Transport
for NSW

New England Highway bypass of Muswellbrook

Addendum review of environmental factors

August 2025

NSW GOVERNMENT

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Acknowledgement of Country

Transport for NSW acknowledges the traditional custodians of the land on which we work and live.

We pay our respects to Elders past and present and celebrate the diversity of Aboriginal people and their ongoing cultures and connections to the lands and waters of NSW.

Many of the transport routes we use today – from rail lines, to roads, to water crossings – follow the traditional Songlines, trade routes and ceremonial paths in Country that our nation's First Peoples followed for tens of thousands of years.

Transport for NSW is committed to honouring Aboriginal peoples' cultural and spiritual connections to the land, waters and seas and their rich contribution to society.

Prepared by AECOM Australia Pty Ltd and Transport for NSW.

Executive summary

The proposed modification

Transport for NSW (Transport) proposes to modify the New England Highway bypass of Muswellbrook by amending the construction footprint in certain areas (15 areas in total) to assist with construction staging and access requirements (proposed modification). Key features of the proposed modification would include:

- Upgrading the intersection of Sandy Creek Road and the New England Highway
- Widening Milpera Drive and installing pipe culverts units along the western edge of Milpera Drive
- Maintenance of existing roadway along Muscle Creek Road, Milpera Drive and Coal Road
- Construction of new dams and relocation of existing dams further from the proposed road corridor
- Construction of additional temporary ancillary facilities
- Construction of new access tracks and working platforms and use of existing access tracks
- Relocation of utilities and vegetation trimming where required
- Installation of directional signage
- Temporary instream crossing structures.

Background

The New England Highway is a major freight and commuter route forming part of the Sydney to Brisbane corridor of the National Land Transport Network and the primary route connecting the Upper Hunter with Newcastle. The highway currently passes through Muswellbrook, forming the main road access through the town.

Highway traffic passes through multiple sets of traffic lights, a roundabout, a school zone and under a narrow railway overpass, which all impact on travel time. The current route causes a restriction to the efficiency of freight/heavy vehicle movements, which also leads to safety and local amenity concerns.

Transport for NSW proposes to build a New England Highway bypass of Muswellbrook to aim to remove conflicts between local and through vehicles, significantly improving the efficiency of through freight movements along the New England Highway, while also improving safety and local amenity.

A review of environmental factors (REF) was prepared for the New England Highway bypass of Muswellbrook in October 2021 (referred to in this addendum REF as the project REF). The project REF was placed on public display between Monday 8 November 2021 and Friday 17 December 2021 for community and stakeholder comment. A submissions report dated June 2022 was prepared to respond to issues raised.

This addendum REF provides a detailed description of the potential environmental impacts associated with the proposed modification of the New England Highway bypass of Muswellbrook.

Need for the proposed modification

The proposed modification is consistent with the strategic needs discussed in Chapter 2 of the REF. The proposed modification is needed to assist with construction staging and access requirements for the approved project.

Proposal objectives

Section 2.3 of the project REF identifies the proposal objectives and development criteria that apply to the proposed modification.

Options considered

The following options were considered for this addendum REF:

- 'Do nothing' option – This option involves carrying out the project as described in the project REF
- Option 1 – This option involves amending the construction footprint to facilitate expedited construction (early works) and provision of alternate access options.

Option 1 was selected as the preferred option as it enables the project to be delivered, ultimately enabling the proposal objectives to be met.

Statutory and planning framework

Section 2.108 of the State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP (Transport and Infrastructure)) permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent.

As the proposed modification is for a road and is to be carried out by Transport for NSW, it can be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Development consent from council is not required.

Community and stakeholder consultation

Transport for NSW has consulted with the community and relevant stakeholders throughout the development of the project, which has continued for those impacted by the proposed modification.

Muswellbrook Shire Council and Subsidence Advisory NSW have been consulted about the proposed modification as per the requirements of SEPP (Transport and Infrastructure).

Community and stakeholder consultation will continue throughout further development of the project and during construction. Information regarding the project and the proposed modification is available on the Transport for NSW website.

Environmental impacts

The main environmental impacts for the proposed modification are:

Biodiversity

The proposed modification would result in the additional direct removal of up to 15.99 hectares (ha) of vegetation and associated habitats. To avoid areas of high-quality vegetation, exclusion zones have been established reducing impacts to 0.18 ha of remnant native vegetation within the construction footprint and 9.24 ha within the proposed modification areas. This has resulted in an overall reduction of the project's impact on the Central Hunter Eucalypt Forest threatened ecological community listed under the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act) compared to that previously assessed in the project REF.

