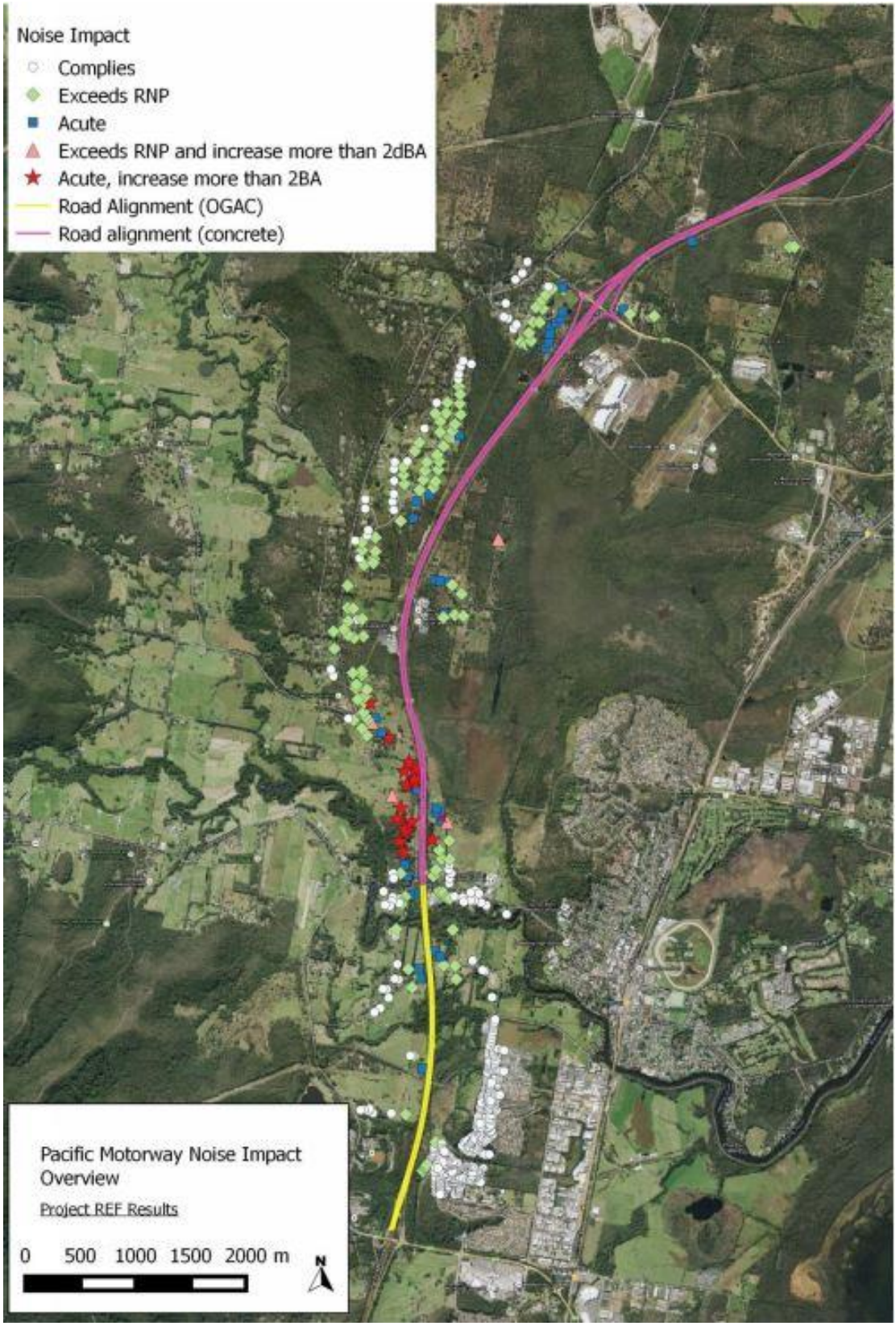


Figure 6-6 Overview of operational noise impacts under the “Build” Option 2029 for the Project REF

Figure 6-7 Overview of operational noise impacts under the “Build” Option 2029 for the Proposal

An overall reduction in operational noise impacts from the Proposal is evident from the noise and vibration assessment, as shown in Table 6-14 and Figure 6-7.

Non-residential noise-sensitive receivers
Two non-residential noise-sensitive receivers were identified within proximity to the Proposal: Woodbury Park Community Centre and a childcare facility.

Woodbury Park Community Centre

The Woodbury Park Community Centre is located within NCA 1 on Woolmers Crescent, Mardi. The centre has interview and activity rooms and a noise criterion of $L_{Aeq,1hr}$ 40 dBA (internal) when the rooms are in use. The predicted $L_{Aeq,1hr}$ daytime noise is 59 dBA external.

With windows closed the noise levels would comply in all rooms at the centre. The main windows at the centre do not face the M1 Pacific Motorway. The predicted external noise levels on the façade facing away from the Motorway range between $L_{Aeq,1hr}$ 40-45 dBA. With windows open, the predicted levels in the centre are expected to be between 32-45 dBA. Therefore, a 5 dBA exceedance may occur in some rooms if used at peak traffic times with the windows open.

It is recommended that internal noise monitoring be carried out at the Woodbury Park Community Centre once the project is operational. Monitoring would be carried out inside any noise-sensitive rooms, and the results for each type of room assessed against the noise criteria of the RNP. If noise is found to exceed the criteria of the RNP, those rooms would be considered for architectural treatment.

Childcare facility

The childcare facility is located at 23 Buttonderry Way, Jilliby (Receiver N4-86, within NCA 4). The daytime noise level is predicted to be 66 dBA under the “no-build” scenario in 2029. This is 11 dBA above the recommended playground noise level. Under the “build” scenario the level is predicted to reduce to 61 dBA. However, this level is still 6 dBA above the recommended playground noise level. Notwithstanding, the facility has been previously architecturally treated under the NAP and no further mitigation is required.

6.2.5 Consideration of potential operational safeguards and management measures

The Roads and Maritime ENMM, together with the Roads and Maritime Environmental Direction No. 24, documents the process of qualifying a residence for consideration of feasible and reasonable noise mitigation.

The ENMM calls for application of all feasible and reasonable noise mitigation with the aim of achieving noise criteria where, following a road redevelopment (beyond the adoption of road design and traffic management measures) where:

- The noise level is above the RNP criteria and there is predicted to be a noticeable increase in road traffic noise of more than 2 dBA (i.e. the noise predictions for the ‘build’ minus the ‘no build’); or
- Road traffic noise levels are predicted to be acute (daytime $L_{Aeq,15hr}$ 65 dBA, night time $L_{Aeq,9hr}$ 60 dBA or greater).

As shown in Table 6-14, following implementation of the Proposal there are predicted to be:

- No receivers with noise above the RNP criteria and with an increase of more than 2 dBA
- 32 receivers predicted to have acute noise levels.

A number of residences have already been treated under the NAP (as detailed in Appendix A - Operational noise assessment) and are considered as already mitigated. As such, these residences are not considered further for treatment as part of this assessment. This reduces the number of residences considered for mitigation from 32 to 25.

Consideration of specific feasible and reasonable mitigation measures, in accordance with the RNP and the ENMM is provided in the operational noise assessment (Appendix A). In summary, this assessment found that noise walls are not considered to be feasible or reasonable for this project.

As the provision of noise walls is not considered to be a feasible and reasonable treatment option for those 25 receives which are predicted to exceed the relevant triggers, architectural treatment would be considered. The residences are shown in Table 6-15 and Figures 9-1, 9-3 and 9-5 of Appendix A – Operational noise assessment.

Table 6-15 Residences to be considered for architectural treatment

NCA	Residences with acute levels (2029 Build) to be considered for architectural treatment
1	N1-2, N1-3, N1-4, N1-14, N1-16, N1-32
2	N2-1, N2-3, N2-5, N2-11, N2-14, N2-16, N2-18
3	N3-22
4	N4-1, N4-13, N4-14, N4-21, N4-23, N4-28, N4-29, N4-30, N4-74, N4-76
5	N5-4
6	-

6.2.6 Safeguards and management measures

The noise and vibration safeguards and management measures from the original Project REF and Submissions Report have been reviewed and would apply to the proposed design amendments. Additional safeguards and management measures for noise and vibration beyond those identified in these documents are outlined in **bold red text** and deleted safeguards and management measures in ~~strike through text~~ in Table 6-16.

Table 6-16 Noise and vibration safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
~~*Noise impacts resulting from design elements~~	• ~~An assessment of feasible and reasonable noise mitigation measures for operation of the proposal is to be undertaken during detailed design in accordance with the Roads and Maritime Environmental Noise Management Manual Practice Note 4~~ • ~~The detailed design should consider pavement treatments such as longitudinal tining or low noise diamond grinding to reduce operational road noise.~~	~~Roads and Maritime Detailed design~~	~~Pre-construction~~
Noise impacts resulting from construction activities	• Appropriate mitigation and management measures are to be used to minimise construction noise and vibration at noise sensitive receivers as described in the approved construction noise and vibration management plan (CNVMP). • Prepare and implement a CNVMP that identifies reasonable and feasible approaches to reduce noise impacts during construction including for ancillary facilities • Undertake at-receiver noise mitigations that are planned to manage operational noise at the commencement of construction • Inform the community at least 48 hours before any out of hours work is to be undertaken and provide the following information: - Programmed times and locations of construction work - Construction noise and vibration impact predictions - Construction noise and vibration mitigation measures being implemented on site.	Construction contractor	Construction

Impact	Environmental safeguards	Responsibility	Timing
	• Provide specific details of all out of hours work to the EPA • Implement a notification and consultation procedure to identify when noise impacts during extended hours and out of hours work are above relevant criteria and enable appropriate management measures to be developed • Implement a phone line and complaints handling procedure for noise and other construction related complaints • Include specific noise mitigation measures in the CNVMP including: - Noise intensive construction works would be carried out during standard construction hours wherever practicable - Noisy activities that cannot be undertaken during standard construction hours would be scheduled as early as possible during the evening and/or night-time periods - Appropriate plant would be selected for each task, to minimise the noise impact - Deliveries would be carried out during standard construction hours where practical and safe to do so - Non-tonal reversing alarms would be fitted on all construction equipment where possible - If it is safe, night-time activities would be planned and conducted in such a manner as to eliminate or minimise the need for audible warning alarms		

Impact	Environmental safeguards	Responsibility	Timing
	- The offset distance between noisy plant items and nearby residential receivers would be maximised - Noisy equipment would be oriented away from residential receivers - Site access points, ancillary site accesses and ancillary facilities would be positioned as far as practicable away from residential receivers - Plan the internal layout and operation of construction ancillary facilities to maximise the separation distance between sensitive receivers and noisy onsite activities - The use of structures or enclosures will be investigated during detailed design and would be used to shield residential receivers from noise sources where considered practicable and effective - Trucks would travel via internal haul routes and major roads and routes where practicable and would not be allowed to queue near residential dwellings - Respite periods would be considered during times of noise intensive works where sensitive receivers would be adversely impacted for extended periods. These could include late start and/or early finishes - Wherever practicable, noise intensive works would be scheduled/ programmed in the following order of priority to minimise the potential impacts on		

Impact	Environmental safeguards	Responsibility	Timing
	sensitive receivers: 1. Standard working hours. 2. Extended working hours. 3. Night time working hours.		
Construction noise	• **Construction noise, including from ancillary sites, will be managed to comply with the requirements of any EPL applicable to the project.**	**Construction contractor**	**Construction**
Noise impacts from ancillary site W9	• **Noise from ancillary site W9 would be managed in line with the requirements of the RNP, ENMM and ICNG and may include where feasible and reasonable:** • **Design of site layout to minimise noise levels at sensitive receivers. As the concrete reprocessing plant is the noisiest activity, it could be located further from the residences than other activities** • **Design of the site to take advantage of any shielding provided by natural landforms or construction earthworks** • **Design of the site layout to take advantage of any 'self-shielding' provided by the equipment. For example, the concrete reprocessing plant could provide acoustic shielding for the asphalt batching plant, or vice versa** • **Noise monitoring at the residences, at the commencement of activities, to inform the noise management process and the need for structures or enclosures to further reduce noise levels.**	**Roads and Maritime**	**Construction**

* These mitigation measures have been completed during detailed design as documented above and in Appendix A.

6.3 Hydrology

This Section provides a review of the potential hydrology impacts associated with the proposed design amendments. This review is based on the assessment that was prepared for the original Project REF and the proposed design amendments as described in Section 3.

Table 6-17 identifies whether the design amendments have the potential to change the hydrology impacts identified in the original Project REF. Where the design amendments do not generate the potential for changes to hydrology impacts that design amendment is not discussed further below.

Table 6-17 Potential for changes to Hydrology impacts

#	Design amendment	Potential for changes in impacts?
1	New ancillary sites	Yes – The additional ancillary sites are proposed in new locations which were not assessed for these activities in the original Project REF. There is the potential for changes in hydrology impacts and therefore an assessment of potential impacts has been carried out and is included below.
2	Doyalson Link Road bridge over M1 Pacific Motorway entry ramp	No – The Doyalson Link Road bridge over the M1 Pacific Motorway entry ramp is unlikely to result in changes to the hydrology impacts identified in the original Project REF as it would not reduce flood storage areas, impede flow paths or alter flow velocities. No additional safeguards/management measures are considered necessary.
3	Widening Sparks Road overbridge	Yes – The widening of the Sparks Road overbridge is intended to address existing drainage issues identified in this location during detailed design. This design change is discussed in further detail below.
4	Revised staging strategy, horizontal and vertical alignment	Yes – The revised vertical alignment has the potential to alter flood extents and therefore an assessment of potential impacts has been carried out and is included below.
5	Revised pavement type	No – The change of pavement type would not alter the current drainage infrastructure or impact the existing hydrological environment. No additional safeguards/management measures are considered necessary.
6	Revised original Project boundary	No – While the original Project boundary has been revised in a number of locations to allow for potential installation of scour protection on existing culverts the potential impacts from these works related primarily to soil and water quality (discussed in Section 6.4). The changes to the original Project boundary are unlikely to result in changes to the hydrology impacts identified in the original Project REF as they would not reduce flood storage areas, impede flow paths or alter flow velocities (other than minor local improvements [i.e. decreases] in velocity for scour protection). No additional safeguards/management measures are considered necessary.

#	Design amendment	Potential for changes in impacts?
7	Wyong River spill containment	No – While the proposed spill containment basin at the Wyong River would direct flows away from the river in the case of an accidental spill, the small capacity of the basin means that the potential for changes to hydrology is insignificant. (An assessment of the potential impacts of the basin on water quality is provided in Section 6.4) No additional safeguards/management measures are considered necessary.
8	Landscape area	Yes – The proposed location for the landscape area is partly within the 1 in 100 year ARI flood level. As such, an assessment of the potential hydrological impacts is provided below.
9	Warnervale Interchange lane/ramp reconfigurations	No – These design amendments would be carried out within the original Project boundary (that was assessed within the original Project REF), do not significantly alter the extent of earthworks required for the original Project and would not reduce flood storage areas, impede flow paths or alter flow velocities. The design amendments are unlikely to result in changes to the hydrology impacts identified in the original Project REF. No additional safeguards/management measures are considered necessary.
10	Variable message signs (VMSs)	
11	Directional signs	No – This design amendment is unlikely to result in changes to the hydrology impacts identified in the original Project REF as it would not significantly alter the extent of earthworks required for the original Project and would not reduce flood storage areas, impede flow paths or alter flow velocities. No additional safeguards/management measures are considered necessary.
12	Revised vertical alignment	Yes - There is the potential for changes in hydrological impacts due to an increase to the vertical alignment of up to 700 mm. This design amendment is discussed in further detail below.

6.3.1 Existing environment

The existing environment was described in Section 6 of the original Project REF. This was reviewed and is still relevant to the proposed design amendments. In addition, some of the design amendments would impact additional areas to those described in the original Project REF and these are discussed below.

The three additional ancillary sites are outside the boundary identified in the original Project REF. A brief description of the hydrological environment at each of the proposed sites is provided in Table 6-18 and shown in Figure 6-8.

Table 6-18 Hydrological environment of the proposed ancillary sites

Ancillary site	Hydrological environment
Site E5	The majority of the site is situated above the mapped 1 in 100 year flood level. Some areas within the southern and eastern portions of the site are subject to 1 in 100 year flooding. The proposed ancillary site is more than 250 m from a mapped water course.
Site W9	The majority of the site is situated above the mapped 1 in 100 year flood level. A small portion of the site along the northern and eastern boundary is subject to 1 in 100 year flooding. A small unnamed ephemeral waterway is located in the northern portion of the site and a constructed drainage channel has been installed flowing generally north to south through the site. There are also a number of farm dams on the site.
Site W8	The majority of the site is situated above the mapped 1 in 100 year flood level. A small portion of the site in the south western corner is subject to 1 in 100 year flooding. The proposed ancillary site is more than 250 m from a mapped water course.

The landscape area would be located partly within the mapped 1 in 100 year ARI flood levels associated with the Porters Creek Wetland.

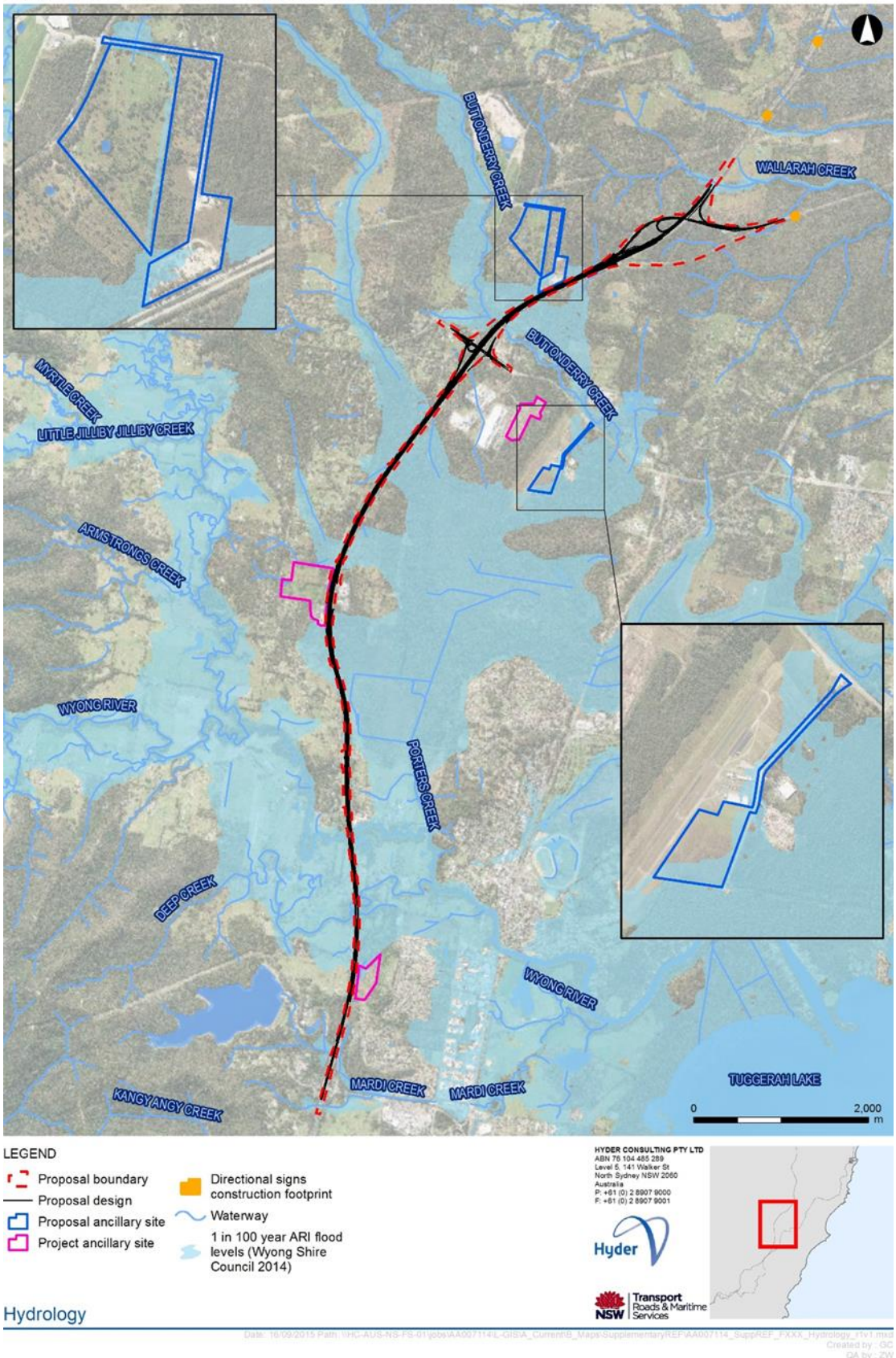


Figure 6-8 Hydrology at the Proposal site and the 1 in 100 year ARI flood extents

6.3.2 Potential impacts

Construction

During construction, the potential change in impacts are associated with the additional ancillary sites and include:

- Stockpiling or material storage reducing flood storage areas and/or impeding flood flows
- Earthworks affecting flow paths.

Stockpiling or material storage reducing flood storage areas and/or impeding flood flows

The original Project REF identified that all stockpile locations and construction ancillary sites should be located above the 1 in 100 year ARI flood level. The additional ancillary sites are generally located above this flood level however there are some areas where the flood level extends onto the sites, as shown in Figure 6-8. Ancillary site activities would be excluded from the 1 in 100 year flood areas where possible. At ancillary sites E5 and W8, proposed site entrances would traverse the flood mapped areas. These entrances would be designed to accommodate safe access/egress in the event of a flood and to avoid impeding flood flows. Site access to ancillary site W9 has been described in Section 3.2.1 and would not traverse flood mapped areas.

The volume of material stockpiled at each ancillary site at any one time would not be sufficient to significantly alter local flood paths. Each individual stockpile site would be managed to avoid localised ponding or the creation of new flow paths, this includes avoiding flood mapped areas where possible.

Earthworks affecting flow paths

At site W9, it is proposed to fill in one farm dam (located near the centre of the site) and the associated downstream drainage line which would affect local flow paths. There is the potential for this aspect to cause downslope erosion and sedimentation and/or localised pooling of water.

The Proposal would potentially involve installation of additional scour protection at a number of the existing culverts. The need for scour protection would be confirmed through site inspections and, if installed, would provide protection to the structures associated with the road (culverts/embankments) and would mitigate potential erosion and sedimentation. The construction of the scour protection would require surface works which may include clearing, grubbing and earthworks within a water course. As stated in Section 5.5, construction of scour protection would constitute work within 40 metres of waterfront land and therefore meet the requirements for needing ‘controlled activity’ approval. However, as identified in the original Project REF, under section 38 of the *Water Management (General) Regulation 2011*, Roads and Maritime is exempt from the requirement to obtain a ‘controlled activity' approval. Nevertheless, a notification of the activity would be provided to the NSW Office of Water at least 30 days before the activity commences. The safeguards and management measures outlined in the original Project REF and Submissions Report would provide adequate measures to prevent impacts to hydrology.

Operation
During operation, potential changes in impacts of the Proposal on the hydrology are:

- Increased flow rate and velocity of surface water runoff (downstream of the Proposal)
- Potential impacts to floodplain storage as a result of new Proposal elements (specifically the altered vertical alignment and landscape area)
- Minor changes to hydrology associated with the widening of the Sparks Road overbridge.

Flow rates and velocities
The installation of the scour protection associated with the revised Project boundary would aid in the protection of downstream water quality by providing protection from erosion associated with stormwater flowing through the culverts. This represents a positive hydrological impact as a result of the Proposal.

Floodplain storage – landscape area
The proposed landscape area (between chainage 89,560 to 89,900 on the eastern side of the M1 Pacific Motorway) encroaches onto the Porters Creek floodplain, in an area identified by Wyong Shire Council as high hazard containing flood storage and flow paths.

A review of the Wyong Shire Council's flood information, including the Porters Creek Flood Study (Cardno, 2009), the Porters Creek Flood Study Addendum (Cardno, 2010), and the associated TUFLOW model predictions, confirms that the proposed landscape area encroaches into a wide storage area with a constant 100 year ARI flood level of 5.85 m AHD, which extends from the M1 Pacific Motorway on the western side to the North Coast rail line on the eastern side. The total volume of the storage is about 22 million cubic metres.

The maximum depth of the encroachment of the landscape area into the floodplain is four metres, this assumes conservative geometry for the purpose of the assessment and would likely be significantly less as the area would be sloped to be similar to adjacent road batters. Using the maximum depth to calculate the volume of storage removed from the floodplain by the proposed landscape area results in a conservative volume of about 44 thousand cubic metres, which is 0.2 per cent of the floodplain storage. This reduction in storage volume would not result in a material change in 100 year ARI peak flood levels, with flood depths expected to rise by less than 10 mm.

The proposed landscape area is located on the fringe of the floodplain, where design 100 year ARI peak flow velocities are not predicted to exceed 0.04 m per second. The section of the flow path obstructed by the landscape area only accommodates a marginal amount of the floodplain flow. The energy losses associated with blocking this flow are not expected to result in increased flood depths (less than 1 mm).

The hydraulic conditions of the floodplain where the landscape area is proposed would result in insignificant changes to the floodplain storage volumes and flow velocities. As a result, the peak design 100 year ARI flood conditions (water levels, velocities, depths) would not be materially affected by the Proposal. The influence of the proposed landscape area on the Probable Maximum Flood (PMF) conditions would be even smaller as the proportion of obstruction of the floodplain would reduce.

Floodplain storage and flood extent – revised vertical alignment

The original Project REF identified that there would be no material change to the flood levels in surrounding areas as a result of the original Project. The Proposal involves increases of up to 700 mm to the vertical alignment of the main motorway carriageways. Wyong Shire Council's flood information, including the Porters Creek Flood Study (Cardno, 2009), the Porters Creek Flood Study Addendum (Cardno, 2010), and the associated TUFLOW model predictions were reviewed to assess the potential impacts of the altered vertical alignment on floodplain storage and flood extents.

The extent of the increase in vertical alignment varies along the length of the Proposal, being marginal at the crossings of the Wyong River and Wallarah Creek, but as high as 700 mm in some locations.

As the existing motorway levels are higher than the predicted 1 in 100 year ARI flood levels, the increase in vertical alignment would not affect flood extents or generate adverse hydraulic impacts for events up to and including the 1 in 100 year ARI flood event.

In order to determine the potential impact of the increased vertical alignment on the PMF extents, the base PMF hydraulic conditions were extracted from the results of the TUFLOW flood model developed by Cardno for Wyong Shire Council's Porters Creek Flood Study Addendum 1 (Cardno, 2011). The area of influence of the proposed road upgrade on the PMF peak flood levels was predicted by projecting the incremented road height on the local topographic contours.

During the PMF event, it is predicted that waterways crossing the M1 Pacific Motorway would overtop the road at three locations. In such instances, the PMF water levels could increase by as much as the increase in vertical alignment, although this assumption is conservative as it does not take into account upstream attenuation through storage and the increased length of the section of the road being overtopped. Additional areas, mostly along the western side of the Pacific Motorway, are also expected to be impacted by the changed PMF event. These areas include a mix of cleared land and bushland, residential land (mostly around the south of Sparks Road, on the western side of the Pacific Motorway), and a minor increased area at the northbound service centre.

The predicted increase in PMF extents associated with the revised vertical alignment is shown on Figure 6-9. The provision of this figure is for information only to confirm that the proposed design would not divert flows into adjoining catchments, which the design complies with. The PMF impacts are spatially limited and contained by the steep edges of the floodplains. The resulting peak flood levels remain commensurate with the magnitude expected from PMF conditions. The flood behaviour is consistent with existing conditions, with no flow being redirected to separate catchments or floodplains.

As the likelihood of a PMF is so low[4] (in the order of one in ten million year ARI), land use planning is typically based on the 1 in 100 year ARI. As identified above, the revised vertical alignment would not change 1 in 100 year ARI flood extents or levels.

In summary, while the increased vertical alignment is likely to increase the flood extent under a PMF event, it would not affect flood extents or generate adverse hydraulic impacts for events up to and including the 1 in 100 year ARI flood event.

Sparks Road overbridge

During the detailed design process, a non-conformance with adopted design criteria was identified on the Sparks Road overbridge in relation to drainage (due to the impact of stormwater encroachment into a trafficable lane).

As part of the Proposal, the overbridge would be widened to address the drainage non-conformance, thereby having a minor positive localised impact on hydrology.

[4] The PMF is defined as the largest flood that could conceivably occur at a particular location.

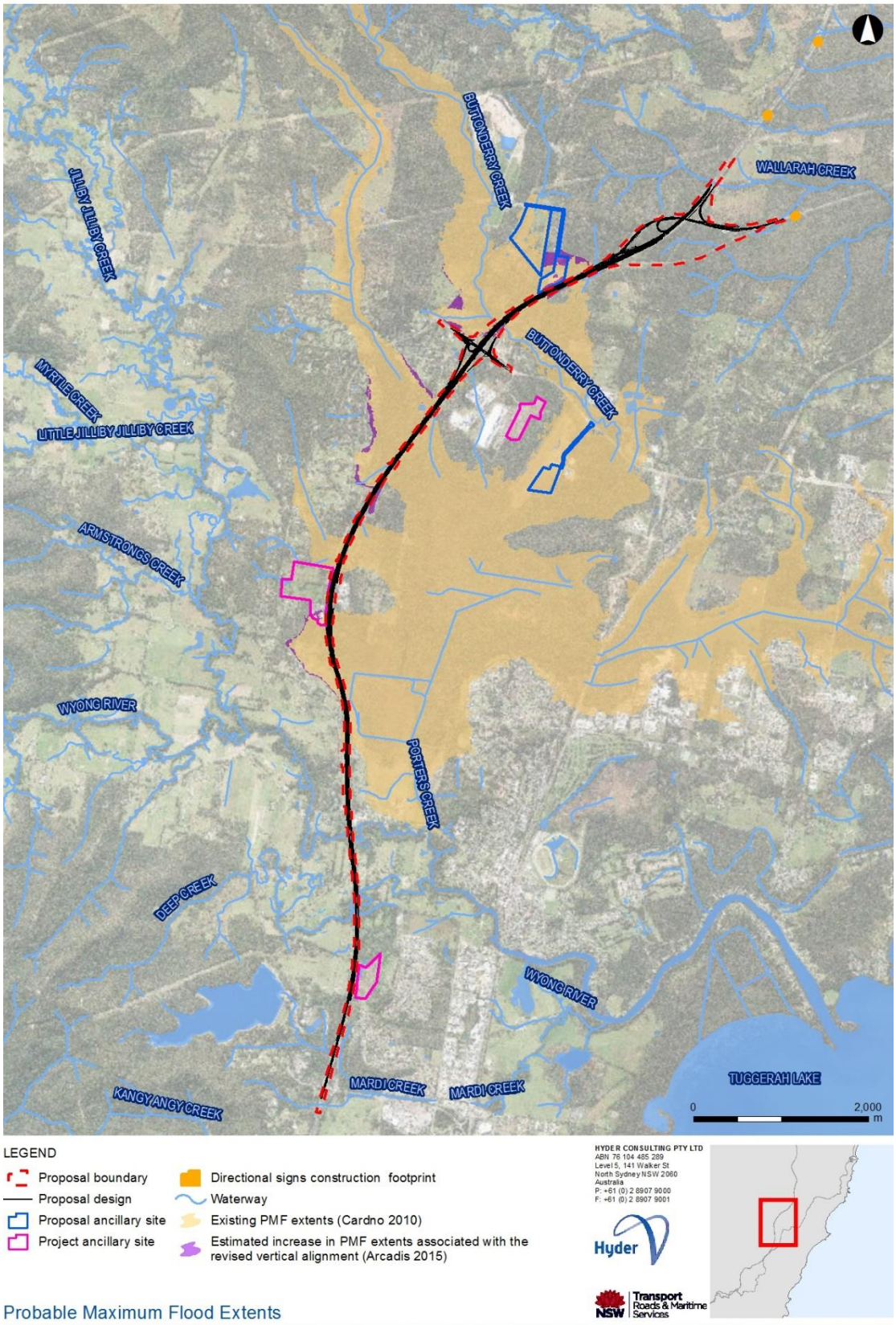


Figure 6-9 Predicted increase in PMF extents associated with the revised vertical alignment (indicative only)

6.3.3 Safeguards and management measures

The hydrology safeguards and management measures from the original Project REF and Submissions Report have been reviewed and would apply to the proposed design amendments. Additional safeguards and management measures for hydrology beyond those identified in these documents are outlined in Table 6-19 and are shown in **bold red text**.

Table 6-19 Additional hydrology safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Stockpiling or material storage reducing flood storage areas and/or affect flow paths	• All stockpile locations and construction ancillary sites should be located above the 1 in 100 year ARI flood level **where possible** • **Where 1 in 100 year ARI flood levels extend partially onto the construction ancillary sites, activities would be excluded from these areas where possible** • **The entrance to ancillary site E5 would be designed to accommodate safe access/egress in the event of a flood and to avoid impeding flood flows.** The SWMP should contain as a minimum the following **additional** elements: • **Consideration of appropriate measures to ensure that the altered drainage arrangements at Site W9 do not result in erosion, sedimentation or localised pooling of water** • **A 1 in 100 year ARI Flood Management Plan to provide adequate management of all areas impacted by 1 in 100 year ARI flood events**.	Construction contractor Roads and Maritime	Construction Pre-construction
Hydrology impacts	• **Drainage arrangements would be maintained or improved in the vicinity of the landscape area to avoid adverse hydrological impacts.**	Construction contractor	Construction

6.4 Soil and water

This Section provides a review of the potential soil and water impacts associated with the proposed design amendments. This review is based on the assessment that was prepared for the original Project REF and the proposed design amendments as described in Section 3.

Table 6-20 identifies whether the design amendments have the potential to change the soil and water impacts identified in the original Project REF. Where the design amendments do not generate the potential for changes to soil and water impacts that design amendment is not discussed further below.

Table 6-20 Potential for changes to soil and water impacts

#	Design amendments	Potential for changes in impacts?
1	New ancillary sites	Yes - As the new ancillary construction sites are proposed in additional locations, which were not assessed for these activities in the original Project REF, there is the potential for changes in soil and water impacts. An assessment of potential impacts has been carried out and is included below.
2	Doyalson Link Road bridge over M1 Pacific Motorway entry ramp	No – These design amendments would be carried out within the original Project boundary (that was assessed within the original Project REF) and do not significantly alter the extent of earthworks required for the original Project. The design amendments are unlikely to result in changes to the soil and water impacts identified in the original Project REF. No additional safeguards/management measures are considered necessary.
3	Widening Sparks Road overbridge	
4	Revised staging strategy and horizontal alignment	
5	Revised pavement type	
6	Revised original Project boundary	Yes – The original Project boundary has been revised in a number of locations to allow for potential installation of scour protection on existing culverts. Proposed culvert works would intersect the natural soil horizons to a minor extent in areas where acid sulfate soils (ASS) risk occurs. The scour protection works would largely be carried out at culverts that were considered in the original Project REF. Scour protection works would also be carried out at the Wallarah Creek culvert, at the northern end of the Proposal. This design amendment is discussed in further detail below.

#	Design amendments	Potential for changes in impacts?
7	Wyong River spill containment	Yes – The design amendment would capture flows from the northbound bridge in the event of a spill and direct the water to a spill containment basin. Groundwater may be encountered during construction of the spill containment basin. This design amendment is discussed in further detail below.
8	Landscape area	Yes – This design amendment involves the placement of materials upstream of a SEPP 14 wetland. This design change is discussed in further detail below.
9	Warnervale Interchange lane/ramp reconfigurations	No – These design amendments would be carried out within the original Project boundary (that was assessed within the original Project REF) and do not significantly alter the extent of earthworks required for the original Project. The design amendments are unlikely to result in changes to the soil and water impacts identified in the original Project REF. No additional safeguards/management measures are considered necessary.
10	Variable message signs (VMSs)	
11	Directional signs	Yes – This design amendment involves installation of directional signs outside the original Project boundary and therefore an assessment of potential soil and water constraints/impacts is provided below.
12	Revised vertical alignment	No – This design amendment would be carried out within the original Project boundary (that was assessed within the original Project REF) and does not significantly alter the extent of earthworks required for the original Project. Therefore, the design amendment is unlikely to result in changes to the soil and water impacts identified in the original Project REF. No additional safeguards/management measures are considered necessary.

6.4.1 Existing environment

The existing environment was described in Section 6 of the original Project REF. This was reviewed and is still relevant to the proposed design amendments. However the additional ancillary sites, revised original Project boundary and directional signs impact additional areas outside those described in the original Project REF, a description of their soil and water characteristics is provided below.

Ancillary sites

The three additional ancillary sites are outside the boundary identified in the original Project REF. The soil landscapes on the sites, as described in the Soil Landscapes of the Gosford-Lake Macquarie 1:100,000 Sheets (Murphy, 1993), are the Wyong and Gorokan.

The Wyong soil landscape exhibits erodibility ranging from high to extreme. The erosion hazard is slight for both non-concentrated flows and wind. For concentrated flows, it is considered slight to moderate. The Gorokan soil landscape exhibits erodibility ranging from moderate to high for non-concentrated flows, and up to very high for concentrated flows. The erosion hazard for both non-concentrated and concentrated flows is considered to be very high, while wind erosion hazard is considered slight. These soil landscapes are described further in Section 6.4 of the original Project REF. No salinity risk has been identified for the proposed ancillary sites.

An acid sulfate soil (ASS) desktop search via the Australian Soil Resource Information System (ASRIS) was conducted in October 2015. The search identified the proposed ancillary sites as having an extremely low probability of ASS occurrence.

A search of SEPP 14 Coastal wetlands was carried out and identified the closest area to the new ancillary sites as being located around 320 m to the southwest of ancillary site E5.

As shown on Figure 6-8 (above in Section 6.3) there are no major water courses identified on any of the proposed ancillary sites however a small unnamed ephemeral tributary is mapped in the northern portion of site W9 and a man-made drainage channel has been installed, flowing generally north to south through the site. There are also a number of farm dams on site W9. There is a man-made drainage line located along the western boundary of site W8.

A search of records held by the NSW EPA for notices issued under Section 58 of the Contaminated Land Management Act 1997 was carried out on 7 October 2015. The search consisted of Wyong, Gosford and Lake Macquarie LGA's and did not identify any registered contaminated land in proximity to the proposed design amendments, with the closest registered site located 1.5 km west of ancillary site E5.

A contamination assessment carried out for the Warner Industrial Park in 2008 (Douglas Partners, 2008) included assessment of site W9. The assessment investigated potential run-on contamination from the Buttonderry Landfill and included surface water and soil testing in the drainage line at the north-western corner of site W9. Testing was carried out at an accredited laboratory for a wide range of contaminants. All results were below the relevant health based and water quality guidelines except for pH which was recorded at 6.4 (slightly below the water quality guideline range of 6.5-8.5). The pH level was not considered indicative of potential run-on contamination from the landfill and the broader test results supported this finding.

During an ecology site visit for the Proposal in August 2015, a number of stockpiles (containing unknown materials) were identified on site W8, and drums and plastic containers (containing unknown liquids) were identified on site W9. These materials indicate the potential for localised contamination to be present on the sites.

Revised Project boundary

Acid sulfate soils (ASS) risk occurs within the Proposal area for about 3.1 km of the Proposal corridor, generally associated within the Wyong and Yarramalong soil landscapes. The risk of ASS occurring in the locations for scour protection ranges from low to high. The Proposal would intersect the natural soil horizons to a minor extent in areas where this ASS risk occurs. The extent of ground disturbance in risk areas would be limited to culvert extensions and culvert surface stabilisation works.

The scour protection works would largely be carried out on culverts that were considered in the original Project REF. Scour protection works would also be carried out at the Wallarah Creek culvert, at the northern end of the Proposal. Wallarah Creek runs generally from west to east, draining into Budgewoi Lake. The broader creek system is one of the least developed in the WSC LGA (WSC, 2015) however the area of the creek within the Proposal boundary is highly modified, having been subjected to previous earthworks associated with the culvert running under the M1 Pacific Motorway.

Installation of scour protection would constitute work within 40 m of waterfront land and therefore meet the requirements for needing 'controlled activity' approval. However, as identified in the original Project REF, under section 38 of the Water Management (General) Regulation 2011 Roads and Maritime is exempt from the requirement to obtain a 'controlled activity' approval. Nevertheless, a notification of the activity would need to be provided to the NSW Office of Water at least 30 days before the activity commences.

The closest SEPP 14 area to the revised Project boundary is located around 180 m to the northeast of chainage 89,460.

The contaminated land search carried out on 7 October 2015 did not identify any new areas of contaminated land that would be impacted as a result of the revised Project boundary.

Landscape area

The proposed location for the landscape area comprises of the Gorokan soil landscape where erodibility ranges from moderate to very high and the erosion hazard ranges from slight to very high. An ASS search on ASRIS identified the proposed landscape area location as having a low probability of ASS occurrence.

A search of SEPP 14 Coastal wetlands was carried out and identified the closest area to the landscape area as being located around 42 m to the east at the closest point.

Directional signs

The directional signs lie within the Gorokan soil landscape as described in the Soil Landscapes of the Gosford-Lake Macquarie 1:100,000 Sheets (Murphy, 1993). This landscape exhibits erodibility ranging from moderate to high for non-concentrated flows, and up to very high for concentrated flows. The erosion hazard for both non-concentrated and concentrated flows is considered to be very high, while wind erosion hazard is considered slight.

The closest SEPP 14 Coastal wetland area to the directional signs is located around 3.4 km to the east.

The contaminated land search carried out on 7 October 2015 did not identify any new areas of contaminated land that would be impacted during installation of the directional signs.

6.4.2 Potential impacts

Construction

Ancillary Sites

Additional ancillary sites would potentially increase the risk of erosion and sedimentation from exposed areas and stockpiles. The operation of concrete re-processing and asphalt batching plants on the ancillary sites is likely to generate dirty water runoff which could cause harm to downstream aquatic environments if not managed appropriately.

The ancillary sites and stockpile locations would need to be carefully managed to avoid erosion within the ancillary site and sediment laden stormwater leaving the site to downstream water courses. The sites would need to be managed in accordance with the erosion and sediment control measures established within the original Project REF and included in Section 6.4.3 and Section 7 of this Supplementary REF.

As identified in Section 3, a water supply would be required for the activities to be carried out at the additional ancillary sites. Extraction of water from surface or groundwater sources has the potential to reduce the supply available for downstream users and associated aquatic environments. Sourcing large volumes of water from the town water supply has the potential to increase demand on the system and could impact the availability of water for existing users.

As identified in Section 6.4.2 of the original Project REF, there is “a risk of encountering contaminated land during temporary occupation of ancillary sites during construction”. This risk applies to the three additional sites that form part of the Proposal. The areas identified as containing drums, plastic containers and stockpiles on sites W8 and W9 are considered to have a higher risk of contamination being present.

Potential environmental impacts associated with the Proposal in relation to contaminated land management, as identified in the original Project REF include:

- Adverse effects on human health (construction personnel/ community)
- Release of contaminants into underlying soils
- Release of contaminants into groundwater
- Movement of contaminated sediments into waterways
- Contaminated or hazardous waste not being correctly handled and/or disposed of
- Increasing waste amounts from improper practices e.g. poor fill management
- Adverse effect on flora and fauna.

As identified in Section 6.4.3 of the original Project REF, each of the ancillary sites proposed as part of the upgrade requires a preliminary environmental survey to be carried out prior to Roads and Maritime occupying the site and the presence of fill (and potential contamination) would be determined by carrying out site inspections.

Revised Project boundary
The Proposal would involve installation of additional scour protection at existing culverts if required. The construction of the scour protection would require surface works which may include clearing, grubbing and earthworks within a water course. These works have the potential to result in erosion and downstream sedimentation if not managed appropriately.

There is potential for ASS to be encountered during the installation of scour protection in low lying areas. Disturbance of ASS has the potential to impact water quality and, in particular, the SEPP 14 listed Porters Creek Wetland and surrounding areas resulting in possible:

- Terrestrial vegetation impacts due to soil and groundwater pollution
- Aquatic flora and fauna impacts due to pollution of waterways
- Damage to building and infrastructure
- Damage to agriculture and aquaculture industries.

Wyong River spill containment
There is the potential to encounter groundwater during excavation for the spill containment basin. This could result in temporary seepage of groundwater into the excavation. It is unlikely that this would result in any notable groundwater drawdown as the excavation would only be open for a short period prior to installation of the spill containment basin and the excavation would be relatively minor in nature. There may be a need to pump out water to the surrounding environment. The spill containment basin would be installed in an area identified as having a low probability of acid sulfate soils and it is unlikely there would be associated soil and water quality impacts. Any offsite discharge of water from the excavation would comply with any applicable discharge quality requirements identified in an environment protection license issued for the upgrade. Safeguards and management measures are included in Section 6.4.3.

Landscape area
The proposed landscape area would be constructed upstream of the SEPP 14 listed Porters Creek Wetland. The construction of this landscape area has the potential to result in erosion and downstream sedimentation impacts during construction. While installation of the landscape area is unlikely to significantly alter the potential erosion and sedimentation impacts identified in the original Project REF, the close proximity to this sensitive environment would require a greater focus on erosion and sediment control measures during the construction of this feature. The materials to be placed in the landscape area would be restricted to VENM, ENM and appropriate topsoil in order to reduce the potential for introduction of materials that could cause adverse environmental impacts. As identified in the original Project REF, the Soil and Water Management Plan (SWMP) would include details of specific measures to protect sensitive areas including SEPP 14 Coastal wetlands.

Directional signs

The location of the new directional signs are outside the original Project boundary and therefore have the potential to result in soil and water impacts in locations that were not assessed in the original Project REF. The erosion and sediment control measures proposed in the original Project REF would be suitable to mitigate potential impacts in these locations.

Operation
The installation of scour protection would aid in downstream water quality by mitigating erosion associated with stormwater discharges from the culverts.

Installation of the spill containment basin and scuppers on the northbound Wyong River bridge would aid in containing potential hydrocarbon spills associated with vehicle accidents should they occur. The basin is designed to outlet from the bottom of the basin, meaning the hydrocarbons which float on water would be kept in the basin until emptied as part of a spill response. This would reduce the potential for hydrocarbon spills to enter the Wyong River.

6.4.3 Safeguards and management measures

The soil and water safeguards and management measures from the original Project REF and Submissions Report have been reviewed and would apply to the proposed design amendments. Additional safeguards and management measures for soil and water beyond those identified in these documents are outlined in **bold red text** in Table 6-21.

Table 6-21 Additional soil and water safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Impacts from acid sulfate soil exposure	**An Acid Sulfate Soil Management Plan would be developed for works proposed in acid sulfate soil risk areas.**	Contractor	Pre-construction and construction
Erosion and sedimentation	The SWMP would contain as a minimum the following **additional** elements: • **Requirements to manage runoff from concrete re-processing and asphalt batching activities to ensure it complies with Section 120 of the POEO Act (or any applicable EPL conditions issued to the Project) prior to discharge from the site** • **Consideration of appropriate measures to ensure that the altered drainage arrangements at Site W9 do not result in erosion, sedimentation or localised pooling of water** • **Restrictions on the materials to be placed in the landscape areas (i.e. only VENM, ENM and appropriate topsoil).**	Construction contractor	Pre-construction

Impact	Environmental safeguards	Responsibility	Timing
Impacts to water quality from accidental spills	**An operational spill response plan would be prepared to guide the effective management of the spill containment structure at the Wyong River bridge.**	Roads and Maritime	Pre-operation
Impacts on waterfront land	**Notification of works within 40 m of Waterfront Land would be provided to the NSW Office of Water at least 30 days before the activity commences.**	Construction contractor	Construction
Impacts on water availability	• **Where possible, the Proposal would use water that is fit for purpose (i.e. use of non-potable water where appropriate)** • **If surface water extraction is required, a water use approval may be required under Section 8 9 of the WMA.** • **If groundwater extraction is required, an aquifer interference approval may be required under Section 91F of the WMA** • **Consultation would be carried out with WSC should a connection to the town water supply be required.**	Roads and Maritime Construction contractor	Pre-construction and/or construction
Groundwater	• **The size, depth and timeframe for installation of the Wyong River spill containment basin would be minimised where possible to reduce the potential for groundwater seepage and associated pump out. Any offsite discharge of water from the excavation would comply with Section 120 of the POEO Act (or any applicable EPL conditions issued to the Project).**	Construction contractor	Construction

6.5 Socio-economic

This Section provides a review of the potential socio-economic impacts associated with the proposed design amendments. This review is based on the assessment that was prepared for the original Project REF and the proposed design amendments as described in Section 3.