The proposed modification would result in an additional loss of 17 hollow-bearing trees and potential minor alteration of waterways including Sandy Creek and Muscle Creek. With the implementation of additional safeguards, the cumulative impact of the proposed modification and the approved project would be considered not significant.

The proposed modification would have no additional impacts on biodiversity during operation.

Noise and vibration

The construction of the proposed modification would result in noise impacts to additional residences for earthworks, pavement works, finishing works and utility relocations compared to the project REF. This includes an additional:

- Six residences during earthworks
- Eight residences during pavement works
- Eight during finishing works
- Seven during utility relocations.

All construction works assessed for the proposed modification are consistent with the project REF and as such no additional mitigation measures have been recommended.

Operation of the proposed modification would result in no noise impact to receivers beyond those identified in the project REF.

Aboriginal heritage

The addendum Cultural Heritage Assessment Report (CHAR) identified 12 Aboriginal Heritage Information Systems (AHIMS) registrations (comprising of eight archaeological sites) located within the study area for the proposed modification. Test excavations undertaken for the assessment identified the presence of subsurface archaeological deposit of varying density and integrity located within all tested areas. Testing within the proposed modification area 10 identified another recorded site named 'Muscle Creek' within the disturbance area. To minimise impact, Transport has refined the proposed modification boundary to avoid the recorded site.

The construction and operation of the proposed modification would result in no change in impact to Aboriginal cultural values or Aboriginal cultural heritage from the assessment in the project REF. Safeguards and mitigation measures recommended in the project REF are appropriate.

Surface water, hydrology and flooding

The proposed modification would be located in areas known to be impacted by flooding and would traverse four waterways. Three dams would also require relocation as part of the proposed modification to move them away from the proposed road corridor.

Construction impacts for the proposed modification would mostly be in accordance with those described in the project REF, with the exception of relocating three dams. The existing dams requiring relocation would need to be dewatered and infilled which, if not managed correctly, can result in releasing contaminated or low quality water and/or weeds or pest species into the environment. Additional mitigation measures have been recommended to manage this risk.

The installation of temporary in-stream structures and any proposed changes to waterways would be designed to maintain existing stormwater flow paths where practical and consider drainage and potential flood events, which would result in minor impacts to surface water flows.

Groundwater

Interaction with groundwater as a result of the proposed modification may occur when constructing dams, however this is considered to be limited due to the expected depth to groundwater surrounding the proposed modification.

Construction impacts for the proposed modification associated with potential sources of chemical contamination from leaching of spills into groundwater are consistent with those described in the project REF. Similarly, consistent with the project REF, groundwater dependent ecosystems which are considered a sensitive receiving environment could receive runoff, both directly and indirectly, from the proposed modification.

Potential operational impacts for the proposed modification are consistent with the project REF.

Soils and mine workings

Construction impacts for the proposed modification would mostly be in accordance with those described in the project REF.

The project REF identified that there is a very high hazard risk of salinity around Muswellbrook, including the Muswellbrook Coal Mine. Dewatering dams has the potential to exacerbate impacts of salinity. This should be considered in the Dewatering Management Plan (DMP) proposed to be prepared as part of the proposed modification.

Given the locations and nature of structures identified in the project REF as potentially containing contamination, the dams have potential to be contaminated. Additional mitigation measures have been recommended to manage this risk, including the development of the DMP.

Potential operational impacts for the proposed modification are consistent with the project REF.

Property and land use

No property acquisition is required as part of the proposed modification.

Where the proposed modification is not located on land owned or operated by Transport for NSW, work would be carried out either with landowner consent or under a lease arrangement with the landowner. Land used for the purposes of construction would be restored following the construction phase and would be available for future agriculture or other use. This is consistent with the project REF.

No operational impacts to property and land use would occur as a result of the proposed modification.

Traffic

Construction impacts for the proposed modification would mostly be in accordance with those described in the project REF.

Use of additional temporary ancillary facilities by construction personnel could increase the number of construction vehicles in the proximity of these areas. As proposed as part of the project REF, all affected residents would be notified prior to any work commencing.

Local roads including Milpera Drive, Muscle Creek Road and Coal Road would be maintained during construction to ensure that potential damages to pavement from construction vehicle usage are managed efficiently. Road maintenance or improvements required during construction may result in additional impacts to surrounding receivers, however would also result in operational benefits for road users. The upgrades to the Sandy Creek Road and New England Highway intersection would also improve the safety profile of the intersection.

Justification and conclusion

The proposed modification is consistent with the proposal objectives as stated in Section 2.3 of the project REF. The proposed modification would facilitate expedited construction (early works) and provision of alternate access options.

This addendum REF has examined and considered to the fullest extent possible, all matters affecting or likely to affect the environment as a result of the proposed modification. The potential environmental impacts of the proposed modification are not likely to be significant and therefore an environmental impact statement and approval from the Minister for Planning under Division 5.2 of the EP&A Act are not required. The potential environmental impacts are considered to be manageable with the effective implementation of the measures detailed in the REF, submissions report and this addendum REF.

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1. Introduction

1.1 Proposed modification overview

Transport for NSW proposes to modify the New England Highway bypass of Muswellbrook by amending the construction footprint in certain areas to assist with construction staging and access requirements (proposed modification). Key features of the proposed modification would include:

- Upgrading the intersection of Sandy Creek Road and the New England Highway
- Widening Milpera Drive and installing pipe culverts units along the western edge of Milpera Drive
- Maintenance of existing roadway along Muscle Creek Road, Milpera Drive and Coal Road
- Construction of new dams and relocation of existing dams further from the proposed road corridor
- Construction of additional temporary ancillary facilities
- Construction of new access tracks and working platforms and use of existing access tracks
- Relocation of utilities and vegetation trimming where required
- Installation of directional signage
- Temporary instream crossing structures.

The location of the proposed modification is shown in Figure 1-1. The proposed modification is shown in Figure 1-2 and Figure 1-3. Section 3 describes the proposed modification in more detail.

A review of environmental factors (REF) was prepared for the New England Highway bypass of Muswellbrook in October 2021 (referred to in this addendum REF as the project REF). The project REF was placed on public display between Monday 8 November 2021 and Friday 17 December 2021 for community and stakeholder comment. A submissions report dated June 2022 was prepared to respond to issues raised.