Table 6-22 identifies whether the design amendments have the potential to change the socio-economic impacts identified in the original Project REF. Where the design amendments do not generate the potential for changes to socio-economic impacts that design amendment is not discussed further below.

Table 6-22 Potential for changes to socio-economic impacts

#	Design amendment	Potential for changes in impacts?
1	New ancillary sites	Yes – The new ancillary sites are located in areas not assessed as part of the original Project REF. There is the potential for changes in socio-economic impacts. An assessment of potential impacts has been carried out and is included below.
2	Doyalson Link Road bridge over M1 Pacific Motorway entry ramp	No – These proposed design amendments are unlikely to result in changes to the socio-economic impacts identified in the original Project REF as they are contained within the original Project boundary and impacts would not differ from those stated in the original Project REF. No additional safeguards/management measures are considered necessary.
3	Widening Sparks Road overbridge	
4	Revised staging strategy and horizontal alignment	Yes – The proposed design amendment would alter construction timeframes and would potentially change amenity and accessibility impacts at the Proposal site. There is the potential for changes in socio-economic impacts. An assessment of potential impacts has been carried out and is included below.
5	Revised pavement type	No – These proposed design amendments are unlikely to result in changes to the socio-economic setting at the Proposal site as accessibility and amenity impacts would not differ from those stated in the original Project REF. No additional safeguards/management measures are considered necessary.
6	Revised original Project boundary	
7	Wyong River spill containment	
8	Landscape area	
9	Warnervale Interchange lane/ramp reconfigurations	
10	Variable message signs (VMSs)	
11	Directional signs	
12	Revised vertical alignment	

6.5.1 Existing environment

The existing environment was described in Section 6 of the original Project REF. This was reviewed and is still relevant to the proposed design amendments.

6.5.2 Potential impacts

Construction

The socio-economic impacts identified in the original Project REF have been reviewed and are still relevant to the proposed design amendments. The key socio-economic impacts (amenity and accessibility) identified in the original Project REF are relevant to the design amendments, and in particular to the additional ancillary sites.

Amenity and accessibility impacts as identified in the original Project REF include increases in construction traffic, traffic delays, dust, changes to visual amenity, and noise. Specific assessments of these impacts are included in the relevant sections of this Supplementary REF.

There is also the potential for odour from the asphalt batching plant, which is proposed for use at one or more of the new ancillary sites, to impact on adjacent properties. Potential odour impacts and management measures are addressed in Section 6.11.

The revised staging strategy and horizontal alignment would reduce the overall construction timeframe therefore reducing the duration of potential amenity and accessibility impacts identified in the original Project REF.

Operation

The operational impacts from the original Project REF have been reviewed and are relevant to the design amendments. No additional operational impacts have been identified.

6.5.3 Safeguards and management measures

The socio-economic safeguards and management measures from the original Project REF and Submissions Report have been reviewed and would apply to the proposed design amendments. No additional safeguards and management measures for socio-economic impacts are proposed beyond those identified in these documents.

6.6 Land use

This Section provides a review of the potential land use impacts associated with the proposed design amendments. This review is based on the assessment that was prepared for the original Project REF and the proposed design amendments as described in Section 3.

Table 6-23 identifies whether the design amendments have the potential to change the land use impacts identified in the original Project REF. Where the design amendments do not generate the potential for changes to land use impacts that design amendment is not discussed further below.

Table 6-23 Potential for changes to land use impacts

#	Design amendment	Potential for changes in impacts?
1	New ancillary site	Yes – The additional ancillary sites are located outside of the area assessed in the original Project REF and the potential impacts on land use have therefore been assessed and documented below.
2	Doyalson Link Road bridge over M1 Pacific Motorway entry ramp	No – These design amendments are contained fully within the original Project boundary assessed in the original Project REF, and are also contained within the road reserve. There would be no changes to the land use impacts identified in the original Project REF.
3	Widening Sparks Road overbridge	
4	Revised staging strategy and horizontal alignment	
5	Revised pavement type	
6	Revised original Project boundary	No – The revised original Project boundary does not extend outside the Roads and Maritime road corridor and there would be no changes to the land use impacts identified in the original Project REF.
7	Wyong River spill containment	No – These design amendments are contained fully within the original Project boundary assessed in the original Project REF, and are also contained within the road reserve. There would be no changes to the land use impacts identified in the original Project REF.
8	Landscape area	
9	Warnervale Interchange lane/ramp reconfigurations	
10	Variable message signs (VMSs)	
11	Directional signs	No – While the directional signs are located outside of the area assessed in the original Project REF, they have a small physical footprint and would be contained fully within the road reserve. There would be no changes to the land use impacts identified in the original Project REF.
12	Revise vertical alignment	No – The revised vertical alignment is contained fully within the original Project boundary assessed in the original Project REF, and is also contained within the road reserve. There would be no changes to the land use impacts identified in the original Project REF.

6.6.1 Existing environment

The existing environment was described in Section 6 of the original Project REF. This was reviewed and is still relevant to the proposed design amendments.

Three new ancillary sites have been proposed in the design amendments for the Proposal. The new ancillary sites are outside of the area assessed in the original Project REF and therefore a description of the land use on and around each of the sites is provided below.

Ancillary site E5 is located beside the Warnervale Airport on the eastern side. The site has previously been cleared however has a range of re-growth vegetation as described in Section 6.8. Warnervale Airport (owned by WSC) is adjacent to E5 and is a private airport which has an obstacle limitation surface under the Wyong LEP (1991). The LEP stipulates height restrictions for development in the vicinity of the airport. These height restrictions apply to ancillary site E5 and are shown in Figure 4-1. Access to the E5 site would be from Jack Grant Avenue, which joins onto Sparks Road.

Ancillary site W8 has mostly been cleared of vegetation with some scattered vegetation in the south western corner as described in Section 6.8. There is a shed located on the site and the surrounding area is currently being used for equipment storage. In the southern part of the site there appears to be an old motocross track, which may or may not currently be in use. Site W8 would be accessed via Kiar Ridge Road.

Ancillary site W9 consists of two agricultural lots. Structures, including residences, formerly standing on these lots have been demolished and the sites have been largely cleared of vegetation. There are still pockets of scattered native vegetation across the site, as described in Section 6.8. Access to W9 would be from Hue Hue Road.

Ancillary sites W8 and W9 are both located in the Wyong mine subsidence district (MSD). Section 6.6.1 of the original Project REF describes the mine subsidence areas. Both W8 and W9 are also within the boundary of the land identified for industrial development as part of the Warner Industrial Park.

6.6.2 Potential impacts

Construction

Two of the proposed ancillary sites (W8 and W9) would be located on land designated for the proposed Warnervale Industrial Park. The Proposal has the potential to impact on development plans for the proposed Warnervale Industrial Park depending on the timing of the works for both projects. Roads and Maritime have consulted with the landowners on the uses and timing of the works prior to site establishment to avoid any land use conflicts. The use of these sites as ancillary sites would not prevent the future development as part of the Warnervale Industrial Park. Following use as ancillary sites for the Proposal, these sites would be rehabilitated to their former conditions or as otherwise agreed with the landowner.

There are three residential properties within 200 m of the northern boundary of site W9 and two residential properties within 200 m of the southern boundary of site W8 (on the other side of the M1 Pacific Motorway). The potential impacts from the activities proposed for sites W8 and W9 (including concrete reprocessing, asphalt batching, stockpiling, materials storage and site compounds) are traffic, noise and visual impacts. These impacts are addressed in Section 6.1, Section 6.2 and Section 6.7 of this document respectively. None of the predicted impacts associated with site W8 and W9 would result in any surrounding land uses becoming unviable.

Ancillary site E5 would be located adjacent to the Warnervale Airport. Any temporary structures on this site would comply with the obstacle limitation surface associated with the airport. Roads and Maritime would continue to consult with WSC to ensure the use of this site does not adversely impact airport operations.

The land use on the proposed ancillary sites would be impacted during the construction period however the use of the sites would be agreed to with the property owners prior to establishment of the ancillary sites. The use of these sites during construction would not impact the future land use at these sites in accordance with the respective zoning provisions.

The ancillary sites are proposed to be used during construction of the Proposal. As identified in Section 3.2.1, a range of rehabilitative activities would be carried out prior to vacation of the ancillary sites. These requirements are outlined in Table 6-24.

Operation
The proposed design amendments would not alter the operational land use impacts identified in Section 6.6 of the original Project REF.

6.6.3 Safeguards and management measures

The land use safeguards and management measures from the original Project REF and Submissions Report have been reviewed and would apply to the proposed design amendments. Additional safeguards and management measures for land use beyond those identified in these documents are included in Table 6-24 in **bold red text** and deletions are shown in ~~strike-through text~~. In addition, the management measures identified in other Sections of this Supplementary REF relating to the additional ancillary sites would need to be complied with during construction of the Proposal.

Table 6-24 Additional land use safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Land use at Warnervale Airport	• **Any structures required at ancillary site E5 (whether temporary or permanent) would comply with the obstacle limitation surface associated with the Warnervale Airport** • **Roads and Maritime would continue to consult with Wyong Shire Council to ensure the use of ancillary site E5 does not adversely impact airport operations.**	Contractor Roads and Maritime	Pre-construction and construction
Impact on ancillary sites	~~All ancillary sites are to be restored to pre-existing conditions or to a condition agreed with the land owner, at the completion of construction.~~ **Prior to vacation of the ancillary sites, unless otherwise agreed to in writing by the property owner, the following works would be carried out:** • **Removal of sheds, structures, plant and equipment and surplus construction materials** • **Smoothing of the land surface and filling of ruts (if any) arising**	Construction contractor	Pre-construction and construction

Impact	Environmental safeguards	Responsibility	Timing
	from the use and occupation of the sites • **Remediation of any contamination arising from the use and occupation of the site** • **Removal of any hardstand areas and concrete pads** • **Filling of holes from removal of hardstand area and concrete pads and properly compact the land** • **Reinstate internal fences and pipes removed during use and occupation of the sites** • **Reinstate perimeter fences removed during use and occupation of the sites (reinstatement would be done in a manner that avoids or minimises clearing of native vegetation)** • **Cleaning out and infilling any water quality or sediment basins constructed during use and occupation of the sites** • **Reinstate appropriate vegetative cover in consultation with the property owner.**		

6.7 Landscape and visual character

This section provides a review of the potential landscape character and visual impacts associated with the proposed design amendments. This review is based on the assessment that was prepared for the original Project REF and the proposed design amendments as described in Section 3.

Table 6-30 identifies whether the design amendments have the potential to change the landscape and visual character impacts identified in the original Project REF. Where the design amendments do not generate the potential for changes to landscape and visual character impacts that design amendment is not discussed further below.

Table 6-25 Potential for changes to landscape and visual character impacts

#	Design amendment	Potential for changes in impacts?
1	New ancillary site	Yes - All of the proposed design amendments have the potential to alter the landscape and visual character impacts identified in the original Project REF and have been considered below.
2	Doyalson Link Road bridge over M1 Pacific Motorway entry ramp	
3	Widening Sparks Road overbridge	
4	Revised staging strategy and horizontal alignment	
5	Revised pavement type	
6	Revised original Project boundary	
7	Wyong River spill containment	
8	Landscaped area	
9	Warnervale Interchange lane/ramp reconfigurations	
10	Variable message signs (VMSs)	
11	Directional signs	
12	Revised vertical alignment	

6.7.1 Existing environment

The existing environment was described in Section 6 of the original Project REF and in the Urban Design, Landscape Character, and Visual Impact Assessment Report (Tract Consultants, 2014). This description was reviewed and is still relevant to the proposed design amendments.

Three new ancillary sites have been proposed as part of the design amendments. The new ancillary sites are outside of the Project boundary assessed in the original Project REF and therefore a description of the existing environment in these areas is provided below.

The original Project REF identified areas of similar spatial or character properties as ‘landscape character zones’ (LCZs) (see Figure 6-10). The LCZs distinguish between different landscape areas within the vicinity of the motorway upgrade.

Proposed ancillary sites W8 and W9 are located in “LCZ 8 Forest Precinct” described as “undulating with steeper terrain than most of the corridor occurring to the north of the study area. […] heavily vegetated, dominated by Eucalypt forest with limited development having occurred to date” (Tract Consultants, 2014). Ancillary sites W8 and W9 are bordered by native vegetation, which partially screens the sites from surrounding areas, and have scattered native vegetation throughout the sites.

Proposed ancillary site E5 is located in “LCZ 7 Industrial Precinct” described as being “located on a small ridge area at the headwaters of Porters Wetland. The area has recently been developed as an industrial development and adjoins the Warnervale Airport” (Tract Consultants, 2014). Site E5 is immediately east of the Warnervale Airport and has previously been cleared however has a range of re-growth vegetation as described in Section 6.8. The site is visible from the airport and from the access route along Jack Grant Avenue.

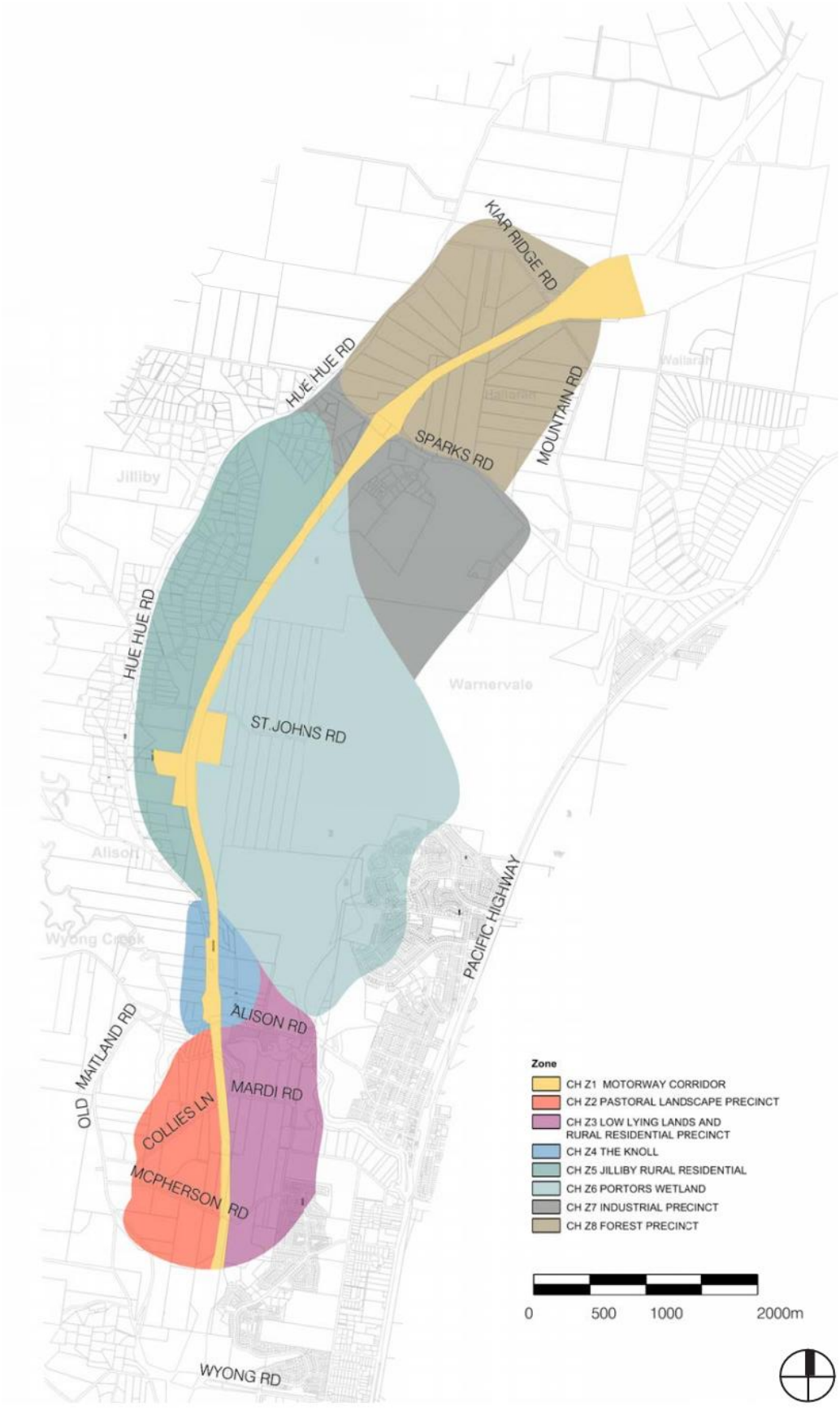


Figure 6-10 Landscape character zones (Tract Consultants, 2014)

6.7.2 Assessment methodology

The assessment carried out for the Proposal considers construction and operational impacts. The primary component of the design amendments which relate to construction impacts are the ancillary sites, which would be used during the construction period and vacated when the Proposal commences operation. The impacts at these locations are therefore temporary in nature and do not relate to lasting landscape character or visual impacts.

As per the approach in the original Project REF, the impacts have been assessed in relation to two discrete impacts: landscape character impacts and visual impacts. The assessment was carried out consistent with the *Environmental Impact Assessment Guidance Note EIA-N04 Guidelines for landscape character and visual impact assessment* (RMS, 2013) and has used an impact assessment grading matrix that takes into account both the magnitude of works and sensitivity of the environment, as shown in Table 6-26.

When assessing landscape character impacts, magnitude refers to the type of proposal and its compatibility with the existing landscape character, whereas sensitivity refers to how sensitive the character of the setting is to the proposed change.

When assessing visual impacts, magnitude represents the contrast in scale, form and type of proposal to the location and context to which it is to be placed, whereas sensitivity is the measure of the visual importance of the view (and is dependent on the distance between viewer and the proposal, the category of viewer and the elements of the proposal that are visible).

Table 6-26 Impact assessment grading matrix

		Magnitude			
		High	**Moderate**	**Low**	**Negligible**
Sensitivity	**High**	High	High to moderate	Moderate	Negligible
	Moderate	High to moderate	Moderate	Moderate to low	Negligible
	Low	Moderate	Moderate to low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Visual impacts were assessed in relation to a number of viewpoints and visual catchments identified in the original Project REF as shown on Figure 6-11.

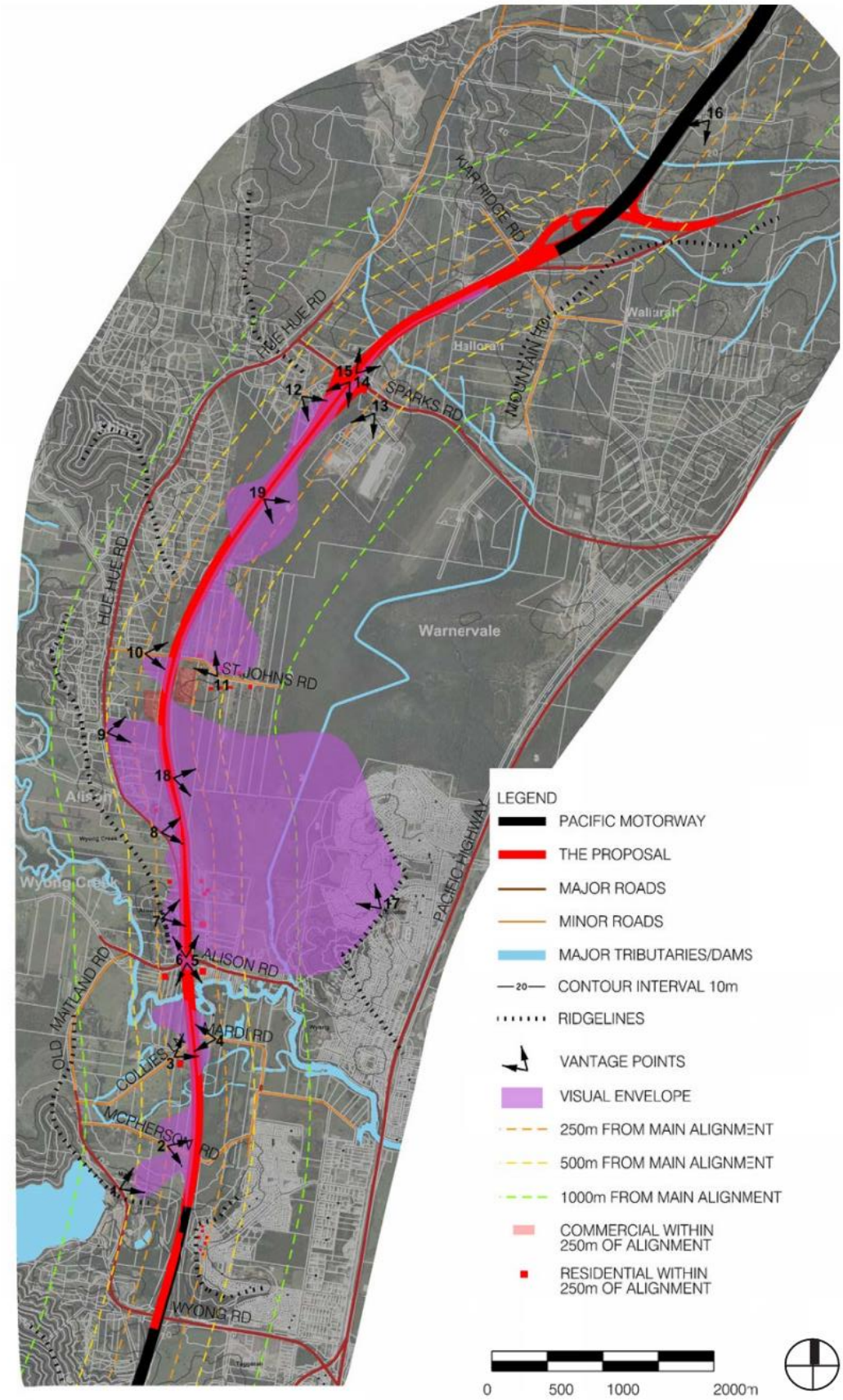


Figure 6-11 Viewpoints and visual catchment envelope

6.7.3 Potential impacts

A description of the impacts of the Proposal compared to the impacts of the original Project is provided below. This considers the urban design objectives and principles identified in the original Project REF, and each LCZ and each viewpoint (as shown in Figure 6-10 and Figure 6-11 above).

Urban design objectives and principles

The urban design objectives and principles developed as part of the Project REF have been reviewed in order to determine their appropriateness to both the Proposal and the landscape context. It has been determined that the following urban design objective (*upgrade works are to improve the visual appearance and character of the road corridor*) and a related principle (*enhance the visual quality of the corridor*) would not be met by the Proposal for the reasons identified below.

The existing motorway corridor is generally consistent in character, and consists of 11-12 m wide northbound and southbound carriageways with a 15-20 m wide vegetated median and vegetated verges. This provides a strong landscape definition and sense of separation from adjoining areas and between the carriageways. The median planting minimises visual impacts for the motorist, breaks up the wide expanse of hard surface, and reduces headlight glare.

In responding to constructability and maintenance access and safety issues, the Proposal slightly reduces the width of the median over the majority of the length of the motorway, and limits the opportunity to plant in the median in some locations, compared to the concept design considered by the original Project REF.

The Proposal would result in about 16 m wide hard surface for each of the northbound and southbound carriageways, including a 3.1 m wide median shoulder for maintenance access, with about eight metres width of vegetated median over half of its length. In the worst case scenario, the corridor would consist of about 35 m of hard surface across the corridor (for about two kilometres of motorway near the Warnervale Interchange).

While the benefits of a wide median would be reduced or not realised at some locations, just over three quarters of the length of the works would still allow for some planting in the median, either native grasses only, or a combination of native grasses/shrubs. The Proposal allows for increased areas of planting to the verges. This design would have negligible impact on the character of the motorway, compared to the concept design, for the majority of its length, however, impacts would be increased where median planting is not possible.

While the design amendments have resulted in the above mentioned urban design objective not being met, their overall change to landscape character and visual impact is considered to be minor. The changes to landscape character and visual impacts are discussed in further detail below.

Landscape character impacts

Landscape Character Zone 1

Under the original Project the motorway corridor was assessed as having low to moderate sensitivity. The magnitude of the works was assessed as moderate due to the increased scale of the road and reduction in median separation and vegetation screening. The overall impact on the landscape character of this zone was assessed as moderate.