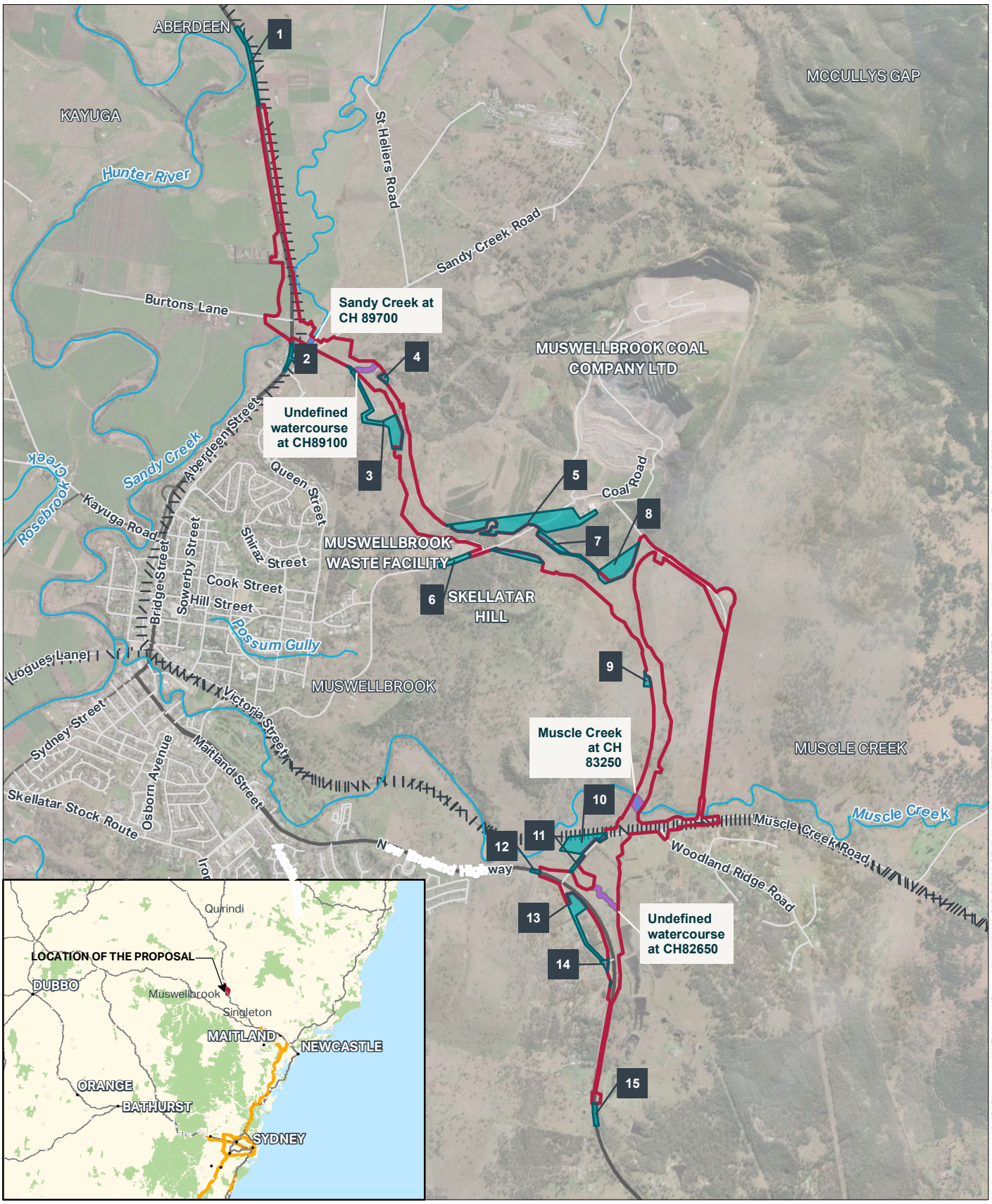

FIGURE 1-1: LOCATION OF THE PROPOSED MODIFICATION

Legend

- Construction Footprint
- Proposed Modification Area
- Indicative location of temporary instream structures