The proposed construction and operational changes in LCZ 1 under the Proposal, include:

- Doyalson Link Road bridge over M1 Pacific Motorway entry ramp
- Widening Sparks Road overbridge
- Revised staging strategy and horizontal alignment
- Revised pavement type
- Revised original Project boundary
- Wyong River spill containment
- Landscaped area
- Warnervale Interchange lane/ramp reconfigurations
- Variable message signs
- Revised vertical alignment.

The design amendments (in particular the revised staging strategy and horizontal alignment) further reduce the width of the median, limiting the amount of vegetation that can be replanted in this area. At the northern end of the corridor, the median would consist of a double type F barrier only. These changes have been made to incorporate safety in design considerations for maintenance access. The changes have been re-assessed to give a high to moderate magnitude rating, with the sensitivity remaining low to moderate. However, the overall landscape character impact would remain moderate.

Landscape Character Zone 2

Under the original Project the LCZ was assessed to have low to moderate sensitivity. The magnitude of the works was assessed as moderate because they would be mostly contained within the motorway corridor. The overall impact on the landscape character of this zone was assessed as moderate to low.

The proposed construction and operational changes in LCZ 2 under the Proposal include:

- Revised staging strategy and horizontal alignment
- Revised pavement type
- Revised vertical alignment.

Under the Proposal, removal of verge vegetation was determined to have the potential to increase exposure or alter the character of the zone and how it relates to the motorway corridor. The Proposal would slightly reduce the width of the median and there would be minimal vegetation removal to the western verge. Therefore, the overall landscape character impact would remain moderate to low.

Landscape Character Zone 3

Under the original Project the zone was assessed to have moderate to low sensitivity. The magnitude of the works was assessed as low because they would be mostly contained within the motorway corridor. The overall impact on the landscape character of this zone was assessed as low to moderate.

The proposed construction and operational changes in LCZ 3 under the Proposal include:

- Revised staging strategy and horizontal alignment
- Revised pavement type
- Revised vertical alignment.

Under the Proposal, minimal verge vegetation would be removed and therefore the moderate to low landscape character impact rating would remain.

Landscape Character Zone 4

Under the original Project the LCZ was assessed to have low sensitivity. The magnitude of the works was assessed as low due to the minimal changes taking place. The overall landscape character impact was considered to be low.

The proposed construction and operational changes in LCZ 4 under the Proposal include:

- Revised staging strategy and horizontal alignment
- Revised pavement type
- Revised vertical alignment.

The Proposal further reduces the width of the median, however, provides additional space to the southbound verge for planting. Therefore, the landscape character impact rating would remain low.

Landscape Character Zone 5

Under the original Project, the LCZ was assessed to have low sensitivity. The magnitude of the works was assessed as low due to screening by generally dense vegetation next to the motorway, giving an overall impact rating of low.

The proposed construction and operational changes in LCZ 5 under the Proposal include:

- Revised staging strategy and horizontal alignment
- Revised pavement type
- Revised vertical alignment
- Variable message sign.

Under the Proposal, the median considerably narrows, however, the dense edge vegetation provides sufficient screening to the zone, maintaining the low landscape character impact rating.

Landscape Character Zone 6

Under the original Project, the LCZ 6 was assessed as having a low sensitivity to change and negligible magnitude of change.

The proposed construction and operational changes in LCZ 6 under the Proposal include:

- Revised staging strategy and horizontal alignment
- Revised pavement type
- Landscaped area
- Variable message sign
- Revised vertical alignment.

The Proposal generally raises the height of the Motorway, exposing it to the LCZ, particularly in the south and introduces a landscape feature to the edge of the Motorway. The width of the median would limit planting to native grasses and low shrubs. The magnitude rating would therefore be considered low, while the sensitivity would remain low. The landscape character impact would therefore increase from negligible to low.

Landscape Character Zone 7

Under the original Project sensitivity and magnitude ratings were assessed to be negligible, as was the landscape character impact.

The proposed construction and operational changes in LCZ 7 under the Proposal include:

- New ancillary site
- Doyalson Link Road bridge over M1 Pacific Motorway entry ramp
- Revised staging strategy and horizontal alignment
- Revised pavement type
- Variable message sign
- Revised vertical alignment.

Under the Proposal, the magnitude would be considered low due to the northbound entry ramp and widening of the northbound exit ramp, removing vegetation, exposing the Proposal. Median vegetation would be removed and replaced with a type F barrier, again exposing the Proposal. Sensitivity would remain negligible. Therefore, the landscape character impact would remain negligible.

Landscape Character Zone 8

Under the original project, sensitivity and magnitude ratings were assessed to be negligible due to the works being screened by the extensive vegetation cover. Therefore, the landscape character impact was also assessed to be negligible.

The proposed construction and operational changes in LCZ 8 under the Proposal include:

- New ancillary sites
- Revised staging strategy and horizontal alignment
- Revised pavement type
- Revised original Project boundary
- Warnervale Interchange lane/ramp reconfigurations
- Directional signs
- Revised vertical alignment.

Under the Proposal, the magnitude would increase from negligible to low due to the Doyalson Link Road Bridge which involves substantial vegetation removal and the removal of all vegetation in the median. The additional clearing associated with the proposed ancillary sites in this zone reinforce this rating. Sensitivity would remain negligible. Therefore, the landscape character impact would remain negligible.

Summary of landscape character impacts

Table 6-27 provides a summary of the landscape character impacts under the original Project and under the Proposal.

Table 6-27 Landscape character impacts under the original Project and the Proposal

LCZ	Original Project			Proposal		
	Sensitivity	Magnitude	Rating	Sensitivity	Magnitude	Rating
1	Low to moderate	Moderate	Moderate	Low to moderate	High to moderate	Moderate
2	Low to moderate	Low	Low	Low to moderate	Low	Low
3	Low to moderate	Low	Low	Low to moderate	Low	Low
4	Low	Low	Low	Low	Low	Low
5	Low	Low	Low	Low	Low	Low
6	Low	Negligible	Negligible	Low	Low	Low
7	Negligible	Negligible	Negligible	Negligible	Low	Negligible
8	Negligible	Negligible	Negligible	Negligible	Low	Negligible

Overall, the Proposal is considered to have a slightly higher impact on landscape character than the original Project, however, the overall landscape character impact ratings remain the same for all LCZs except in LCZ 6 where the impact increases from negligible to low due to the decreased median width available for revegetation.

Visual impacts

Viewpoint 1

The original Project REF assessed the magnitude of visual impacts to be low due to distance from the original Project and verge planting providing screening, and the sensitivity to be low. This gave an overall impact of low.

The Proposal would retain verge vegetation in this viewpoint unless clearing is critical for construction purposes. Any clearing carried out in these areas would be revegetated with suitable native species. The visual impact rating would remain low.

Viewpoint 2

The original Project REF assessed the magnitude of visual impacts to be moderate due to partial loss of screening vegetation, and the sensitivity to be moderate to high due to the close proximity of residences. This gave an overall impact of moderate to high.

The Proposal would retain verge vegetation in this viewpoint unless clearing is critical for construction purposes. Any clearing carried out in these areas would be revegetated with suitable native species. Magnitude is assessed to be low and sensitivity would remain moderate to high. Therefore, the visual impact rating would reduce from a moderate to high rating to moderate.

Viewpoint 3

The original Project REF assessed the magnitude of visual impacts to be moderate due to possible partial loss of screening vegetation, and the sensitivity to be moderate due to the close proximity of residences. This gave an overall impact of moderate.

The Proposal would retain verge vegetation in this viewpoint unless clearing is critical for construction purposes. Any clearing carried out in these areas would be revegetated with suitable native species. Magnitude is assessed to be low and sensitivity would remain moderate. Therefore, the visual impact rating would reduce from moderate to be moderate to low.

Viewpoint 4

The original Project REF assessed the magnitude of visual impacts to be moderate due to partial loss of screening vegetation, and the sensitivity to be moderate to high due to the close proximity of residences. This gave an overall impact of moderate to high.

Under the Proposal, some additional screen planting may be possible, however, the visual impact rating would remain moderate to high.

Viewpoints 5 and 6

The original Project REF assessed the magnitude of visual impacts to be moderate due to the removal of median vegetation, and the sensitivity to be moderate to low due to the surrounding light industrial land use. This gave an overall impact of moderate.

The Proposal halves the width of the Motorway median to provide for the 3.1 m wide off-side shoulders, reducing the amount of revegetation. A section of the median south of the bridge, would have all vegetation removed to cater for a new emergency crossover point. However, the magnitude would remain moderate and the sensitivity would remain moderate to low, retaining the moderate visual impact rating.

Viewpoint 7

The original Project REF assessed the magnitude of visual impacts to be moderate to low due to the removal of median vegetation, and the sensitivity to be moderate due to the residential receivers being provided with some screening. This gave an overall impact of moderate.

Despite the removal of much of the median vegetation as part of the Proposal, the visual impact rating would remain moderate, as the impacts are unlikely to be visible from this viewpoint.

Viewpoint 8

The original Project REF assessed the magnitude of visual impacts to be moderate due to the removal of median vegetation, and the sensitivity to be high due to the proximity of residential dwellings. This gave an overall impact of high to moderate.

Some additional roadside vegetation would be removed and replaced with similar species in the Proposal. However, the visual impact rating would remain moderate to high.

Viewpoint 9

The original Project REF assessed the magnitude of visual impacts to be moderate to low due to the potential removal of verge vegetation, and the sensitivity to be moderate to low due to the distance of residential dwellings. This gave an overall impact of moderate to low.

No additional verge vegetation would be removed in the Proposal, therefore the moderate to low visual impact rating would remain.

Viewpoint 10

The original Project REF assessed the magnitude of visual impacts to be low to negligible due to the screening from existing vegetation, and the sensitivity to be low to negligible due to the distance of residential dwellings. The overall visual impact was therefore assessed as low to negligible.

The assessment of the Proposal identifies that the visual impact rating would be negligible, as the works would not be seen from this viewpoint.

Viewpoint 11

The original Project REF assessed the magnitude of visual impacts to be low due to the amount of existing vegetation between the Project and the viewer, and the sensitivity to be moderate to low due to the distance of residential dwellings. This gave an overall impact of moderate to low.

Some additional roadside vegetation would be removed as part of the Proposal, however this would be replaced. The visual impact would remain moderate to low.

Viewpoint 12

The original Project REF assessed the magnitude of visual impacts to be low due to the minimal changes taking place, and the sensitivity to be moderate to low due to the existing exposure of residential dwellings to the exit ramp. This gave an overall impact of moderate to low.

The works visible in the Proposal would be the Sparks Road commuter car park and the widened exit ramp which would include vegetation removal and replacement. However, the visual impact would remain moderate to low.

Viewpoints 13 to 15

The original Project REF assessed the magnitude of visual impacts to be low due to the amount of existing vegetation limiting visibility to the Project, and the sensitivity to be low due to the vegetation cover and industrial land use. This gave an overall impact of low.

The Proposal would include widening of the northbound exit ramp, widening of the Sparks Road bridge, narrowing of the median, including removal of all vegetation north of the interchange, and formalising the commuter car park. The magnitude of visual impacts would change from low to moderate and the sensitivity would remain low. This would increase the overall impact from low to be moderate to low.

Viewpoint 16

The original Project REF assessed the magnitude of visual impacts to be low due to the amount of existing vegetation limiting visibility to the Project, and the sensitivity to be low due to the vegetation cover and distance from the viewer. This gave an overall impact of low.

Despite the scale of the works involved in the Proposal at the interchange, it is unlikely that they would be highly visible, except for the removal of median vegetation, however, this would not be sufficient to change the magnitude rating which would remain low. Sensitivity would also remain low and therefore the visual impact rating would remain low.

Viewpoint 17

The original Project REF assessed the magnitude of visual impacts to be low due to the distance of the Project, and the sensitivity to be low due to the distance of the viewer. This gave an overall impact of low.

Due to the distance from the works, about 1.4 km, the visual impact rating would remain low.

Viewpoints 18 and 19

The original Project REF assessed the magnitude of visual impacts to be moderate to low due to the wider road pavement and removal of median vegetation, and the sensitivity to be low due to the transitory nature of the viewer. This gave an overall impact of moderate to low.

As part of the Proposal most of the median vegetation would be removed, reducing the buffer between the carriageways. In the context of a motorway environment, the magnitude has been re-assessed to be moderate. The sensitivity remains low and therefore the overall visual impact rating would remain moderate to low.

Viewpoint 20

The original Project REF assessed the magnitude of visual impacts to be low due to the landform and vegetation restricting views to the Project, and the sensitivity to be low due to the residential properties facing away from the alignment. This gave an overall impact of low. There is a well vegetated buffer between the Motorway and the residences. Therefore, the visual impact would remain low.

Viewpoint 21

The original Project REF assessed the magnitude of visual impacts to be moderate due to the wider road pavement and removal of median vegetation and modification of bridges, and the sensitivity to be moderate to Low due to the transitory nature of the viewer. This gave an overall impact of moderate.

The design amendments in the Proposal, particularly the provision of the 3.1 m wide off-side shoulders, would slightly increase the magnitude rating, however, not sufficiently enough to increase the rating from moderate. The sensitivity rating would remain moderate to low and therefore the overall visual impact would remain moderate.

Summary of visual impacts

Table 6-28 below provides a summary of the visual impacts under the original Project and under the Proposal.

Table 6-28 Visual impacts under the original Project and under the Proposal

View point	Original Project Sensitivity	Magnitude	Rating	Proposal Sensitivity	Magnitude	Rating
1	Low	Low	Low	Low	Low	Low
2	High to moderate	Moderate	High to moderate	High to moderate	Low	Moderate
3	Moderate	Moderate	Moderate	Moderate	Low	Moderate to low
4	High to moderate	Moderate	High to moderate	High to moderate	Moderate	High to moderate
5 & 6	Moderate to low	Moderate	Moderate	Moderate to low	High to moderate	Moderate

View point	Original Project			Proposal		
	Sensitivity	Magnitude	Rating	Sensitivity	Magnitude	Rating
7	Moderate	Moderate to low	Moderate	Moderate	Moderate to low	Moderate
8	High	Moderate	High to moderate	High	Moderate	High to moderate
9	Moderate to low	Moderate to low	Moderate to low	Moderate to low	Moderate to low	Moderate to low
10	Low to negligible	Low to negligible	Low to negligible	Negligible	Negligible	Negligible
11	Moderate to low	Low	Moderate to low	Moderate to low	Low	Moderate to low
12	Moderate to low	Low	Moderate to low	Moderate to low	Low	Moderate to low
13 - 15	Low	Low	Low	Low	Moderate	Moderate to low
16	Low	Low	Low	Low	Moderate to low	Moderate to low
17	Low	Low	Low	Low	Low	Low
18 & 19	Low	Moderate to low	Moderate to low	Low	Moderate to low	Moderate to low
20	Low	Low	Low	Low	Low	Low
21	Moderate to low	Moderate	Moderate	Moderate to low	Moderate	Moderate

Overall, the visual impact ratings for the Proposal generally remain the same as those in the original Project REF. Viewpoints 13 to 15 and viewpoint 16 increase slightly from low to be moderate to low, while viewpoint 2 reduces slightly from high to moderate to be moderate and viewpoint 3 from moderate to be moderate to low.

Conclusion

The original Project REF identified that the greatest landscape character impact would be to the Motorway corridor. The character zones adjoining would generally have minimal impact as a sizeable buffer exists between the road corridor and the character zone, so works within the corridor would have minimal impact beyond. A number of viewpoints from residences in relatively close proximity to the motorway were also identified as places where potential visual impacts could occur.

Overall, the Proposal would have a slightly higher impact on the landscape character of the M1 Pacific Motorway and Porters Wetland. The greatest impact would come from the 3.1 m wide off-side shoulders and the reduced space available in the median for planting. Visual impact ratings for the Proposal generally remain the same as those in the original Project REF. Viewpoints to areas with a greater magnitude, such as Warnervale and Doyalson Interchanges have slightly increased impacts, whilst viewpoints to the southern end of the Proposal where existing verge vegetation is to be retained, have slightly reduced impacts.

6.7.4 Safeguards and management measures

The landscape character and visual safeguards and management measures from the original Project REF and Submissions Report have been reviewed and would apply to the proposed design amendments. Additional safeguards and management measures for landscape character and visual impacts beyond those identified in these documents are included in Table 6-29 in **bold red text** and deletions are shown in ~~strike through text~~.

Table 6-29 Additional landscape character and visual safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Impact on ancillary sites	~~All ancillary sites are to be restored to pre-existing conditions or to a condition agreed with the land owner, at the completion of construction.~~ **Prior to vacation of the ancillary sites, unless otherwise agreed to in writing by the property owner, the following works would be carried out:** • **Removal of sheds, structures, plant and equipment and surplus construction materials** • **Smoothing of the land surface and filling of ruts (if any) arising from the use and occupation of the sites** • **Remediation of any contamination arising from the use and occupation of the site** • **Removal of any hardstand areas and concrete pads** • **Filling of holes from removal of hardstand area and concrete pads and properly compact the land** • **Reinstate internal fences and pipes removed during use and occupation of the sites** • **Reinstate perimeter fences removed during use and occupation of the sites (reinstatement would be done in a manner that avoids or minimises clearing of native vegetation)** • **Cleaning out and infilling any water quality or sediment basins constructed during use and occupation of the sites**	Construction contractor	Pre-construction and construction

Impact	Environmental safeguards	Responsibility	Timing
	• **Reinstate appropriate vegetative cover in consultation with the property owner.**		
General reduction of landscape character and visual amenity	• **Adherence to design principles for landscaped areas outlined in the 100% Urban Design Report (SMM, 2015)** • **Carry our landscape design strategies outlined in the 100% Urban Design Report (SMM, 2015)** • **Vegetation clearing adjacent to the northbound lanes between chainages 86,270 and 87,775 would be avoided where possible. Any clearing in this area would be revegetated with suitable native species.**		

6.8 Biodiversity

This Section provides a review of the potential biodiversity impacts associated with the proposed design amendments. This review is based on the biodiversity technical study that was prepared for the original Project REF and the proposed design amendments as described in Section 3. The review is also informed by surveys carried out on 15 July and 5, 6 and 25 August 2015 and updated database searches (EPBC Act Protected Matters search dated 14 August 2015 and NSW BioNet Wildlife Atlas dated 13 August 2015). The results of additional investigations are provided in detail in the Technical note: Biodiversity (Appendix B).

Table 6-30 provides a summary of whether the design amendments have the potential to change the biodiversity impacts identified in the original Project REF. Where the design amendments do not generate the potential for changes to biodiversity impacts that design amendment is not discussed further below.

Table 6-30 Potential for changes to biodiversity impacts

#	Design amendment	Potential for change in impacts?
1	New ancillary sites	Yes – The new ancillary sites would encompass areas not assessed by the original Project REF, resulting in the potential for changes in biodiversity impacts. An assessment of potential impacts has been carried out and is included below.
2	Doyalson Link Road bridge over M1 Pacific Motorway entry ramp	Yes – This design amendment results in an altered vegetation clearance footprint from that assessed in the original Project REF. In addition, a Little Eagle nest was subsequently identified in vegetation proposed to be cleared for the original Project REF at this location, requiring updates to the assessment. An assessment of potential impacts has been prepared and is included below.
3	Widening Sparks Road overbridge	Yes – The widening of the overbridge would result in a change in the location of the construction footprint, although there would not be any increase to the size of the footprint. An assessment of potential impacts has been prepared and is included below.
4	Revised staging strategy and horizontal alignment	Yes – The revised horizontal alignment would require minor additional vegetation clearing. An assessment of potential impacts has been prepared and is included below. The revised staging strategy does not alter the construction impacts identified in the original Project REF as the corresponding areas were already proposed to be cleared as part of the original Project.
5	Revised pavement type	No – The revised pavement type would not result in any additional vegetation clearing. As such, there is no potential for changes in biodiversity impacts.
6	Revised original Project boundary	Yes – The revised original Project boundary includes areas of vegetation not assessed in the original Project REF and would also result in reductions in the width of some construction exclusion zones around threatened flora species. An assessment of potential impacts has been prepared and is included below.
7	Wyong River spill containment	No – The construction of the Wyong River spill containment would not result in any additional vegetation clearing. The adjacent exclusion zone (to protect important habitat for threatened fauna connectivity) would be maintained. As such, there is no potential for changes in biodiversity impacts.
8	Landscape area	Yes – The landscape area is proposed to be constructed adjacent to (but outside of) a SEPP14 coastal wetland. An assessment of potential impacts has been prepared and is included below.

#	Design amendment	Potential for change in impacts?
9	Warnervale Interchange lane/ramp reconfigurations	Yes – The Warnervale Interchange lane/ramp reconfigurations would result in minor changes to clearance areas for vegetation communities. An assessment of potential impacts has been prepared and is included below.
10	Variable message signs (VMSs)	No – The locations proposed for installation of the VMSs would be contained within the original Project boundary assessed in the original Project REF and would not result in any additional clearing of vegetation or changes to fauna habitat. As such, there is no potential for changes in biodiversity impacts.
11	Directional signs	Yes – The directional signs are located in areas not assessed as part of the original Project REF and would require some minor additional vegetation clearing. An assessment of potential impacts has been prepared and is included below.
12	Revised vertical alignment	No – This design amendment relates to a change in the vertical alignment only and therefore would not alter the biodiversity impacts identified in the original Project REF.

6.8.1 Existing environment

The existing environment was described in Section 6.8.1 of the original Project REF. This was reviewed and is still relevant to the proposed design amendments.

The design amendments would impact some additional areas to those described in the original Project REF. These areas include the ancillary sites identified in Section 3 and additional areas associated with the revised original Project boundary.

Vegetation communities

Classification of vegetation communities follows that used for the vegetation mapping of Wyong LGA by Bell and Driscoll (2008), as adopted in the Biodiversity Technical Study for the original Project REF by SMEC (2014). The nine different vegetation communities which were identified and mapped in the Proposal boundary are:

- Modified Alluvial Floodplain Shrub Swamp Forest
- Alluvial Riparian Blackbutt Forest
- Alluvial Woollybutt – Melaleuca Sedge Forest
- Narrabeen Buttonderry Footslopes Forest
- Narrabeen Dooralong Spotted Gum – Ironbark Forest
- Narrabeen Doyalson Coastal Woodland
- Disturbed: Canopy only
- Disturbed regrowth
- Cleared.

The location of these vegetation communities are shown on Figures 1a to 1n in Appendix B.

Seven of the vegetation communities identified in the Proposal boundary were also mapped as occurring within the original Project REF boundary. Vegetation communities not recorded in the original Project REF are Modified Alluvial Floodplain Shrub Swamp Forest, which was identified on the additional ancillary sites, and Cleared, which was identified on the additional ancillary sites and within some other additional survey sites, mainly at the road interface.

A description of each vegetation community is provided in Appendix B.

Threatened ecological communities

Four of the vegetation communities identified in the additional survey areas fall wholly or partially within the definition of threatened ecological communities (TECs) listed as Endangered under the TSC Act (Table 6-31). None of these communities or any other vegetation in the Proposal boundary conforms with any TEC listed under the EPBC Act.

Table 6-31 TECs identified in the study area

Vegetation community	TEC
Alluvial Riparian Blackbutt Forest	River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions
Alluvial Woollybutt – Melaleuca Sedge Forest/Modified Alluvial Floodplain Swamp Shrub Forest	Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions
Narrabeen Dooralong Spotted Gum – Ironbark Forest	Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion

Fauna habitat

The following fauna habitats were identified in the additional survey areas:

- Open forest
- Swamp forest
- Cleared and disturbed
- Aquatic habitats.

A description of each fauna habitat type is provided in Appendix B.

Threatened flora species

Database searches

Eleven additional threatened flora species were identified in the updated searches. The additional threatened species and their conservation status are described in Appendix B. An assessment of the likelihood of each species to occur within the Proposal area is provided in Appendix B. All of the additional threatened flora species were assessed as having a low likelihood of occurrence within the Proposal area.

Field assessment
Two threatened flora species were recorded within the Proposal boundary, on ancillary sites W8 and W9. These flora species and their locations are:

- *Angophora inopina* (Charmhaven Apple), listed as a Vulnerable species under the TSC Act and EPBC Act, on ancillary site W8.
- *Melaleuca biconvexa* (Biconvex Paperbark), listed as a Vulnerable species under the TSC Act and EPBC Act, on ancillary site W9.

Threatened fauna species

Database searches
Forty additional fauna species including threatened and migratory species under the TSC Act and/or EPBC Act were identified in the updated searches. The additional threatened/migratory species and their conservation status are described in Appendix B.

An assessment of the likelihood of each species to occur within the Proposal boundary is provided in Appendix B. All migratory listed species were searched on the Atlas of Living Australia to identify any records within 10 km of the Proposal boundary.

Fourteen threatened fauna species were assessed to have a high likelihood of occurrence in the Proposal boundary, and one species was assessed to have a moderate likelihood of occurrence in the Proposal boundary. All other species were assessed as having a low likelihood of occurrence.

Field assessment
Ecologically sensitive features identified within the Proposal boundary include hollow bearing trees providing potential habitat for threatened species including Squirrel Glider, Eastern Pygmy Possum, woodland birds, microbats and owls. A Little Eagle nest was identified in vegetation proposed to be cleared for the original Project REF at the Doyalson Link Road interchange.

Furthermore, SEPP 14 wetlands have been mapped adjacent to the eastern side of the M1 Pacific Motorway. The wetlands contain swamp forest and would provide habitat for a range of fauna, including threatened species. These wetlands are located outside the Proposal boundary.

Ecologically sensitive features identified within the additional ancillary sites include:

- Raptor nest, potentially of the Little Eagle *Hieraaetus morphnoides* (Vulnerable under the TSC Act) on ancillary site W9
- Potential Koala habitat (Vulnerable under the TSC and EPBC Acts) on ancillary sites W8 and W9
- Hollow bearing trees at ancillary sites W8 and W9.

The locations of ecologically sensitive features identified within the Proposal boundary are mapped in Appendix B.

6.8.2 Potential impacts

Construction

This Section discusses the ecological impacts of each of the relevant design amendments. The cumulative change to vegetation clearing (including to EECs) is presented quantitatively at the end of this section.

Where the design amendments are likely to alter the predicted impacts on threatened species with a moderate or high likelihood of occurrence on site, Assessments of Significance prepared for the original Project REF have been revised to reflect the cumulative potential impacts resulting from the current Proposal (Appendix B). These assessments confirmed that significant impacts are unlikely.

Ancillary sites

As outlined in Section 3.2.1, three additional ancillary sites are proposed, being sites W8, W9 and E5. The use of these sites would involve direct and indirect ecological impacts, both of which were taken into account as part of the options evaluation for ancillary sites (refer to Section 2.4.1).

Direct impacts would include:

- Clearing of mostly disturbed native vegetation, including some small areas of threatened ecological communities
- Removal of two isolated trees of *Angophora inopina*, listed as a Vulnerable species under the TSC Act and EPBC Act, on ancillary site W8
- Removal of mature trees and some hollow-bearing trees, resulting in the loss of foraging, shelter and breeding resources for a range of fauna species. In total, seven hollow-bearing trees would be removed within the footprint of the additional ancillary sites.

Indirect impacts may include disturbance to fauna from increased activity and noise associated with movement of construction vehicles and from machinery used within these sites (in particular concrete re-processing and batching plants).

The original Project REF identified that there would be no potential impacts to native vegetation on the Hue Hue Road ancillary site REF. In order to provide vehicle access to the ancillary site from the southern boundary, it is proposed to clear a small amount (about 0.03 ha) of Alluvial Woollybutt-Melaleuca Sedge Forest.

Doyalson Link Road bridge over the M1 Pacific Motorway

Construction of the Doyalson Link Road bridge over the M1 Pacific Motorway entry ramp results in an altered clearance footprint to accommodate this design amendment, with minor changes to the areas of Narrabeen Buttonderry Footslopes Forest and Narrabeen Dooralong Spotted Gum – Ironbark Forest to be cleared.

Following determination of the original Project REF, a Little Eagle nest was identified in vegetation proposed to be cleared for the original Project REF at the Doyalson Link Road Interchange. Removal of this nest is proposed to occur prior to the onset of the breeding season to avoid brooding (incubation) failure or nest abandonment. An updated Assessment of Significance for the Little Eagle has been included in Appendix B.

Widening Sparks Road overbridge
The Proposal would widen the Sparks Road overbridge to incorporate a pedestrian path and cycleway (rather than constructing a separate pedestrian cycleway as proposed in the original Project REF). The construction footprint is generally the same size as proposed under the original Project REF however it is in a slightly different location (i.e. immediately adjacent to the existing bridge instead of slightly north of it). The potential change in clearing impacts have been accounted for in the overarching clearing calculations carried out for the Proposal.

Revised horizontal alignment
The revised horizontal alignment would result in minor changes to clearance areas for vegetation communities. The potential change in clearing impacts have been accounted for in the overarching clearing calculations carried for the Proposal.

Revised original Project boundary
The revised original Project boundary would result in some additional vegetation clearing to that identified and assessed within the original Project REF. In addition, the revised original Project boundary results in areas where three of the 25 m radius exclusion zones for threatened plants proposed in the Submissions Report would be unachievable. The exclusion zones have been reduced, however no threatened flora species would be directly impacted as a result of this change and the revised exclusion zones provide a sufficient level of protection for these species.

The revised original Project boundary would also result in the removal of mature trees and some hollow-bearing trees, resulting in the loss of foraging, shelter and breeding resources for a range of fauna species. In total, five hollow-bearing trees would be removed within the footprint of the revised original Project boundary.

Landscape area
The landscape area is proposed to be constructed adjacent to (but outside of) a SEPP14 coastal wetland. Installation of the landscape area has the potential to indirectly impact this sensitive ecological community through erosion and sedimentation during construction. As outlined in Section 3, the materials selected for the landscape area would be restricted to virgin excavated natural material (VENM), excavated natural material (ENM) and suitable topsoil to minimise the potential for contaminants to enter the wetland. With the implementation of the safeguards and management measures outlined in Section 6.8.3 and Section 7.2, the Proposal is unlikely to result in any impacts to the SEPP 14 wetland.

Warnervale Interchange lane/ramp reconfigurations
The Warnervale Interchange lane/ramp reconfigurations would result in minor changes to clearance areas for vegetation communities.

Directional signs
The northernmost directional sign would result in the clearance of about 53 square metres of the native vegetation community Narrabeen Doyalson Coastal Woodland (mapped by Bell, 2008). This vegetation type does not fall within the definition of any threatened ecological communities.

Operation
Design amendments which would have potential additional operational impacts are discussed below.

The original Project REF included the revegetation of the medians following construction as part of the assessment of impacts. The narrowing of the medians as part of the Proposal reduces the area available for revegetation and some sections of the median would not be revegetated. The impact of no vegetation in the median or a reduced area for revegetation would not reduce connectivity for fauna and impacts would be consistent with the ecological impacts assessed within the original Project REF.

Wyong River spill containment provides increased protection to the water quality of Wyong River through the interception of potential contaminants entering the waterbody from the northbound bridge. The operational outcomes resulting from this design amendment on biodiversity are positive with increased security of water quality within the Wyong River.

The design of the landscape area may result in minor shading of wetland vegetation, locally altered hydrological regimes and encroachment closer to the boundary of the wetlands. The Proposal would ensure that there are no adverse impacts on water quality or flow regime which could impact the adjacent wetlands during operation.

Summary of impacts across the Proposal site

Impacts to native vegetation
Impacts to native vegetation as a result of the Proposal have been calculated by measuring the extent of mapped vegetation communities within the revised original Project boundary and ancillary sites and subtracting the area of mapped vegetation within the construction exclusion zones (Table 6-32). The total area of native vegetation to be cleared is 24.37 ha, representing a net increase of 5.07 ha from the 19.3 ha assessed in the original Project REF and Submissions Report.

The areas of most vegetation communities to be cleared have generally increased, however for some vegetation communities there has been a decrease. This is associated with reclassification of some vegetation communities within the Proposal boundary and adjacent areas following ground truthing as well as changes in the extent of construction exclusion zones.

Table 6-32 Impacts to vegetation communities

Vegetation community	Original Project design impacts (ha)	Total revised impacts (ha)	Change (ha)
Alluvial Bluegum-Paperbark Mesic Palm Forest	0.02	0.08	+0.06
Modified Alluvial Floodplain Shrub Swamp Forest	0	0.04	+0.04
Alluvial Redgum Footslopes Forest	0.66	0.66	0
Alluvial Riparian Blackbutt Forest	0	0.18	+0.18
Alluvial Woollybutt-Melaleuca Sedge Forest	1.45	0.54	-0.91
Narrabeen Buttonderry Footslopes Forest	4.43	8.41	+3.98

Vegetation community	Original Project design impacts (ha)	Total revised impacts (ha)	Change (ha)
Narrabeen Coastal Blackbutt Shrubby Forest	0.34	0.02	-0.32
Narrabeen Dooralong Spotted Gum-Ironbark Forest	6.1	4.36	-1.74
Narrabeen Doyalson Coastal Woodland	0.41	1.65	+1.24
Riverine Alluvial Gallery Rainforest-Moist Forest	0	0.09	+0.09
Disturbed: Canopy only	5.64	7.45	+1.81
Disturbed: Regrowth	0.25	0.89	+0.64
Total native vegetation	**19.3**	**24.37**	**+5.07**

Impacts to threatened ecological communities
Revised impacts to threatened ecological communities as a result of the Proposal are shown in Table 6-33. There has been a slight reduction in the area of TECs cleared for the Proposal from that identified in the original Project REF and Submissions Report, partially as a result of the reclassification of some areas of Narrabeen Spotted Gum Ironbark Forest and Lower Hunter Spotted Gum – Ironbark Forest.

Table 6-33 Impacts to threatened ecological communities

Endangered Ecological Community	Original Project design impacts (ha)	Total revised impacts (ha)	Change (ha)
Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion	4.9	4.09	-0.81
River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	1.01	1.01	0
Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions	1.12	0.57	-0.55
Total	**7.03**	**5.67**	**-1.36**

Assessments of Significance have been prepared to assess impacts to threatened ecological communities in accordance with Section 5A of the EP&A Act (Appendix B). The Assessments of Significance found that the impacts of the Proposal would not be significant.

Impacts to threatened flora species
The Proposal would have direct impacts on one threatened flora species: *Angophora inopina* (Charmhaven Apple), listed as Vulnerable under the TSC Act and EPBC Act. Two isolated trees of this species growing in cleared land on ancillary site W9 would be removed.

Two other threatened flora species identified in the original Project REF, *Grevillea parviflora* subsp. *parviflora* and *Melaleuca biconvexa*, may be subject to additional indirect impacts as a result of the proposed design amendments. *Melaleuca biconvexa* has been recorded on ancillary site W9 and there have been reductions to the width of some construction exclusion zones adjoining individuals of *Grevillea parviflora* subsp. *parviflora*.

Assessments of Significance have been prepared to assess impacts to threatened flora species in accordance with Section 5A of the EP&A Act and/or the Matters of National Environmental Significance: Significant Impact Guidelines 1.1 - Environment Protection and Biodiversity Conservation Act 1999 (Appendix B). The Assessments of Significance found that the impacts of the Proposal would not be significant.

Impacts to fauna habitat

Impacts to fauna habitat as a result of the Proposal have been calculated by measuring the extent of mapped fauna habitats within the revised original Project boundary and subtracting the area of mapped habitat within the construction exclusion zones (Table 6-34). Impacts to fauna habitat were not quantified in the original Project REF and, as such, a direct comparison is not provided.

Table 6-34 Impacts to fauna habitat

Fauna habitat	Total impacts (ha)
Open Forest	22.88
Swamp Forest	1.49
Cleared and Disturbed	29.89
Total	**54.26**

Further, the Proposal would result in the removal of up to 12 additional hollow-bearing trees, five of which are within the revised original Proposal boundary and seven are within the ancillary sites. The loss of hollow-bearing trees would result in impacts to foraging, shelter and breeding resources for a range of fauna species including threatened species such as Squirrel Glider, Eastern Pygmy Possum, woodland birds and microbats and owls. However, impacts would not be significant (refer to following paragraph and Appendix B).

Impacts to threatened fauna species

The Proposal would potentially impact 15 additional threatened and/or migratory fauna species that were not assessed in the original Project REF. Assessments of Significance have been prepared to assess impacts to these threatened and/or migratory fauna species in accordance with Section 5A of the EP&A Act and/or the Matters of National Environmental Significance: Significant Impact Guidelines 1.1 - Environment Protection and Biodiversity Conservation Act 1999 (Appendix B). The Assessments of Significance found that the impacts of the Proposal would not be significant.

In addition, impacts to threatened and/or migratory fauna species assessed in the original Project REF have changed as a result of additional clearing of vegetation and loss of habitat features (e.g. hollow-bearing trees). As such, the Assessments of Significance prepared in the original Project REF have been updated and provided in Appendix B. The updated Assessments of Significance found that the impacts of the Proposal would not be significant.

Conclusion
Overall, the impacts from construction and operation of the Proposal would not significantly alter the biodiversity impacts identified in the original Project REF and, with the implementation of the safeguards and management measures outlined in Section 6.8.3 and Section 7.2, are unlikely to significantly impact the environment.

6.8.3 Safeguards and management measures

The biodiversity safeguards and management measures from the original Project REF and Submissions Report have been reviewed and would apply to the proposed design amendments. Additional safeguards and management measures for biodiversity beyond those identified in these documents are outlined in Table 6-35. Amendments to the measures from the Submissions Report are shown in ~~strike through~~ text for deletions and **bold red text** for additions.

Table 6-35 Additional biodiversity safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Threatened fauna species impact	**The removal of the Little Eagle nest and nest tree near Doyalson Link Road would occur between March and July to avoid the breeding and nesting season (and potential incubation failure or nest abandonment). The nest would be checked prior to removal for signs of use to avoid mortality to young.**	Roads and Maritime	Pre-construction
Threatened fauna species impact	**A delineated exclusion zone of 90 m would be established around the raptor nest on ancillary site W9. Ancillary site establishment would occur outside the nesting period of the Little Eagle to avoid brooding failure or nest abandonment, if this species is utilising this nest.**	Construction contractor Roads and Maritime	Pre-construction, construction
Threatened fauna habitat impact	**A delineated exclusion zone of 10 m would be established around retained hollow-bearing trees. No ancillary activities would be carried out within the exclusion zones.**	Construction contractor	Pre-construction, construction
Threatened fauna habitat impact	**Where hollow-bearing trees are to be removed, nest boxes would be used to mitigate habitat loss. A nest box strategy would be prepared in accordance with Guide 8 (Nest Boxes) of the Roads and Maritime Biodiversity Guidelines (2011).**	Construction contractor	Pre-construction

Impact	Environmental safeguards	Responsibility	Timing
Fauna injury	**Barbed wire on fencing adjacent to native vegetation would only be used where absolutely necessary. Where use of barbed wire is necessary, consideration would be given to making it more visible to flying and arboreal animals.**	Construction contractor Roads and Maritime	Pre-construction, construction
Aquatic impacts	**Exclusion zones (20 m) would be established around retained water bodies (including creeks and dams).**	RMS	Pre-construction, construction
Impacts on native vegetation	Exclusion zones detailed in ~~Figure 1 and Figure 2 of the Submissions Report~~ **Appendix B** are to be established and maintained throughout construction. Ensure that exclusion zones are fenced off and signage erected in accordance with the Roads and Maritime Biodiversity guidelines: Guide 2 – Exclusion Zones (RTA, 2011).	RMS	Pre-construction, construction
Impacts on native vegetation/ fauna habitat	~~There should be no clearing of any mature trees on construction ancillary sites.~~ **There should be no clearing of any mature trees at the McPherson Road and Warren Road ancillary sites. Clearing of mature trees on the Hue Hue Road ancillary site would be restricted to the area required to provide vehicle access from the service centre (0.03 ha).** **Clearing of mature trees on construction ancillary sites W8, W9 and E5 would be minimised. Where clearing is required pre-clearing and staged clearing procedures would be followed in accordance with Roads and Maritime Biodiversity Guidelines Guide 4: Clearing of vegetation and removal of bushrock.**	Construction contractor	Pre-construction, construction

Impact	Environmental safeguards	Responsibility	Timing
Threatened flora species impact	Locations confirmed to contain individuals of threatened flora species, including buffer zones up to 25 m from the individuals of *Tetratheca juncea* or *Grevillea parviflora* subsp. *parviflora* would be exclusion zones **except for the three locations where these buffer zones have been reduced to 5, 15 and 17 metres along the M1 Pacific Motorway road shoulder.** ~~Exclusion zones are detailed in Figure 1 and Figure 2 of the Submissions Report.~~ Exclusion zones are to be established prior to construction commencing and maintained throughout construction.	Construction contractor	Pre-construction, construction

6.9 Non-Aboriginal heritage

This Section provides a review of the potential non-Aboriginal heritage impacts associated with the proposed design amendments. This review is based on the assessment that was prepared for the original Project REF and the proposed design amendments as described in Section 3.

Table 6-36 identifies whether the design amendments have the potential to change the non-Aboriginal heritage impacts identified in the original Project REF. Where the design amendments do not generate the potential for changes to non-Aboriginal heritage impacts that design amendment is not discussed further below.

Table 6-36 Potential for changes to non-Aboriginal heritage impacts

#	Design amendment	Potential for changes in impacts?
1	New ancillary sites	Yes – The new ancillary construction sites would encompass areas not assessed by the original Project REF resulting in potential for changes in non-Aboriginal heritage impacts. An assessment of potential impacts has been carried out and is included below.
2	Doyalson Link Road bridge over M1 Pacific Motorway entry ramp	No – These design amendments are unlikely to result in changes to the non-Aboriginal heritage impacts identified in the original Project REF. No additional safeguards/management measures are considered necessary.
3	Widening Sparks Road overbridge	
4	Revised staging strategy and horizontal alignment	
5	Revised pavement type	No – The revised pavement type is unlikely to result in changes to the non-Aboriginal heritage impacts identified in the original Project REF. No additional safeguards/management measures are considered necessary.

#	Design amendment	Potential for changes in impacts?
6	Revised original Project boundary	Yes – The revised original Project boundary would encompass areas not assessed by the original Project REF and as a result there is potential for changes in non-Aboriginal heritage impacts. An assessment of potential impacts has been carried out and is included below.
7	Wyong River spill containment	No – These design amendments are unlikely to result in changes to the non-Aboriginal heritage impacts identified in the original Project REF. No additional safeguards/management measures are considered necessary.
8	Landscape area	
9	Warnervale Interchange lane/ramp reconfigurations	
10	Variable message signs (VMSs)	Yes – The VMSs and two directional signs would encompass areas not assessed by the original Project REF and as a result, there is potential for changes in non-Aboriginal heritage impacts. An assessment of potential impacts has been carried out and is included below. One directional sign is located within the original Project boundary assessed by the original Project REF as having no known non-Aboriginal heritage constraints and therefore works in that area have not been assessed further.
11	Directional signs	
12	Revised vertical alignment	No – The revised vertical alignment is unlikely to result in changes to the non-Aboriginal heritage impacts identified in the original Project REF as works would be entirely within the original Project boundary and within the road corridor. No additional safeguards/management measures are considered necessary.

6.9.1 Existing environment

No non-Aboriginal heritage constraints were identified within the original Project REF. The design amendments would impact some additional areas outside of those described in the original Project REF. These areas include the new ancillary sites (as described in Section 3.2.1), the revised original Project boundary (as described in Section 3.2.6), the VMSs (as described in Section 3.2.11) and the vehicle direction signs (as described in Section 3.2.12).

Database searches were conducted on 8 September 2015 to determine if any of the design amendments would impact non-Aboriginal heritage items. These searches included:

- EPBC Act Protected Matters Search with a 10 km radius centred on the site
- NSW State Heritage Register and State Heritage Inventory search or items within the Wyong LGA
- Wyong LEP 2013 heritage maps and Wyong LEP 1991 Heritage items.

The searches did not identify any non-Aboriginal heritage items within or in close proximity to the proposed design amendments.

Due to the distance the new ancillary sites and the vehicle direction signs are from the heritage items, they are unlikely to impact any items of non-Aboriginal heritage.

The revised original Project boundary does not change from the original Project REF boundary at the closest non-Aboriginal heritage items: Alison Homestead and Wyong Dairy Co-operative (former), and therefore would not impact these items of non-Aboriginal heritage.

6.9.2 Potential impacts

Construction and operation
Given no non-Aboriginal heritage constraints were identified in the additional areas to be directly or indirectly impacted by the design amendments, there is no change to the potential impacts identified in the original Project REF.

6.9.3 Safeguards and management measures

The non-Aboriginal heritage safeguards and management measures from the original Project REF and Submissions Report have been reviewed and would apply to the proposed design amendments. No additional safeguards and management measures for non-Aboriginal heritage are proposed beyond those identified in the original Project REF and Submissions Report.

6.10 Aboriginal heritage

This Section provides a review of the potential Aboriginal heritage impacts associated with the proposed design amendments. This review is based on the assessment that was prepared for the original Project REF and the proposed design amendments as described in Section 3.

Table 6-37 identifies whether the design amendments have the potential to change the Aboriginal heritage impacts identified in the original Project REF. Where the design amendments do not generate the potential for changes to Aboriginal heritage impacts that design amendment is not discussed further below.

Table 6-37 Potential for changes to Aboriginal heritage impacts

#	Design amendment	Potential for changes in impacts?
1	New ancillary sites	Yes – The new ancillary construction sites would encompass areas not assessed by the original Project REF and as a result there is the potential for changes in Aboriginal heritage impacts. An assessment of potential impacts has been carried out and is included below.

#	Design amendment	Potential for changes in impacts?
2	Doyalson Link Road bridge over M1 Pacific Motorway entry ramp	No – The design amendments are unlikely to result in changes to the Aboriginal heritage impacts identified in the original Project REF as they are contained within the original Project boundary where there are no known Aboriginal heritage constraints. No additional safeguards/management measures are considered necessary.
3	Widening Sparks Road overbridge	
4	Revised staging strategy and horizontal alignment	
5	Revised pavement type	
6	Revised original Project boundary	Yes – The revised original Project boundary would encompass areas not assessed by the original Project REF and as a result there is the potential for changes in Aboriginal heritage impacts. An assessment of potential impacts has been carried out and is included below.
7	Wyong River spill containment	No – These design amendments are unlikely to result in changes to the Aboriginal heritage impacts identified in the original Project REF as they are contained within the original Project boundary where there are no known Aboriginal heritage constraints. No additional safeguards/management measures are considered necessary.
8	Landscape area	
9	Warnervale Interchange lane/ramp reconfigurations	
10	Variable message signs (VMSs)	Yes – The signs would be installed in area not assessed by the original Project REF and as a result there is the potential for changes in Aboriginal heritage impacts. An assessment of potential impacts has been carried out and is included below.
11	Directional signs	
12	Revised vertical alignment	No – The revised vertical alignment is unlikely to result in changes to the Aboriginal heritage impacts identified in the original Project REF as the amendment is contained within the original Project boundary where there are no known Aboriginal heritage constraints. No additional safeguards/management measures are considered necessary.

6.10.1 Existing environment

No Aboriginal heritage constraints were identified within the original Project boundary in the original Project REF. The design amendments would impact some additional areas outside of those assessed in the original Project REF. The additional areas include the ancillary sites, the areas incorporated as a result of the revised original Project boundary and the areas to be impacted by the variable message signs and the directional signs.

An extensive search of the Aboriginal Heritage Information Management System (AHIMS) was carried out on 9 July 2015 to identify constraints in these additional areas. The search identified 43 Aboriginal sites or objects within three kilometres of the Proposal however none of these are located in areas which would be impacted by the Proposal (see Figure 6-12).

Further searches were carried out to determine if any known Aboriginal heritage sites are located in proximity to the site. Databases searched include:

- EPBC Act Protected Matters Search with a 10 km radius centred on the site
- NSW State Heritage Register (SHR) and State Heritage Inventory (SHI) search for items within the Wyong LGA
- National Native Title Register within the Wyong LGA.

All search results did not identify any Aboriginal heritage sites in proximity to the site.

In addition to the AHIMS search, a site visit and Stage 1 PACHCI assessment were carried out by Roads and Maritime's Aboriginal Cultural Heritage Advisor (Hunter Region) to determine any potential additional impacts resulting from the Proposal (see Appendix D). The assessment concluded that the Proposal is unlikely to impact any known Aboriginal heritage objects or places. The conclusion of this assessment was:

- The activities of the Project are unlikely to harm known Aboriginal objects or places
- The AHIMS search did not indicate moderate to high concentrations of 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 Office of Environment and Heritage's Due Diligence Code of Practice for the Protection of Aboriginal objects in NSW and the Roads and Maritime Service's procedure
- The cultural heritage potential for the study area appears to be reduced due to past disturbance
- There is an absence of sandstone rock outcrops likely to contain Aboriginal art.