- State Road
- Regional Road
- Local Road
- Railway
- Watercourse

N

0 0.5 1 km

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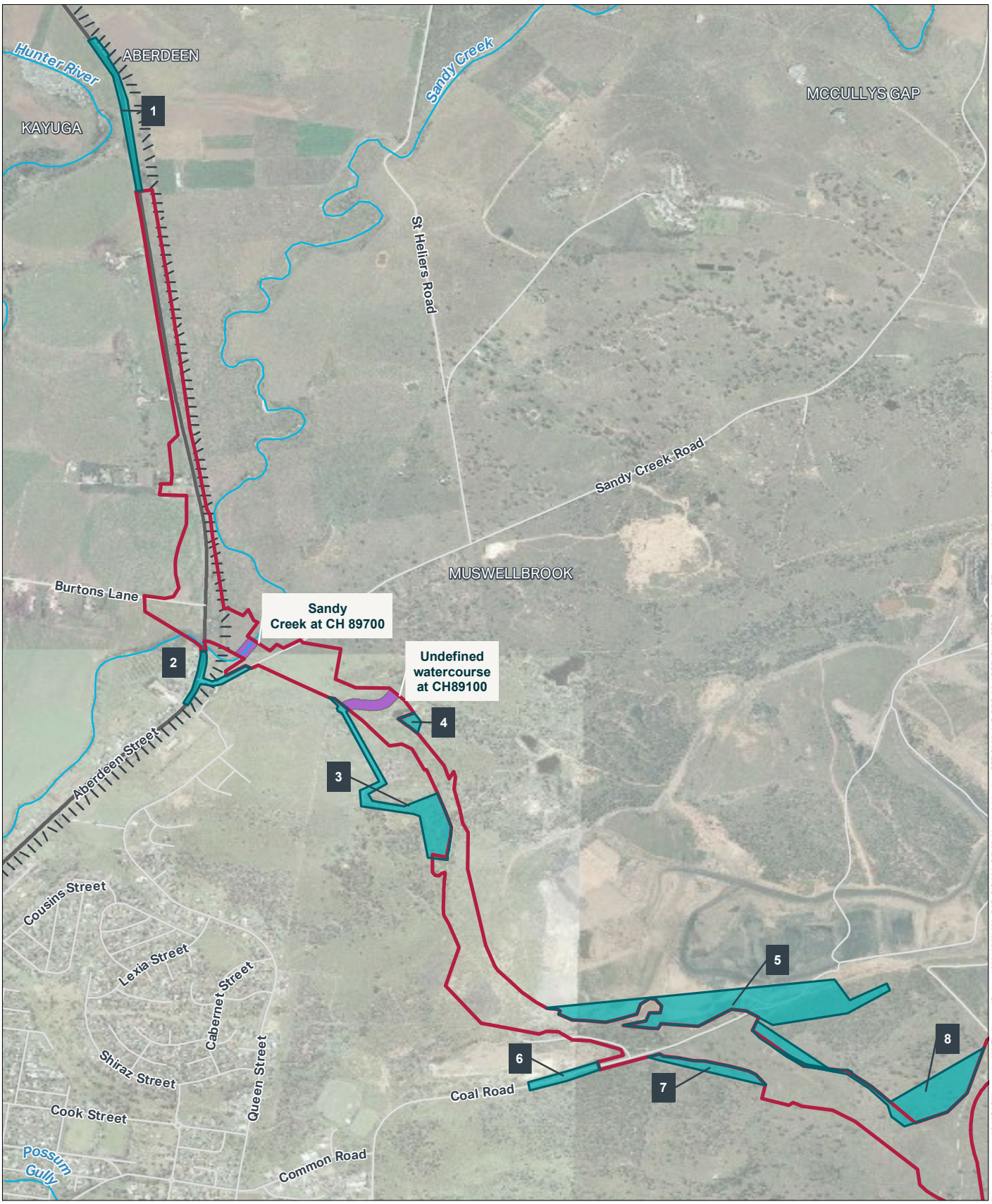