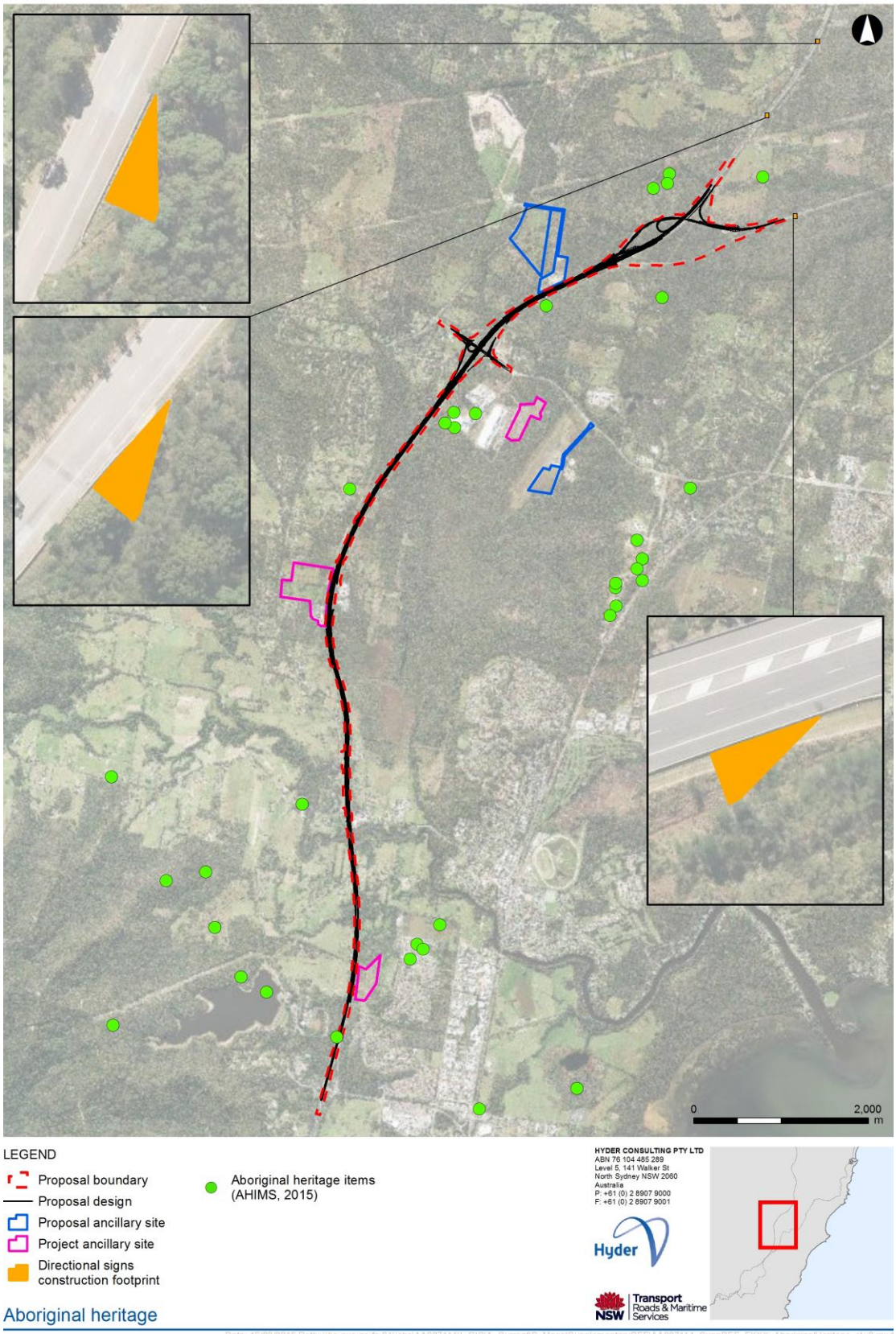


Figure 6-12 Aboriginal heritage items and design amendments outside of those assessed in the original Project REF

6.10.2 Potential impacts

Construction

Given no Aboriginal heritage constraints were identified in the additional areas to be impacted by the design amendments there is no change to the potential impacts identified in the original Project REF. The potential impacts identified in the original Project REF, which remain relevant to the design amendments, are restricted to potential unexpected finds.

Operation

Operation of the Proposal would not impact Aboriginal heritage.

6.10.3 Safeguards and management measures

The Aboriginal heritage safeguards and management measures from the original Project REF and Submissions Report have been reviewed and would apply to the proposed design amendments. No additional safeguards and management measures for Aboriginal heritage are proposed beyond those identified in the original Project REF and Submissions Report.

6.11 Air quality

This Section provides a review of the potential air quality impacts associated with the proposed design amendments. This review is based on the assessment that was prepared for the original Project REF and the proposed design amendments as described in Section 3.

Table 6-38 identifies whether the proposed design amendments have the potential to change the air quality impacts identified in the original Project REF. Where the proposed design amendments do not generate the potential for changes to air quality impacts that design amendment is not discussed further below.

Table 6-38 Potential for changes to air quality impacts

#	Design amendment	Potential for change in impacts?
1	New ancillary sites	Yes – The activities on the new ancillary sites have the potential to cause air quality impacts and are discussed further below.
2	Doyalson Link Road bridge over M1 Pacific Motorway entry ramp	No – While these design amendments would collectively increase the construction footprint of the original Project and therefore have the potential for additional wind erosion and dust generation, this increase would not be significant when compared to the overall original Project construction footprint. There is unlikely to be a change in potential air quality impacts as a result of these design amendments. The air quality safeguards and management measures from the original Project REF and Submissions Report would continue to apply and no additional measures are considered necessary.
3	Widening Sparks Road overbridge	
4	Revised staging strategy and horizontal alignment	
5	Revised pavement type	
6	Revised original Project boundary	
7	Wyong River spill containment	
8	Landscape area	
9	Warnervale Interchange lane/ramp reconfigurations	

#	Design amendment	Potential for change in impacts?
10	Variable message signs (VMSs)	
11	Directional signs	
12	Revised vertical alignment	

6.11.1 Existing environment

The existing environment was described in Section 6 of the original Project REF. This was reviewed and is still relevant to the proposed design amendments.

The location of the three new ancillary sites are shown on Figure 1-1. There are three sensitive receivers (residential properties) to the north-northeast of ancillary site W9. These sensitive receivers are within 100 m of ancillary site W9. There are also two sensitive receivers around 130 m to the south of ancillary site W8 across the existing M1 Pacific Motorway.

6.11.2 Potential impacts

Construction

The use of the three additional ancillary sites, as discussed in Section 3.2.1, would include concrete re-processing and batching plants and an asphalt batching plant. These facilities have the potential to create air quality issues (dust and odour) for nearby sensitive receivers. These impacts would be mitigated through provision of a 300 m buffer zone between the location of these particular facilities on ancillary sites (W8 and W9) and any nearby sensitive receivers and the implementation of air quality controls at the plants themselves. In addition, standard air quality management measures would be adopted during the construction period to minimise potential impacts, as discussed in Section 6.11.3.

Stockpiling of soils at the ancillary sites has the potential to cause dust and affect neighbouring sensitive receivers. Dust management measures would be adopted to minimise these impacts as discussed below.

Provided appropriate safeguards detailed in the original Project REF are implemented it is expected that the potential impacts on local air quality and nearby sensitive receivers for the duration of construction would be manageable and therefore construction is unlikely to have a significant impact on local air quality.

Operation

The operational air quality impacts identified in the original Project REF have been reviewed and are relevant to the proposed design amendments. No additional operational air quality impacts have been identified.

6.11.3 Safeguards and management measures

The air quality safeguards and management measures from the original Project REF and Submissions Report have been reviewed and would apply to the proposed design amendments. Additional safeguards and management measures for air quality beyond those identified in these documents are outlined in Table 6-39 and are shown in **bold red text**.

Table 6-39 Additional air quality safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Impacts on local air quality during construction	Prepare an Air Quality Management Plan (AQMP) as part of the CEMP. This Plan must show the locations of all potentially affected properties and residences on a map and provide details of air quality control measures to be undertaken during construction, including: • Air quality**, odour** and dust management objectives consistent with DECCW guidelines • Potential sources and impacts of **odour and** dust, identifying all sensitive receptors • An environmental risk assessment to address potential impacts and mitigation measures to minimise air quality impacts to sensitive receivers and to the environment • Mitigation measures to be implemented, including measures during weather conditions where high dust episodes are likely (such as strong winds in dry weather) • A monitoring program to assess compliance with the identified objectives • A progressive stabilisation/rehabilitation strategy for disturbed surfaces with the aim of minimising exposed surfaces • Contingency plans to be implemented in the event of non-compliances and/or complaints about dust • The concrete re-processing plants and asphalt batching plants would be located a minimum of 300 m from the nearest sensitive receiver • Procedures for regularly reviewing the effectiveness of the AQMP.	Construction contractor	Pre-Construction

6.12 Resources and waste management

This section provides a review of the potential resource and waste management impacts associated with the proposed design amendments. This review is based on the assessment that was prepared for the Project REF and the proposed design amendments as described in Section 3.

Table 6-40 identifies whether the design amendments have the potential to change the resource and waste management impacts identified in the original Project REF.

Where the design amendments do not have the potential for changes to resource and waste management impacts that design amendment is not discussed any further below.

Table 6-40 Potential for changes to resource and waste management impacts

#	Design amendment	Potential for changes in impacts?
1	New ancillary sites	No - The new ancillary sites would not result in the consumption of any new resources or the generation of any new waste streams and, as such, are unlikely to result in changes to the impacts identified in the Project REF. No additional safeguards/management measures are considered necessary.
2	Doyalson Link Road bridge over M1 Pacific Motorway entry ramp	Yes – These design amendments have the potential to alter the waste and resource management impacts and are discussed further below.
3	Widening Sparks Road overbridge	
4	Revised staging strategy and horizontal alignment	
5	Revised pavement type	No. The revised Project boundary accommodates other design and constructability changes and would not change the resource and waste management impacts as described in the original Project REF. No additional safeguards/management measures are considered necessary.
6	Revised original Project boundary	Yes – These design amendments have the potential to alter the waste and resource management impacts and are discussed further below.
7	Wyong River spill containment	
8	Landscape area	
9	Warnervale Interchange lane/ramp reconfigurations	
10	Variable message signs (VMSs)	
11	Directional signs	

6.12.1 Policy Settings

The existing environment was described in Section 6 of the Project REF. This was reviewed and a number of changes to the policy setting have occurred since the Project REF.

The Project REF referenced the NSW Waste Avoidance and Resource Recovery Strategy 2007 which has since been updated. The updated NSW Waste Avoidance and Resource Recovery Strategy 2014-21 (WARR Strategy 2014-21) aims to maximise conservation of natural resources and to minimise environmental harm from waste management and disposal of solid waste.

The updates to the WARR Strategy 2014-21 include additional resource recovery goals and diversion targets. The goals are:

- Avoid and reduce waste generation
- Increase recycling
- Divert more waste from landfill
- Manage problem wastes better
- Reduce litter
- Reduce illegal dumping.

Targets for each of these key areas are specified in the WARR Strategy 2014-21. Since determination of the Project REF, the resource recovery target for construction and demolition waste has increased from 70 per cent to 80 per cent.

6.12.2 Potential impacts

Construction

Collectively, the design amendments identified in Table 6-40 above are expected to result in changes to the resource consumption and waste generation impacts identified in the original Project REF.

The original Project REF identified a deficit of around 20,000 m³ of site won materials therefore requiring importation of fill for general earthworks. The volume of site won/imported materials excavated/stored would vary depending on construction staging. The design amendments are expected to result in about 15,000 m³ of surplus site won material. This volume would change if the Doyalson Interchange North Facing Ramps (southbound exit and northbound entry ramps) (DINFR) are constructed in a separate stage after completion of the works along the mainline. This is because the mainline works require imported fill material and DINFR results in excess material being generated. If constructed separately, about 35,000 m³ of imported materials would be required for construction of the mainline and there would be an excess of about 50,000 m³ of site won material from works at DINFR. The volumes of other pavement materials required for the Project have not significantly changed as a result of the design amendments.

Any excess of spoil (VENM, ENM and suitable topsoil would be reused on site in designated landscape area This would reduce the overall volume of waste required for removal, transportation and re-use offsite. VENM and ENM would be managed in accordance with the relevant policy and legislative requirements as discussed in Section 4 and Section 6.12.1.

The revised staging strategy, which results in narrowing of the medians, would increase the quantity of materials consumed as part of the Proposal due to the need for additional permanent pavement to be constructed in the existing median. The increase is likely to be marginal and would not significantly alter the waste and resource management impacts identified in the original Project REF.

Operation

The proposed design amendments would not alter the operational resource and waste management impacts identified in the original Project REF.

6.12.3 Safeguards and management measures

The resource and waste management safeguards and management measures from the original Project REF and Submissions Report have been reviewed and are considered to be relevant for the Proposal. Additional safeguards and management measures for resource and waste management are included below in Table 6-41. Amendments to measures from the original Project REF and Submissions Report are shown in bold red text.

Table 6-41 Additional resource and waste management safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Materials management	The SWMP and Materials Management Plan should contain as a minimum the following elements: • **Restrictions on the materials to be placed in the landscape area (i.e. only VENM, ENM and appropriate topsoil).**	Construction contractor	Pre-construction
Construction waste	**Ensure VENM reused onsite complies with NSW EPA requirements outlined in the VENM Certificate available on the NSW EPA Website (NSW EPA 2015).**	Construction contractor	Pre-construction
Construction waste	**Ensure ENM is reused and managed in accordance with the Excavated Natural Material Order 2014 and Excavated Natural Material Exemption 2014 (NSW EPA 2014).**	Construction contractor	Pre-construction
Construction waste	**Excess materials may be reused on other nearby construction and development projects only where appropriate approvals are in place to receive such materials.**	Construction contractor	Pre-construction

6.13 Climate change

This Section provides a review of the potential climate change impacts associated with the proposed design amendments. This review is based on the assessment that was prepared for the original Project REF and the proposed design amendments as described in Section 3.

Table 6-42 identifies whether the design amendments have the potential to change the climate change impacts identified in the original Project REF. Where the design amendments do not generate the potential for changes to climate change impacts that design amendment is not discussed further below.

Table 6-42 Potential for changes to climate change impacts

#	Design amendment	Potential for changes in impacts?
1	New ancillary sites	No – Climate change impacts would not change as a result of the design amendments. The Proposal would not be directly impacted by sea level changes as the proposed design amendments are not in a coastal location. Long-term impacts such as variations in rainfall and temperatures and associated impacts would still apply to the proposed design amendments (refer to Section 6.13.2 of the original Project REF). The potential of the Proposal to impact on climate change would not significantly differ from those stated in the original Project REF as sources of Greenhouse Gas (GHG) emissions from construction and operation activities would not significantly change as a result of the design amendments. No additional safeguards/management measures are considered necessary.
2	Doyalson Link Road bridge over M1 Pacific Motorway entry ramp	
3	Widening Sparks Road overbridge	
4	Revised staging strategy and horizontal alignment	
5	Revised pavement type	
6	Revised original Project boundary	
7	Wyong River spill containment	
8	Landscape area	
9	Warnervale Interchange lane/ramp reconfigurations	
10	Variable message signs (VMSs)	
11	Directional signs	
12	Revised vertical alignment	

The policy setting and the construction and operational impacts of climate change were described in the original Project REF (refer to Section 6.13.1 and 6.13.2 of the original Project REF). These have been reviewed and are still relevant to the proposed design amendments. Safeguards and management measures outlined in the original Project REF and Submission Report have also been reviewed and would apply to the proposed design amendments. No additional safeguards or management measures are considered necessary.

6.14 Cumulative impacts

Cumulative impacts have the potential to arise from the interaction of individual elements within the Proposal and the additive effects of other external projects. Roads and Maritime is required under Clause 228(2) of the EP&A Regulation to take into account potential cumulative impacts as a result of the Proposal.

This Section provides a review of the potential cumulative impacts associated with the proposed design amendments. This review is based on the assessment that was prepared for the original Project REF and the proposed design amendments as described in Section 3.

Table 6-43 identifies whether the proposed design amendments have the potential to change the cumulative impacts identified in the original Project REF. Where the proposed design amendments do not generate the potential for changes to cumulative impacts that design amendment is not discussed further below.

Table 6-43 Potential for changes to cumulative impacts

#	Design amendment	Potential for changes in impacts?
1	New ancillary sites	Yes – Two of the proposed additional ancillary sites (sites W8 and W9) would be located in land designated for the Warnervale Industrial Park. The Proposal has the potential to result in cumulative impacts should construction of the Warner Industrial Park commence during construction of the Proposal. Similarly, there is the potential for cumulative impacts to occur should the Proposal and the Warnervale Industrial Park proceed sequentially.
2	Doyalson Link Road bridge over M1 Pacific Motorway entry ramp	No – Cumulative impacts identified in the original Project REF would not change as a result of these design amendments. No additional safeguards/management measures are considered necessary.
3	Widening Sparks Road overbridge	
4	Revised staging strategy and horizontal alignment	
5	Revised pavement type	
6	Revised original Project boundary	
7	Wyong River spill containment	
8	Landscape area	
9	Warnervale Interchange lane/ramp reconfigurations	
10	Variable message signs (VMSs)	
11	Directional signs	
12	Revised vertical alignment	

6.14.1 Potential impacts

Construction

Two of the proposed additional ancillary sites (sites W8 and W9) would be located in land designated for the Warner Industrial Park. The Proposal has the potential to result in cumulative impacts should construction of the Warner Industrial Park commence on adjacent lots during construction of the Proposal. Potential cumulative impacts may include traffic, noise and air quality impacts. There is also the potential for cumulative impacts if the two projects occur sequentially, thereby prolonging the period of construction works occurring on the ancillary sites.

Consultation has been carried out with the owners of sites W8 and W9 and representatives of the Warner Industrial Park regarding the proposed use of sites W8 and W9. Consultation would continue throughout construction of the Proposal to share relevant information and develop strategies to minimise cumulative impacts, if required.

Provided appropriate safeguards detailed in the original Project REF, Submissions Report and Section 6.14.2 are implemented, the impact of potential cumulative impacts is unlikely to be significant.

Operation

The operational impacts have been reviewed and are still relevant to the proposed design amendments. No additional cumulative impacts are expected during operation as a result of the Proposal.

6.14.2 Safeguards and management measures

The cumulative impact safeguards and management measures from the original Project REF and Submissions Report have been reviewed and would apply to the proposed design amendments. Additional safeguards and management measures for cumulative impacts beyond those identified in these documents are outlined in **bold red text** in Table 6-44.

Table 6-44 Additional cumulative impact safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing
Cumulative impacts	**Roads and Maritime would carry out ongoing consultation with owners of all ancillary sites and representatives of adjacent developments to minimise the potential cumulative impacts where possible.**	Roads and Maritime	Pre-construction Construction

7 Environmental management

This Section describes how the Proposal would be managed to reduce potential environmental impacts throughout detailed design, construction and operation. A framework for managing the potential impacts is provided with reference to environmental management plans and relevant Roads and Maritime Services QA specifications. A summary of site-specific environmental safeguards is provided including the safeguards from the original Project REF, Submissions Report and any additional safeguards and management measures as detailed in Section 6. The licence and/or approval requirements required prior to construction are also listed.

7.1 Environmental management plans (or system)

The environmental management plans (EMPs) identified in the original Project REF remain relevant to the Proposal. The proposed EMPs are discussed again below for information.

A number of safeguards and management measures have been identified in order to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the Proposal. Should the Proposal proceed, these management measures would be incorporated into the detailed design and applied during construction and operation of the Proposal.

A CEMP would be prepared to describe safeguards and management measures identified. These plans would provide a framework for establishing how these measures would be implemented and who would be responsible for their implementation.

The plans would be prepared prior to construction of the Proposal and must be reviewed and certified by the Roads and Maritime Services Environmental Officer, Hunter Region, prior to the commencement of any onsite works. The CEMP would be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The EMPs would be developed in accordance with the specifications set out in: QA Specification G36 – Environmental Protection (Management System), QA Specification G38 – Soil and Water Management (Soil and Water Plan) and the QA Specification G40 – Clearing and Grubbing.

7.2 Summary of safeguards and management measures

Environmental safeguards outlined in this document would be implemented when undertaking the Proposal, should it proceed. These safeguards would minimise any potential adverse impacts arising from the proposed works on the surrounding environment. The safeguards and management measures are summarised in Table 7-1 and include those proposed in the original Project REF and the Submissions Report (as revised) as well as any additional measures or changes to measures proposed in this Supplementary REF. New measures are shown in **bold red text** and deletions are shown in ~~strike through text~~.

Table 7-1 Summary of site specific environmental safeguards

No.	Impact	Safeguard	Responsibility	Timing
1	General	All environmental safeguards must be incorporated within the following documents: • Project Environmental Management Plan • Detailed design stage • Contract specifications for the proposal • Contractor's Environmental Management Plan.	Project manager	Pre-construction
2	General	• A risk assessment must be carried out on the Proposal in accordance with the Roads and Maritime Services Audit Pack and OSD risk assessment procedures to determine an audit and inspection program for the works. The recommendations of the risk assessment are to be implemented • A review of the risk assessment must be undertaken after the initial audit or inspection to evaluate is the level of risk chosen for the project is appropriate • 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.	Project manager and regional environmental staff	Pre-construction After first audit
3	General	• The environmental contract specification G36, G38 and G40 must be forwarded to the Roads and Maritime Services Lead Environmental Officer for review at least 10 working days prior to the tender stage • A contractual hold point must be maintained until the CEMP is reviewed by the Roads and Maritime Services Senior Environmental Officer.	Project manager	Pre-construction
4	General	The Roads and Maritime Services Project Manager must notify the Roads and Maritime Services Environmental Officer Hunter Region at least 5 days prior to work commencing.	Project manager	Pre-construction
5	General	All businesses and residences likely to be affected by the proposed works	Project	Pre-construction

		must be notified at least 5 working days prior to the commencement of the proposed activities.	manager	
6	General	Environmental awareness training must be provided, by the contractor, to all field personnel and subcontractors.	Contractor	Pre-construction and during construction as required
7	Impacts on traffic during construction	Prepare and implement a detailed traffic management plan (TMP) as part of the Construction Environmental Management Plan (CEMP). The TMP is to include appropriate guidelines and procedures required to ensure the continuous, safe and efficient movement of construction and non-construction traffic in and around the project area. The TMP would be submitted in stages to reflect the progress of the work and would detail: • Signage requirements • Lane possession and approval process during periods of online construction • Measures to minimise disruption and inconvenience to road users during the construction period • Traffic control devices such as temporary signals • A local and regional communications strategy • Measures to provide adequate warning, information and guidance for road users during the construction period • Appropriate construction speed limits to be implemented in consultation with Roads and Maritime to facilitate safety of road users and construction personnel • Specific traffic management plans to address night works safety for motorists and for construction personnel • Temporary accesses, ancillary site entrances and exits and other traffic management measures to be designed in accordance with relevant road safety and Roads and Maritime requirements • Temporary accesses, ancillary site entrances and exits and other	Construction contractor	Pre-construction and construction

		traffic management measures that do not impact upon the safety of the users of the existing road network • Safe pedestrian access for the public along Sparks Road during construction • Temporary parking for use by construction staff at a construction compound • Access to all properties including the motorway service centres to be maintained throughout the construction • ~~Make provision for emergency services vehicles to pass through construction zones and u~~**U**pdate the local emergency services on the staging and progress of works that would affect their movement • **Key safety issues that may arise due to heavy vehicle manoeuvres at major and minor road intersections.**		
8	Damage to roads from construction traffic	• Dilapidation surveys of roads around the proposal area should be undertaken prior to their use for construction and after construction is complete • Any damage to roads as a result of the construction traffic should be repaired.	Construction contractor	Construction
9	Impacts to cyclists during construction	• Cyclist groups would be consulted prior to the commencement of construction and advised to use alternative sections of the M1 Pacific Motorway or alternative routes during the construction period • Appropriate signage and way finding provisions would be implemented for cyclist detours.	Construction contractor	Construction
10	Impacts on river traffic during construction	• **The maritime section of Roads and Maritime would be consulted regarding reduced clearance under the Wyong River bridge. Consultation would include discussion of appropriate safeguards which may include:** • **Installation of signage up and downstream of the Wyong River bridge to warn river traffic of reduced clearance prior to installation of structures under the bridge**	Construction contractor	Construction

		• **The clearance under the Wyong River bridge would be returned to the existing level following installation of the scupper piping.**		
11	Provision of incident management during construction	The contractor would consult with Roads and Maritime Traffic Commanders, Traffic Emergency Patrols (TEP) and the Transport Management Centre (TMC) to plan the construction to allow for appropriate incident response plans to be implemented.	Construction contractor	Construction
12	Impacts to traffic during operation	Access arrangements for properties located along Sparks Road will be designed in consultation with the property owners.	Roads and Maritime	Detailed design
~~13~~[5]	~~Noise impacts resulting from design elements~~	• ~~An assessment of feasible and reasonable noise mitigation measures for operation of the proposal is to be undertaken during detailed design in accordance with the Roads and Maritime Environmental Noise Management Manual Practice Note 4~~ • ~~The detailed design should consider pavement treatments such as longitudinal tining or low noise diamond grinding to reduce operational road noise.~~	~~Roads and Maritime Detailed design~~	~~Pre-construction~~
14	Noise impacts resulting from construction activities	Appropriate mitigation and management measures are to be used to minimise construction noise and vibration at noise sensitive receivers as described in the approved construction noise and vibration management plan (CNVMP).	Construction contractor	Construction
15	Noise impacts resulting from construction activities	• Prepare and implement a CNVMP that identifies reasonable and feasible approaches to reduce noise impacts during construction including for ancillary facilities • Undertake at-receiver noise mitigations that are planned to manage operational noise at the commencement of construction	Construction contractor	Construction

[5] These mitigation measures have been completed during detailed design as documented above and in Appendix A.

		• Inform the community at least 48 hours before any out of hours work is to be undertaken and provide the following information:
		  • Programmed times and locations of construction work
		  • Construction noise and vibration impact predictions
		  • Construction noise and vibration mitigation measures being implemented on site
		• Provide specific details of all out of hours work to the EPA
		• Implement a notification and consultation procedure to identify when noise impacts during extended hours and out of hours work are above relevant criteria and enable appropriate management measures to be developed
		• Implement a phone line and complaints handling procedure for noise and other construction related complaints
		• Include specific noise mitigation measures in the CNVMP including:
		  • Noise intensive construction works would be carried out during standard construction hours wherever practicable
		  • Noisy activities that cannot be undertaken during standard construction hours would be scheduled as early as possible during the evening and/or night-time periods
		  • Appropriate plant would be selected for each task, to minimise the noise impact
		  • Deliveries would be carried out during standard construction hours where practical and safe to do so
		  • Non-tonal reversing alarms would be fitted on all construction equipment where possible
		  • If it is safe, night-time activities would be planned and conducted in such a manner as to eliminate or minimise the need for audible warning alarms
		  • The offset distance between noisy plant items and nearby residential receivers would be maximised
		  • Noisy equipment would be oriented away from residential receivers.
		  • Site access points, ancillary site accesses and ancillary facilities		

		would be positioned as far as practicable away from residential receivers • Plan the internal layout and operation of construction ancillary facilities to maximise the separation distance between sensitive receivers and noisy onsite activities • The use of Structures or enclosures will be investigated during detailed design and would be used to shield residential receivers from noise sources where considered practicable and effective • Trucks would travel via internal haul routes and major roads and routes where practicable and would not be allowed to queue near residential dwellings • Respite periods would be considered during times of noise intensive works where sensitive receivers would be adversely impacted for extended periods. These could include late start and/or early finishes • Wherever practicable, noise intensive works would be scheduled/programmed in the following order of priority to minimise the potential impacts on sensitive receivers: 1. Standard working hours 2. Extended working hours 3. Night time working hours		
16	Construction vibration	• Prepare and implement a CNVMP that identifies reasonable and feasible approaches to reduce vibration impacts during construction including for ancillary facilities • Include specific vibration mitigation measures in the CNVMP including: • Vibration intensive works would not occur outside the safe working distances outlined in Table 6-18 unless necessary • If vibration intensive works would be required outside the safe working distances outlined in Table 6-18, alternative equipment would be used to ensure these distances are not exceeded.	Construction contractor	Construction
17	Exceedance of RNP where the predicted level	The suitability of architectural treatment of sensitive receivers would be considered on a case by case basis by Roads and Maritime, and	Roads and Maritime	Operation

	is acute or more than two db(A) higher than under the 'no build' option	negotiated with property owners.		
18	**Construction noise**	• **Construction noise, including from ancillary sites, will be managed to comply with the requirements of any EPL applicable to the project.**	**Construction contractor**	**Construction**
19	**Noise impacts from ancillary site W9**	• **Noise from ancillary site W9 would be managed in line with the requirements of the RNP, ENMM and ICNG and may include where feasible and reasonable:** • **Design of site layout to minimise noise levels at sensitive receivers. As the concrete reprocessing plant is the noisiest activity, it could be located further from the residences than other activities** • **Design of the site to take advantage of any shielding provided by natural landforms or construction earthworks** • **Design of the site layout to take advantage of any 'self-shielding' provided by the equipment. For example, the concrete reprocessing plant could provide acoustic shielding for the asphalt batching plant, or vice versa** • **Noise monitoring at the residences, at the commencement of activities, to inform the noise management process and the need for structures or enclosures to further reduce noise levels.**	**Roads and Maritime**	**Construction**
20	Stockpiling or material storage may reduce flood storage areas and/or affect flow paths	• All stockpile locations and construction ancillary sites should be located above the 100 year ARI flood level **where possible** • **Where 1 in 100 year ARI flood levels extend partially onto the construction ancillary sites, activities would be excluded from these areas where possible** • **The entrance to ancillary site E5 would be designed to accommodate safe access/egress in the event of a flood and to**	Construction contractor	Construction

		avoid impeding flood flows. The SWMP should contain as a minimum the following **additional** elements: • **Consideration of appropriate measures to ensure that the altered drainage arrangements at Site W9 do not result in erosion, sedimentation or localised pooling of water** • **A 1 in 100 year ARI Flood Management Plan to provide adequate management of all areas impacted by 1 in 100 year ARI flood events.**		
21	Earthworks may affect flow paths	All piped and channelised water should be directed to existing points of discharge.	Construction contractor	Construction
22	Increased flow rates and velocities may affect downstream environments	• The design will incorporate measures such as energy dissipation measures, scour protection and other design features to control flow intensity and direction of flow • Erosion and sediment control measures will be implemented. These will include scour protection and water quality basins.	Design Team Construction contractor	Detailed design Construction
23	Impacts on water availability	• **Where possible, the Proposal would use water that is fit for purpose (i.e. use of non-potable water where appropriate)** • **If surface water extraction is required, a water use approval may be required under Section 89 of the WMA** • **If groundwater extraction is required, an aquifer interference approval may be required under Section 91F of the WMA** • **Consultation would be carried out with WSC should a connection to the town water supply be required.**	Roads and Maritime Construction contractor	Pre-construction and/or construction.
24	Hydrology impacts	• **Drainage arrangements would be maintained or improved in the vicinity of the landscape area to avoid adverse hydrological impacts.**	Construction contractor	Construction

25	Groundwater	Any potential for changes in the groundwater table and any resulting impacts will be reviewed in response to any design refinements. Where necessary, measures to manage the changes will be designed and implemented during construction and operation.	Design team Construction contractor	Detailed design Construction
26	Groundwater	• **The size, depth and timeframe for installation of the Wyong River spill containment basin would be minimised where possible to reduce the potential for groundwater seepage and associated pump out. Any offsite discharge of water from the excavation would comply with Section 120 of the POEO Act (or any applicable EPL conditions issued to the Project).**	Construction contractor	Construction
27	Erosion and sedimentation	A Construction Environmental Management Plan (CEMP) and associated sub-plans would be prepared for all construction and maintenance activities associated with the proposal. The CEMP should be prepared in accordance with Roads and Maritime guidelines and specification, including, but not limited to G38, G39 and G40. The CEMP would be supported by a Soil and Water Management Plan (SWMP).	Construction contractor	Pre-construction
28	Erosion and sedimentation	A qualified soil conservationist should develop the construction phase soil and water management strategy in accordance with the principles and practises detailed in Managing Urban Stormwater: Soils and Construction (Landcom, 2004) and in consultation with relevant government agencies and Council. The soil and water management strategy should be documented within the SWMP.	Construction contractor	Pre-construction
29	Erosion and sedimentation **/ affect flow paths**	The SWMP should contain as a minimum the following elements: • Consideration of appropriate erosion and sediment control during staging of the main widening and replacement construction works • Consideration of appropriate erosion and sediment controls at ancillary sites with particular consideration of sediment basins at batch plant sites or where significant material processing or stockpiling will occur • Measures to develop, maintain, monitor and improve progressive, site specific Erosion and Sedimentation Control Plans (ESCPs)	Construction contractor	Pre-construction

		• Identification of site conditions or construction activities that could potentially result in erosion and associated sediment runoff • Methods to minimise potential adverse impacts of construction activities on the water quality within surrounding waterways • Details of specific measures to protect sensitive areas including SEPP14 wetlands, drinking water catchments and sensitive vegetation (EECs) • Details of measures to minimise any adverse impacts of sedimentation on the surrounding environment • Details of measures to minimise soil erosion caused by all construction works including clearing, grubbing and earthworks • Details of measures to make site personnel aware of the requirements of the SWMP by providing information within induction, toolbox and training sessions • Details of the roles and responsibilities of personnel responsible for implementing the SWMP • Details of measures for the inspection and maintenance of construction phase water treatment devices and structures • **Requirements to manage runoff from concrete re-processing and asphalt batching activities to ensure it complies with Section 120 of the POEO Act (or any applicable EPL conditions issued to the Proposal) prior to discharge from the site.** • **Consideration of appropriate measures to ensure that the altered drainage arrangements at Site W9 do not result in erosion, sedimentation or localised pooling of water** • **Restrictions on the materials to be placed in the landscape area (i.e. only VENM, ENM and appropriate topsoil).**		
30	Erosion and sedimentation	Soil and water management measures in the ESCP are to be consistent with the principles and practises detailed in Landcom's (2004) Managing Urban Stormwater: Soils and Construction.	Construction contractor	Pre-construction

31	Erosion and sedimentation	The proposal (including ancillary sites) may require sediment control basins. Temporary basins are to be sized accordingly to the area of land being disturbed and activities being conducted at each site. Sediment basins are to be considered at concrete batch plant sites and or where significant material stockpiling or processing occurs.	Construction contractor	Construction
32	Disturbance to asbestos containing materials	An Asbestos Management Plan is to be developed in accordance with the Roads and Maritime Services Asbestos Management Plan (2013).	Construction contractor	Construction
33	Disturbance to asbestos containing materials	If previously unidentified asbestos contamination is discovered during construction, work in the affected area must cease immediately, and an investigation must be undertaken and report prepared to determine the nature, extent and degree of the asbestos contamination. The level of reporting must be appropriate for the identified contamination in accordance with the relevant EPA and workcover Guidelines and include the proposed methodology for the remediation of the asbestos contamination. Remediation activities must not take place until receipt of the investigation report by occupational health professional. Works may only recommence upon receipt of a validation report from a suitably qualified contamination specialist that the remediation activities have been undertaken in accordance with the investigation report and remediation methodology.	Construction contractor	Construction
34	Disturbance of contaminated material	A Contaminated Land Management Plan is to be prepared for construction areas identified as contaminated land or any land contamination caused by the proposal.	Construction contractor	Construction
35	Disturbance of contaminated material	The Contaminated Land Management Plan is to detail procedures to: • Include measures to identify and manage acid sulphate soils • Protect the environment by implementing control measures to divert surface runoff away from the contaminated land • Capture and manage any surface runoff contaminated by exposure to	Construction contractor	Construction

		the contaminated land • Investigate the contamination to determine the concentration and type of contaminants and the extent of contamination • Assess the requirement to notify relevant authorities, including the EPA • Manage the remediation and subsequent validation of the contaminated land, including any certification required.		
36	Disturbance of contaminated material	Each of the ancillary sites proposed, requires a preliminary environmental survey to be undertaken prior to Roads and Maritime occupying the site. The presence of fill (and potential contamination) would be determined by undertaking site inspections.	Construction contractor	Construction
37	Disturbance of contaminated material	Additional assessment is to be undertaken for soils requiring offsite disposal to ensure the correct waste classification is determined. Excavated material that is not suitable for onsite re-use or recycling, such as contaminated material should be transported to a site that may legally accept that material for re-use or disposal.	Construction contractor	Construction
38	Disturbance of contaminated material	If previously unidentified contamination is discovered or suspected during construction, work in the affected area must cease immediately, and an investigation must be undertaken and report prepared to determine the nature, extent and degree of any contamination. The level of reporting must be appropriate for the identified contamination in accordance with OEH Guidelines for Consultants Reporting on Contaminated Sites (2011).	Construction contractor	Construction
39	Accidental spills during construction	• Vehicles and machinery should be properly maintained to minimise the risk of fuel/oil leaks. Routine inspections of all construction vehicles and equipment should be undertaken for evidence of fuel/oil leaks • No stockpiles of materials or storage of fuels or chemicals would be located within the 100 year ARI flood zone.	Construction contractor	Construction
40	Impacts to water quality from accidental	• **An operational spill response plan would be prepared to guide the effective management of the spill containment structure at the Wyong River bridge.**	Roads and Maritime	Pre-operation

	spills			
41	Impacts from acid sulfate soil exposure	• **An Acid Sulfate Soil Management Plan would be developed for works proposed in acid sulfate soil risk areas.**	Contractor	Pre-construction and construction
42	Accidental spills during construction	• All fuels, chemicals and hazardous liquids should be stored within an impervious bunded area in accordance with Australian standards and EPA guidelines • Any onsite refueling would occur in a designated area with impervious surfaces.	Construction contractor	Construction
43	Impacts on waterfront land	• **Notification of works within 40 m of Waterfront Land would be provided to the NSW Office of Water at least 30 days before the activity commences.**	Construction contractor	Construction
44	Traffic delays during construction	• A Traffic Control Plan (TCP) is to be prepared in accordance with RTA's Traffic Control at Work Sites Manual (2010), and approved by Roads and Maritime prior to implementation. The TCP is to include the notification of any traffic alterations or closures • The TCP is to include procedures for individual notification with directly impacted residences, businesses, emergency services, utility authorities, transport industry groups and government stakeholders • Timely notification of changes to informal car parking arrangements is to be undertaken prior to construction commencing.	Contractor	Pre-construction
45	Disturbance from activities on ancillary sites	• Consult with sensitive receivers located nearby to construction ancillary sites about likely impacts prior to construction • Site plant and equipment likely to cause disturbance to sensitive receivers located nearby ancillary sites at a suitable distance to minimise impacts.	Roads and Maritime Contractor	Pre-construction
46	Uncertainty surrounding construction	• The TCP is to include a construction communications plan including requirements to provide details and timing of proposed activities to affected residents, 24 hour contact name and number for complaints and details of a notification plan for changed conditions during the	Contractor	Pre-construction

	activities	construction period • The communications plan is to be prepared in accordance with Roads and Maritime Community Participation and Communications Manual (2012).		
47	Exclusion from the proposal area during construction for informal parking	The new car park at the Warnervale Interchange should be scheduled for construction as early in the construction program as reasonably practicable.	Contractor	Construction
48	Emergency access	Relevant emergency services, including fire, ambulance and police, are to be consulted to ensure that safe access is maintained during the construction period in the event of an emergency.	Contractor	Pre-construction
49	Property acquisition	If property acquisition is required, all acquisition is to be undertaken in accordance with the *Land Acquisition (Just Terms) Compensation) Act 1981.*	Roads and Maritime	Pre-construction
50	Impacts on ancillary sites	~~All ancillary sites are to be restored to pre-existing conditions or to a condition agreed with the land owner, at the completion of construction.~~ **Prior to vacation of the ancillary sites, unless otherwise agreed to in writing by the property owner, the following works would be carried out:** • **Removal of sheds, structures, plant and equipment and surplus construction materials** • **Smoothing of the land surface and filling of ruts (if any) arising from the use and occupation of the sites** • **Remediation of any contamination arising from the use and occupation of the site** • **Removal of any hardstand areas and concrete pads** • **Filling of holes from removal of hardstand area and concrete pads and properly compact the land**	Construction contractor	Construction

		• **Reinstate internal fences and pipes removed during use and occupation of the sites** • **Reinstate perimeter fences removed during use and occupation of the sites (reinstatement would be done in a manner that avoids or minimises clearing of native vegetation)** • **Cleaning out and infilling any water quality or sediment basins constructed during use and occupation of the sites** • **Reinstate appropriate vegetative cover in consultation with the property owner.**		
51	Land use at 50Warnervale Airport	• **Any structures required at ancillary site E5 (whether temporary or permanent) would comply with the obstacle limitation surface associated with the Warnervale Airport** • **Roads and Maritime would continue to consult with Wyong Shire Council to ensure the use of ancillary site E5 does not adversely impact airport operations.**	Contractor Roads and Maritime	Pre-construction and construction
52	Potential long term far field effects from mine subsidence	• Roads and Maritime and Wallarah 2 Coal Project are to continue to closely liaise with respect to detailed subsidence planning and monitoring prior to longwall mining activity • Detailed design, in the vicinity of Sparks Road, west of the M1 Pacific Motorway, is to cater for ground strains of ± 2 mm/m • Further consultation is to be undertaken with the MSB during detailed design to ensure all potential impacts and risks are identified and mitigated.	Roads and Maritime Detailed design	Pre-construction Construction Operation
53	General reduction of landscape character and visual amenity	• Revegetation by planting or seeding of the median should be undertaken where median width permits • An effective visual barrier should be created between the two carriageways where this is achievable • Species used should be endemic and frangible • Key locations where median screening plays an important role and should be provided include:	Detailed design Roads and Maritime Construction	Pre-construction Construction

		• On sweeping curves to combat glare from headlights • Just north of Alison Road where the alignment is over looked by a number of properties • Between the two motorway service centres • Revegetation on the verges within the alignment corridor is to be undertaken to provide separation and screening from the motorway • Protection, retention and enhancement of existing vegetation cover should be considered, in particular, at: • McPherson Road • Collies Lane • Mardi Road • Alison Road • Hue Road • St Johns Road.	contractor	
54	Consistency with built form	Design of the pedestrian bridge at Sparks Road should consider the approaches of the Urban Design Strategy including the following key issues: • Pier form and spacing • Superstructure depth and the relationship to the existing bridge structure • Throw screens and the need for consistency of form with existing throw screens along the corridor.	Detailed design Roads and Maritime	Pre-construction
55	General construction impacts on flora and fauna	• Prepare a Flora and Fauna Management Plan, including weed management, and ensure that it is integrated with the landscape plan for the project • 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.	Construction contractor	Pre-construction
56	Risk to fauna in remnant	• Limit of work temporary fencing is to be established	Roads and	Pre-construction

	vegetation to be removed or modified by the proposal	• Pre-clearing processes are to be undertaken in accordance Roads and Maritime Biodiversity Guidelines (2011) and RMS Biodiversity Guidelines: Guide 4 - Clearing of vegetation and removal of bushrock (RTA, 2011) • A fauna relocation site would be identified prior to construction to release any uninjured fauna encountered on site.	Maritime	
57	Minimise impacts of the proposal on EECs and SEPP 14 wetlands	• Offsetting for impacts on EEC vegetation should be investigated in accordance with the Roads and Maritime Guideline for Biodiversity Offsets (2011) • Where possible, retain vegetation that contains EECs present in the proposal area and adjacent sites • Exclusion zones detailed in ~~Figure 1 and Figure 2 of the Submissions Report~~ **Appendix B** are to be established and maintained throughout construction. Ensure that exclusion zones are fenced off and signage erected in accordance with the Roads and Maritime Biodiversity guidelines: Guide 2 – Exclusion Zones (RTA, 2011).	Roads and Maritime Construction contractor	Pre-construction
58	Maintenance of habitat corridor and wildlife connectivity	• If any box culverts are to be replaced, the design of replacement box culverts would ensure that that they continue to be able to be used by fauna for movement across the motorway • Culverts would be designed to facilitate opportunistic fauna crossing under the M1 Motorway • Construction of the proposal should be undertaken in accordance with Roads and Maritime Wildlife Connectivity Guidelines (2011).	Detailed design Roads and Maritime Construction contractor	Pre-construction
59	Retention of native vegetation, habitat trees including hollow bearing trees) and	• Threatened flora present in the survey area would be protected and retained where possible • Where individuals of *Tetratheca juncea* or *Grevillea parviflora* subsp. *Parviflora* are identified outside of the construction footprint they would be protected and disturbance avoided during construction • Locations confirmed to contain individuals, including buffer zones up to 25 metres from the individuals of *Tetratheca juncea* or *Grevillea*	Detailed design Roads and Maritime Construction	Pre-construction Construction

	potential Koala habitat	*parviflora* subsp. *Parviflora* would be exclusion zones **except for the three locations where these buffer zones have been reduced to 5, 15 and 17 metres along the M1 Pacific Motorway road shoulder**. ~~Exclusion zones are detailed in Figure 1 and Figure 2 of the Submissions Report.~~ Exclusion zones are to be established prior to construction commencing and maintained throughout construction • Ensure that exclusion zones are fenced off and signage erected in accordance with the Roads and Maritime Biodiversity guidelines: Guide 2 – Exclusion Zones (RTA, 2011) • In the event that unexpected threatened species are detected at the site prior to construction the RMS Unexpected Threatened Species Finds Procedure should be enacted (RTA, 2011) • During detailed design consideration is to be given to minimising, where reasonably practicable, any vegetation clearance required as a result of the design. In particular, potential koala habitat should be avoided or the construction footprint locally minimised where avoidance cannot be achieved • Retain and protect avoided potential koala habitat from disturbance during construction • Establish exclusion zones around remnant vegetation, habitat trees, water bodies and EEC to be retained to prevent inadvertent disturbance during construction • Vegetation that has been protected is not to be removed • If native vegetation must be removed, wood debris and any bush rock encountered should be stockpiled for later re-use or relocation in appropriate environments following Roads and Maritime Biodiversity Guidelines (2011) • Construction access tracks and construction areas along the motorway verge should be sited to avoid or minimise disturbance of native vegetation • ~~There should be no clearing of any mature trees on construction~~	contractor Qualified ecologist	

		~~ancillary sites.~~ • **There should be no clearing of any mature trees at the McPherson Road and Warren Road ancillary sites. Clearing of mature trees on the Hue Hue Road ancillary site would be restricted to the area required to provide vehicle access from the service centre (0.03 ha)** • **Clearing of mature trees on construction ancillary sites W8, W9 and E5 would be minimised. Where clearing is required pre-clearing and staged clearing procedures would be followed in accordance with Roads and Maritime Biodiversity Guidelines Guide 4: Clearing of vegetation and removal of bushrock.**		
60	Site specific environmental induction	All staff working on site are to undertake a site-specific environmental induction. The induction is to include items such as: • Sensitivity of surrounding vegetation (particularly EECs, remnant and riparian vegetation) • Site environmental procedures (vegetation management, sediment and erosion control protective fencing and noxious weeds) • What to do in case of emergency (chemical spills, fire or fauna encountered) • Key contact in case of environmental incident • Details of threatened flora species and risk of myrtle rust.	Construction contractor Roads and Maritime	Pre-construction
61	Staged habitat removal	• Where reasonably practicable, habitat trees and hollow bearing trees are to be retained throughout the proposal area • If hollow bearing trees are unable to be retained, a qualified ecologist is to be present onsite for staged habitat removal and hollow clearing and must follow the Roads and Maritime Staged Habitat Removal Process.	Construction contractor Qualified ecologist	Construction
62	Minimise risk of establishment	• The use of pesticides in weed control is to be minimised to reduce threat to fauna species • Inspection and maintenance procedures are to be implemented to	Construction contractor	Construction

	and spread of invasive species and disease due to the proposed development activities	reduce the carriage of weed material on machinery • All pathogens (eg Chytrid, Myrtle Rust and *Phytophthora*) are to be managed in accordance with the Roads and Maritime Biodiversity Guidelines - Guide 7 (Pathogen Management) and DECC Statement of Intent 1: Infection of native plants by *Phytophthora cinnamomi* (for *Phytophthora*), DPI Myrtle rust response 2010–11: Preventing spread of Myrtle Rust in bushland and OEH Interim management plan for Myrtle rust in bushland (2011) • Declared noxious weeds are to be managed according to requirements under the Noxious Weeds Act 1993 and Guide 6 (Weed Management) of the Roads and Maritime Biodiversity Guidelines (2011).		
63	Flora and fauna encountered	• 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) • WIRES is to be consulted if any injured fauna are encountered as outlined in site specific environmental inductions • Fauna handling must be carried out in accordance with the requirements the Roads and Maritime Biodiversity Guidelines - Guide 9 (Fauna Handling).	Construction contractor	Construction
64	Threatened fauna species impact	**The removal of the Little Eagle nest and nest tree near Doyalson Link Road would occur between March and July to avoid the breeding and nesting season (and potential incubation failure or nest abandonment). The nest would be checked prior to removal for signs of use to avoid mortality to young.**	Roads and Maritime	Pre-construction
65	Threatened fauna species impact	**A delineated exclusion zone of 90 m would be established around the raptor nest on ancillary site W9. Ancillary site establishment would occur outside the nesting period of the Little Eagle to avoid brooding failure or nest abandonment, if this species is utilising this nest.**	Construction contractor Roads and Maritime	Pre-construction, construction