FIGURE 1-2: PROPOSED MODIFICATION (NORTH)

N 0 0.5 1 km

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Legend

- Construction footprint
- Proposed modification figures
- Indicative location of temporary instream structures
- State Road
- Local Road
- Railway
- Watercourse

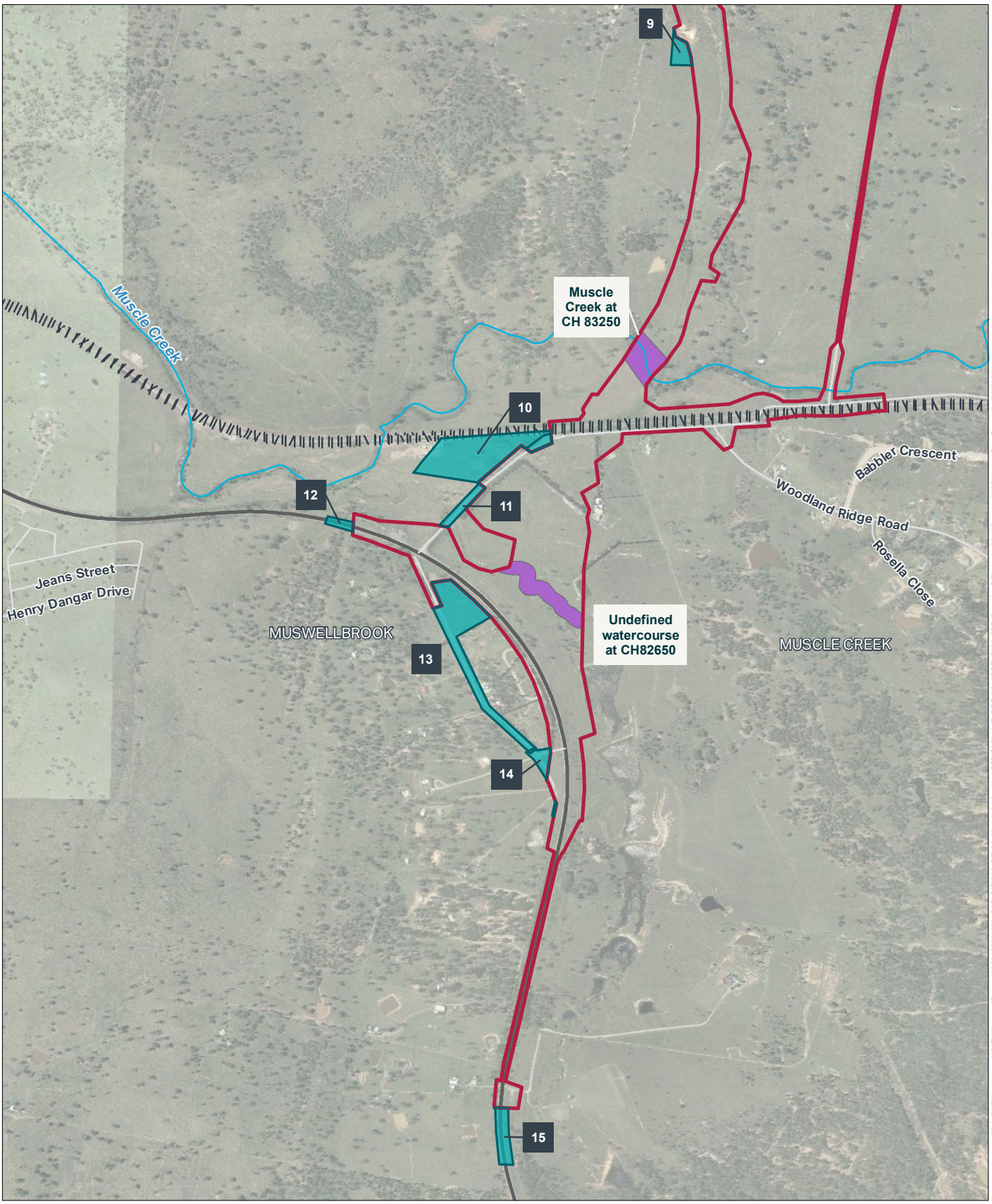

FIGURE 1-3: PROPOSED MODIFICATION (NORTH)

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Legend

- Construction footprint
- Proposed modification figures
- Indicative location of temporary instream structures
- State Road
- Local Road
- Railway
- Watercourse

1.2 Purpose of the report

This addendum REF has been prepared by AECOM Australia Pty Ltd (AECOM) on behalf of Transport for NSW Hunter. For the purposes of these works, Transport for NSW is the proponent and the determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

This addendum REF is to be read in conjunction with the project REF and submissions report for the project. The purpose of this addendum REF is to describe the proposed modification, to document and assess the likely impacts of the proposed modification on the environment, and to detail mitigation and management measures to be implemented.

The description of the proposed work and assessment of associated environmental impacts has been undertaken in context of section 171 of the Environmental Planning and Assessment Regulation 2021, *Is an EIS Required? Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979* (Is an EIS Required? guidelines) (DUAP, 1995/1996), *Roads and Road Related Facilities EIS Guideline* (DUAP, 1996), the *Biodiversity Conservation Act 2016* (BC 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 addendum REF helps to fulfil the requirements of:

- Section 5.5 of the EP&A Act including that Transport for NSW examines and takes into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity
- The strategic assessment approval granted by the Federal Government under the EPBC Act in September 2015, with respect to the impacts of Transport for NSW's road activities on nationally listed threatened species, ecological communities and migratory species.

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

- Whether the proposed modification is likely to result in a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act
- The significance of any impact on threatened species as defined by the BC Act and/or FM Act, in section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report
- The significance of any impact on nationally listed biodiversity matters under the EPBC Act, including whether there is a real possibility that the activity may threaten long-term survival of these matters, and whether offsets are required and able to be secured
- The potential for the proposed modification to significantly impact any other matters of national environmental significance or Commonwealth land and therefore the need to make a referral to the Australian Department of Climate Change, Energy, the Environment and Water for a decision by the Australian Government 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 proposed modification

Section 2 of the project REF addresses the strategic need for the project, the project objectives and the options that were considered. The proposed modification described and assessed in this addendum REF is consistent with the strategic need for the project.

The proposed modification is needed to assist with construction staging and access requirements for the approved project.

2.2 Proposal objectives and development criteria

Section 2.3 of the project REF identifies the proposal objectives and development criteria that apply to the proposed modification.

2.3 Alternatives and options considered

2.3.1 Methodology for selection of preferred option

The proposed modification involves a number of the amendments to the construction footprint which have emerged from detailed consideration of construction staging and access requirements and does not require consideration of other options.

Therefore, the process of option selection had two broad stages:

- Consideration of whether the proposal could be constructed within the approved construction footprint (i.e. the 'do nothing' option)
- Consideration of amendments to the construction footprint to assist with construction and by reference to the respective impacts and benefits.

2.3.2 Identified options

The following options were considered for the proposed modification:

- 'Do nothing' option – This option involves carrying out the project as described in the project REF
- Option 1 – This option involves amending the construction footprint to facilitate expedited construction (early works) and provision of alternate access options.

2.3.3 Analysis of options

'Do nothing' option

The 'Do nothing' option was not considered further as it would not assist with constructability or access requirements which could impact timing, safety and delivery of the project.