66	Threatened fauna habitat impact	**A delineated exclusion zone of 10 m would be established around retained hollow-bearing trees. No ancillary activities would be carried out within the exclusion zones.**	Construction contractor	Pre-construction
67	Threatened fauna habitat impact	**Where hollow-bearing trees are to be removed, nest boxes would be used to mitigate habitat loss. A nest box strategy would be prepared in accordance with Guide 8 (Nest Boxes) of the *Roads and Maritime Biodiversity Guidelines* (2011).**	Construction contractor	Pre-construction
68	Fauna injury	**Barbed wire on fencing adjacent to native vegetation would only be used where absolutely necessary. Where use of barbed wire is necessary, consideration would be given to making it more visible to flying and arboreal animals.**	Construction contractor Roads and Maritime	Pre-construction, construction
69	Aquatic impacts	**Exclusion zones (20 m) are to be established around retained water bodies (including creeks and dams).**	Roads and Maritime	Pre-construction, construction
70	Re-establishment of any native vegetation disturbed or removed by the proposal	• Revegetate or replant disturbed areas with native vegetation following construction • Revegetation and replanting is to be carried out following Roads and Maritime Biodiversity Guidelines.	Construction contractor	Post-construction
71	Unexpected impacts on Aboriginal heritage values	Should Aboriginal archaeological material be unexpectedly uncovered during construction, all works are to cease within the vicinity of the material/find and the steps in the RTA Standard Management Procedure: Unexpected Archaeological Finds must be followed. Roads and Maritime Environmental Manager would be notified immediately.	Construction contractor	Construction
72	Unexpected impacts on human remains	In the event that construction of the project reveals possible human skeletal material (remains) the RMS Standard Management Procedure: Unexpected Archaeological Finds would be implemented and NSW Police would be notified immediately.	Construction contractor	Construction
73	Impact on	The screening plantings along the western and southern boundaries of the	Contractor	Pre-construction

	aesthetic values of heritage listed property	Alison Homestead should be maintained and, if removed, replaced with appropriate alternative plantings following construction works.		Construction
74	Unexpected impacts on non-Aboriginal heritage values	Should archaeological material be unexpectedly uncovered during construction, all works are to cease within the vicinity of the material/find and the steps in the RTA Standard Management Procedure: Unexpected Archaeological Finds must be followed. Roads and Maritime Senior Regional Environmental Officer must be contacted immediately.	Contractor	Construction
75	Impacts on local air quality during construction	Prepare an Air Quality Management Plan (AQMP) as part of the CEMP. This Plan must show the locations of all potentially affected properties and residences on a map and provide details of air quality control measures to be undertaken during construction, including: • Air quality**, odour** and dust management objectives consistent with DECCW guidelines • Potential sources and impacts of **odour and** dust, identifying all dust sensitive receptors • An environmental risk assessment to address potential impacts and mitigation measures to minimise dust impacts to sensitive receivers and to the environment • Mitigation measures to be implemented, including measures during weather conditions where high dust episodes are likely (such as strong winds in dry weather) • A monitoring program to assess compliance with the identified objectives. • A progressive stabilisation/ rehabilitation strategy for disturbed surfaces with the aim of minimising exposed surfaces • Contingency plans to be implemented in the event of non-compliances and/or complaints about dust • Procedures for regularly reviewing the effectiveness of the AQMP.	Contractor	Pre-construction

76	Impacts on local air quality during construction	• The AQMP is to be followed and updated as required for the duration of construction works • Construction plant and equipment is to be maintained in order to ensure exhaust emissions comply with applicable regulations (POEO Act). Emissions controls used on vehicles and construction equipment would comply with standards listed in Schedule 4 of the Protection of the Environment Operations (Clean Air) Regulation 2010. In addition, plant would be operated in a proper and efficient manner • Controlling truck speed and movements onsite and restrict trucks to designated roadways • Modifying or stopping construction activities during periods of high wind, if necessary • Vehicle loads involving loose materials are to be covered when travelling offsite • Implementing control measures, such as compaction or stabilisation, in order to minimise dust from stockpile sites, work areas and exposed soils • Regularly inspecting and maintaining erosion control structures to ensure silt does not become a source of dust • Maintaining all equipment for dust control to keep it in good operating condition. The equipment would be operable at all times with the exception of shutdowns required for maintenance.	Contractor	Construction

77	Construction waste	• A Materials Management Plan is to be prepared by the construction contractor as part of the CEMP prior to the commencement of relevant site works. The Materials Management Plan is to ensure that wastes are properly managed during construction in a way that it is consistent with the principles of avoidance, reduction, re-use and recycling.
		• The Materials Management Plan would:
		  • Identify the waste streams that would be generated during construction
		  • Detail for each of the identified waste streams:
			Construction contractor	Pre-construction

		• Its waste classification • How and where the waste is to be reused, recycled, stockpiled or disposed • The receptacles that would be used for storing identified waste materials prior to re-use, recycling, stockpiling or disposal • How, and by whom, the waste would be transported between generation, storage and point of re-use, recycling, stockpiling or disposal (including maintenance of a waste management register) • Specify the methods to be used for monitoring the implementation of the Materials Management Plan • Comply with the requirements of the PoEO Act for any non-licensed as well as licensed waste activities that involve the generation, storage and/or disposal of waste • Identify the need or otherwise for Section 143 Notices to be obtained from landowners of sites where waste is to be deposited • Comply with any relevant NSW Resource Recovery Exemptions when applying waste to land • **Place restrictions on the materials to be placed in the landscape area (i.e. only VENM, ENM and appropriate topsoil).** • The Resource Management Hierarchy principles of the WARR Act are to be adopted in the Materials Management Plan, as follows: • Unnecessary resource consumption is to be avoided as a priority • Generation of excess materials is to be avoided as a priority • Resource recovery including the re-use of materials, reprocessing, recycling, and energy recovery would be implemented throughout construction • Disposal is only to be undertaken as a last resort • Re-use opportunities for the proposal would be considered within the Materials Management Plan and may include: • Re-use of recovered aggregates and excavated road materials in		

		road construction in accordance with Roads and Maritime pavement specifications • Weed free topsoil may be stockpiled and reused on batters or in landscaping and revegetation works • ENM may be sent offsite to a place that can legally accept this material for re-use or reprocessing. To facilitate future re-use, excavated natural material should not be mixed with any other types of waste • Virgin excavated natural material (VENM) may be sent offsite to a place that can legally accept this material for re-use or reprocessing. To facilitate future re-use, virgin excavated natural material should not be mixed with any other types of waste • The Materials Management Plan is to include the following as a minimum: • All wastes, including contaminated wastes, would be identified and classified in accordance with OEH's Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes (DEC, 1997) • Excavated material that is not suitable for onsite re-use or recycling would be transported to a site that may legally accept that material for re-use or disposal • Green waste that could not be reused during revegetation works would be transported to an appropriate waste depot for recycling • Putrescible and other waste, such as chemical waste that cannot be recycled, would be regularly collected and disposed of at an appropriate disposal site • Other recyclable wastes would be separated and transported to a suitable recycler • Contaminated wastes would be disposed of at an appropriate waste facility • Should contaminated land be found during construction activities, a contaminated land management plan would be developed and implemented in accordance with G36 • Construction waste material would not be left onsite once the		

		works have been completed • Loads being transported from the site for disposal would be covered • Excavated flexible and concrete pavement would be recycled where possible • Working areas would be maintained, kept free of rubbish and cleaned up at the end of each working day.		
78	Materials use	Where feasible and reasonable, procure materials with recycled content or re-use materials for road construction and maintenance such as recycled aggregates in road pavement and surfacing (including crushed concrete, granulated blast furnace slag, glass, slate waste and fly ash). This measure forms part of RMS' implementation of the NSW Government's 'Waste Reduction and Purchasing Policy' (WRAPP).	Construction contractor	Construction
79	Construction waste	• The Materials Management Plan would be implemented for all stages of construction • The Materials Management Plan would be regularly reviewed and revised as necessary • Wastes would be properly managed during construction in a way that it is consistent with the principles of avoidance, reduction, re-use and recycling.	Construction contractor	Construction
80	Construction waste	**Ensure VENM reused onsite complies with NSW EPA requirements outlined in the VENM Certificate available on the NSW EPA Website (NSW EPA 2015).**	Construction contractor	Pre-construction
81	Construction waste	**Ensure ENM is reused and managed in accordance with the Excavated Natural Material Order 2014 and Excavated Natural Material Exemption 2014 (NSW EPA 2014).**	Construction contractor	Pre-construction
82	Construction waste	**Excess materials may be reused on other nearby construction and development projects only where appropriate approvals are in place to receive such materials.**	Construction contractor	Pre-construction
83	GHG emissions	Specify construction materials with lower emissions intensity in the detailed design (e.g. Recycled steel in place of virgin steel) where	Designer	Detailed design

		engineering and other technical specifications can be met and the alternative is feasible and reasonable.	Contractor	Construction
84	GHG emissions	• Plant and equipment will be switched off when not in use • Vehicles, plant and construction equipment will be appropriately sized for the task and properly maintained so as to achieve optimum fuel efficiency • Materials will be delivered with full loads and will come from local suppliers, where possible.	Contractor	Construction
85	Impact of increased flood events	Detailed design should take the effect of climate change on the proposal into consideration, including for the drainage design.	Roads and Maritime	Pre-construction
86	GHG emissions	The energy efficiency and related carbon emissions will be considered in the selection of vehicle and plant equipment.	Contractor	Pre-construction
87	Cumulative impacts	Roads and Maritime would undertake ongoing consultation with the Department of Planning and Environment and Wyong Shire Council.	Roads and Maritime	Pre-construction Construction
88	Cumulative impacts	Works would be staged to avoid and minimise impacts along the entire length where possible.	Contractor	Construction
89	Cumulative impacts	**Roads and Maritime would carry out ongoing consultation with owners of all ancillary sites and representatives of adjacent developments to minimise the potential cumulative impacts where possible.**	Roads and Maritime	Pre-construction Construction

7.3 Licensing and approvals

Licensing and approval requirements for the original Project are outlined in Section 4.2 of the Submissions Report and have been reproduced below in Table 7-2 with additional requirements shown in **bold red** text.

Table 7-2 Summary of licensing and approvals required

Requirement	Timing
An applicable road occupancy licence would be required. A road occupancy licence allows the proponent to use a specified road space at approved times, provided certain conditions are met. The licence applies to the occupation of the "road space" only and does not imply permission or approval for the actual (physical) works being undertaken.	An applicable road occupancy licence would need to be in place prior to the commencement of construction.
Elements of the proposal would meet the requirements for needing 'controlled activity' approval given that there would be works within 40 m of waterfront land. However, under section 38 of the Water Management (General) Regulation 2004, Roads and Maritime is exempt from the requirement to obtain a 'controlled activity' approval. Notification of the activity to the NSW Office of Water would be required.	A notification of the activity would need to be provided to the NSW Office of Water at least 30 days before the activity commences.
If surface water extraction is required, a water use approval may be required under Section 8 9 of the *Water Management Act 2000.*	**Prior to construction commencement or during construction as required.**
If groundwater extraction is required, an aquifer interference approval would be required for the work under Section 91F of the *Water Management Act 2000.*	Prior to construction commencement or during construction as required.
The proposal would be a scheduled activity under the *Protection of the Environment Operations Act 1997*. An environment protection licence (EPL) would be required under Section 48 of this act to authorise the carrying out of scheduled development	An EPL would be required prior to undertaking the scheduled work. Each period of 12 months (commencing from the issue of a licence) is a licence fee period for a licence. The administrative fee for any licence fee period of a licence must be paid not later than 60 days after the beginning of that licence fee period. **The EPL would cover the construction ancillary sites to be used for the upgrade.**

8 Conclusion

This Section provides the justification for the Proposal taking into account its biophysical, social and economic impacts, the suitability of the site and whether or not the Proposal is in the public interest. The Proposal is also considered in the context of the objectives of the EP&A Act, including the principles of ecologically sustainable development as defined in Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*.

8.1 Justification

The Proposal is required to facilitate construction of the M1 Pacific Motorway Replacement and Widening: Tuggerah to Doyalson (the original Project). The proposed design amendments have been identified as a routine part of detailed design and, in general, would improve safety for road users during construction and operation, improve safety for maintenance crews during operation, improve drainage and water quality outcomes, ensure the upgrade can be efficiently constructed (i.e. sufficient ancillary sites and construction space) and decrease construction timeframes.

While there would be some environmental impacts as a consequence of the Proposal, they have been avoided or minimised where reasonably practicable through design and project-specific safeguards and management measures summarised in Section 7.

The beneficial effects of the Proposal are considered to outweigh any adverse impacts associated with the Proposal.

8.2 Objects of the EP&A Act

The assessment against the objects of the EP&A Act in the original Project REF was reviewed and updated as shown in Table 8-1. The proposed design amendments would not significantly alter the assessment against the objects of the EP&A Act as presented in the original Project REF.

Table 8-1 Assessment of the Proposal against the Objects of the EP&A Act

Object	Comment
5(a)(i) To encourage the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment.	The Proposal comprises a number of design amendments required to facilitate construction of the Project. The Project is required due to the condition of the existing motorway, to ease existing congestion and to meet future growth and the substantial increase in traffic volumes that are expected. A number of mitigation measures have been included which would minimise the impacts of the Proposal on the environment.
5(a)(ii) To encourage the promotion and co-ordination of the orderly economic use and development of land.	The Proposal would facilitate the construction of the Project which would provide improved capacity for access to new development areas in the Warnervale Town Centre.

Object	Comment
5(a)(iii) To encourage the protection, provision and co-ordination of communication and utility services.	The Proposal may have minor impacts on communication and utility services in the form of temporary, short term disturbances during construction. Any impacts would be coordinated with utility service providers in advance of any disruptions.
5(a)(iv) To encourage the provision of land for public purposes.	The Proposal would not impact on land available for public purposes.
5(a)(v) To encourage the provision and co-ordination of community services and facilities.	The Proposal involves works for the purpose of replacing and widening an existing motorway. The Proposal would benefit the community by extending the life of this important motorway within the National highway network and would cater for future traffic growth in the area.
5(a)(vi) To encourage the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats.	Construction of the Proposal would require the clearing of some native vegetation, including threatened flora species, threatened fauna habitat and threatened ecological communities. Associated impacts are discussed in Section 6.6. The Proposal would minimise where possible the impacts on other vegetation and habitats located near the Proposal. Appropriate safeguards have been identified to minimise impacts on biodiversity.
5(a)(vii) To encourage ecologically sustainable development.	Ecologically sustainable development is considered in Sections 8.2.1 – 8.2.4 below.
5(a)(viii) To encourage the provision and maintenance of affordable housing.	Not relevant to the Proposal.
5(b) To promote the sharing of the responsibility for environmental planning between different levels of government in the State.	Not relevant to the Proposal however Roads and Maritime would continue to consult with other government agencies regarding the Proposal.
5(c) To provide increased opportunity for public involvement and participation in environmental planning and assessment.	Consultation activities for the Proposal are discussed in Section 5.

8.2.1 The precautionary principle

This principle states that 'if there are threats of serious or irreversible damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation'. Evaluation and assessment of alternative options associated with both the original Project and the design amendments put forward as part of the Proposal have aimed to reduce the risk of serious and irreversible impacts on the environment. A range of specialist studies were carried out for key issues to provide accurate and impartial information to assist in the evaluation of options and assessment of potential impacts.

The detailed assessment of potential environmental impacts during the detailed design process has sought to minimise impacts on the urban and natural amenity of the Proposal area while maintaining engineering feasibility and safety for all road users. A number of safeguards have been proposed to minimise potential impacts. These safeguards would be implemented during construction and operation of the Project. No safeguards have been postponed as a result of lack of scientific certainty.

A construction environment management plan would be prepared prior to commencing construction. This requirement would ensure that the proposed activities achieve a high-level of environmental performance. No mitigation measures or management mechanisms would be postponed as a result of a lack of information.

8.2.2 Intergenerational equity

This principle states that 'the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations'.

The Proposal facilitates the development of the original Project which would replace an important existing asset that has significant cracking and requires repair to improve road safety. The original Project would also provide increased capacity to alleviate existing traffic congestion and meet future projected traffic growth. The original Project would benefit future generations by ensuring that the works do not give rise to long-term adverse impacts on the environment and potential impacts would be minimised by implementation of appropriate safeguards.

Should the Proposal not proceed, the principle of intergenerational equity may be compromised, as future generations would inherit a lower level of service on this important motorway which is part of the national highway network. Travel times and the number of accidents along the M1 Pacific Motorway are likely to increase without the implementation of the Project as the volume of traffic increases over time.

The Project would benefit future generations by ensuring that road safety is improved, with this being a positive benefit for all road users.

8.2.3 Conservation of biological diversity and ecological integrity

This principle states that the 'diversity of genes, species, populations and communities, as well as the ecosystems and habitats to which they belong, must be maintained and improved to ensure their survival'.

A thorough assessment of the existing local environment has been carried out in order to identify and manage any potential impacts of the Proposal on local biodiversity. Specific efforts have been taken to avoid and minimise impacts on biodiversity.

An area of up to about 24.14 ha of native vegetation (including about 5.5 ha of EECs listed under the TSC Act) would require clearing as part of the Proposal. Assessments of significance for the potential impacts concluded that a significant impact is not likely.

Nine threatened flora species, one endangered flora population and 35 threatened fauna species listed under the TSC Act have the potential to be impacted. Eight threatened flora species, six threatened fauna species and four migratory fauna species listed under the EPBC Act have the potential to be impacted. Assessments of significance for these species concluded that a significant impact as a result of the Proposal is not likely.

The Proposal is not considered to have a significant impact on biological diversity and ecological integrity.

An ecological assessment and appropriate site-specific safeguards are provided in Section 6.8 and Appendix B of this Supplementary REF as well as Section 6.8 and Appendix H of the original Project REF.

8.2.4 Improved valuation, pricing and incentive mechanisms

This principle requires that 'costs to the environment should be factored into the economic costs of a project'.

The original Project REF examined the environmental consequences of the original Project and identified management measures and safeguards for areas which have the potential to experience adverse impacts. This Supplementary REF has examined the environmental consequences associated with the Proposal and relevant management measures and safeguards are included in Section 7.

Implementation of these mitigation measures would result in an economic cost to Roads and Maritime. The implementation of management measures and safeguards would increase both the capital and operating costs of the Project. This signifies that environmental resources have been given appropriate valuation.

The Proposal has been developed with an objective of minimising potential impacts on the surrounding environment. This indicates that the design for the Proposal has been developed with an environmental objective in mind.

8.3 Conclusion

The Proposal involves a number of design amendments that would facilitate the construction of the original Project. The original Project would replace the existing pavement and widen around 12.3 km of the M1 Pacific Motorway from two lanes in each direction to three lanes in each direction between Wyong Road, Tuggerah, and Doyalson Link Road, Kiar. The Proposal is subject to assessment under Part 5 of the EP&A Act. This Supplementary 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 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.

A number of potential environmental impacts from the Proposal have been avoided or reduced during the detailed design process. The Proposal as described in this Supplementary REF best meets the original Project objectives but would still result in some impacts including temporary noise impacts during the construction period as well as long term noise and biodiversity impacts. Mitigation measures as detailed in this Supplementary REF would ameliorate or minimise these expected impacts. The Proposal would also improve safety for road users during construction and operation, improve safety for maintenance crews during operation, improve drainage and water quality outcomes, ensure the upgrade can be efficiently constructed and decrease construction timeframes. Importantly, the Proposal would facilitate construction of the original Project which would replace an existing asset to improve road safety, alleviate existing traffic congestion and provide additional capacity for projected traffic growth. On balance the Proposal is considered justified.

The environmental impacts of the Proposal are not likely to be significant and therefore it is not necessary for an environmental impact statement to be prepared and approval to be sought for the Proposal from the Minister for Planning under Part 5.1 of the EP&A Act. The Proposal is unlikely to have a significant impact on threatened species, populations or ecological communities or their habitats, within the meaning of the *Threatened Species Conservation Act 1995* or *Fisheries Management Act 1994* and therefore a Species Impact Statement is not required. The Proposal is also unlikely to affect Commonwealth land or have a significant impact on any matters of national environmental significance.

9 Certification

This Supplementary Review of Environmental Factors provides a true and fair review of the Proposal 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 Proposal.

Zoe Wood
Senior Environmental Consultant
Hyder Consulting
Date: 13/05/2016

Todd Brookes
Principal Environmental Consultant
Hyder Consulting

I have examined this Supplementary Review of Environmental Factors and the certification by Zoe Wood and Todd Brookes of Hyder Consulting and accept the Supplementary Review of Environmental Factors on behalf of Roads and Maritime Services.

Brett Hoad
Project Manager/Engineer
Infrastructure Delivery | Infrastructure Development
Hunter Region
Date:

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Terms and acronyms used in this Supplementary REF

AHIMS	Aboriginal Heritage Information Management System
AQMP	Air quality management plan
ARI	Average recurrence interval
ASRIS	Australian Soil Resource Information System
ASS	Acid sulfate soils
CASA	Civil Aviation Safety Authority
CEMP	Construction environmental management plan
CNVMP	Construction noise and vibration management plan
DINFR	Doyalson Interchange north facing ramps
DLALC	Darkinjung Local Aboriginal Land Council
EEC	Endangered ecological community
EIA	Environmental impact assessment
EMPs	Environmental management plans
ENM	Excavated natural material
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW). Provides the legislative framework for land use planning and development assessment in NSW
EPA	NSW Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
EPL	Environment protection licence
FM Act	*Fisheries Management Act 1994* (NSW)
GHG	Greenhouse gas
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
LCZs	Landscape character zones
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
MNES	Matters of national environmental significance under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*
MSB	Mine Subsidence Board
MSD	Mine subsidence district
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
OGA	Open grade asphalt
OLS	Obstacle limitation surface (height restrictions for development near the Warnervale Airport as identified in the Wyong LEP)
PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation
PCP	Plain concrete pavement
PMF	Probable Maximum Flood
PoEO Act	*Protection of the Environment Operations Act 1997*

REF	Review of environmental factors
SEPP	*State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.*
SEPP 14	*State Environmental Planning Policy No.14 – Coastal Wetlands*
SEPP 44	*State Environmental Planning Policy 44 Koala Habitat Protection*
SEPP 71	State Environmental Planning Policy 71 Coastal Protection
SHI	State Heritage Inventory
SHR	NSW State Heritage Register
SMA	Stone mastic asphalt
SWMP	Soil and water management plan
TECs	Threatened ecological communities
TEP	Traffic emergency patrols
TMC	Transport Management Centre
TMP	Traffic Management Plan
TSC Act	*Threatened Species Conservation Act 1995* (NSW)
VENM	Virgin excavated natural material
VMP	Vegetation management plan
VMS	Variable message sign
WARR	*Waste Avoidance and Resource Recovery*
WMA	*Water Management Act 2000*
WSC	Wyong Shire Council

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May 2016
RMS 16.494
ISBN: 978-1-925582-09-3