Option 1

Option 1, the proposed modification, was developed for the reasons identified in Table 2-1. The location of each of the proposed

Table 2-1: Reasons for the development of the proposed modification

Proposed modification area	Reason for amendment
1	• To allow the construction of southbound directional signage in advance of the northern connection
2	• To improve the safety profile of the intersection to cater for increased traffic volumes during construction of the bypass • To allow access to water and copper utilities along Sandy Creek to allow extended relocation footprint (if required)
3	• To enable access along existing tracks within private lands located outside of the construction footprint • To enable relocation of utilities (including establishment of new accesses and working platforms)
4	• To enable modification of the existing dam and realignment of the watercourse to move them away from the proposed road corridor to reduce the risk of saturation and failure of the road embankment
5	• To allow access to High Voltage power lines using existing access tracks for relocation as early works (avoid constructing new accesses over steep terrain) • To enable construction of replacement overhead electrical utilities between the Muswellbrook Coal Company (MCC) Substation and MCC offices to replace the lines proposed for removal at Skelatar Cut (part of the project REF)
6	• To allow construction of utilities along Coal Road, maintenance of Coal Road access during construction and an extension of tie in works (if required by detailed design)
7	• To allow access along the existing access track from Coal Road along the eastern side of the alignment for early works • To allow relocation of the farm dam • To provide opportunities to refine the Coal Road connection design to include a northbound off-ramp on the southern side of Coal Road (not part of this scope)
8	• To allow access to relocate electrical utilities over Skelatar Cut
9	• To enable reconstruction of the existing dam outside of the proposed road corridor
10	• To provide an alternate access past the Main North railway line for use during construction • To provide an alternate location for a construction compound site
11	• To allow maintenance of Muscle Creek Road during construction (if needed) in response to pavement damage due to construction vehicle usage
12	• To allow the construction of directional signage
13	• To enable establishment of an additional construction ancillary facility within Lot 7 DP 249566 • To allow widening of Milperra Drive (if needed) to access the additional construction ancillary facility • To allow maintenance of Milperra Drive during construction (if needed) in response to pavement damage due to construction vehicle usage
14	• To allow construction of local road improvements between the existing and proposed intersections of Milpera Drive • To allow construction of continued access along the travelling stock route (TSR) once the new Milpera Drive intersection is constructed • To enable a construction compound site to be constructed in the area between the existing and proposed Milpera Drive intersections
15	• To allow the construction of northbound directional signage in advance of the southern connection
Temporary instream structures	• To allow the movement of construction vehicles over waterways • To maintain the flow of water and passage of fish.

2.4 Preferred option

Option 1, the proposed modification, was selected as the preferred option as this enables the project to be delivered, ultimately enabling the proposal objectives to be met.

3. Description of the proposed modification

3.1 The proposed modification

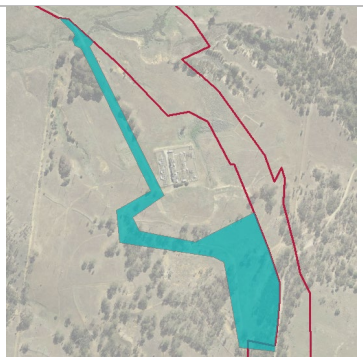
Transport for NSW proposes to modify the New England Highway bypass of Muswellbrook by amending the construction footprint in certain areas to assist with construction staging and access requirements. An overview of the proposed modification is shown in Figure 1-2: and Figure 1-3 with each modification area also shown in the figures included in Table 3-1.

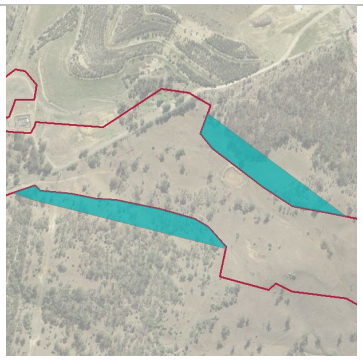
Key features of the proposed modification would include:

- Upgrading the intersection of Sandy Creek Road and the New England Highway
- Widening Milpera Drive and installing pipe culverts units along the western edge of Milpera Drive
- Maintenance of existing roadway along Muscle Creek Road, Milpera Drive and Coal Road
- Construction of new dams and relocation of existing dams further from the proposed road corridor
- Construction of additional temporary ancillary facilities
- Construction of new access tracks and working platforms and use of existing access tracks
- Relocation of utilities and vegetation trimming where required
- Installation of directional signage
- Temporary instream crossing structures.

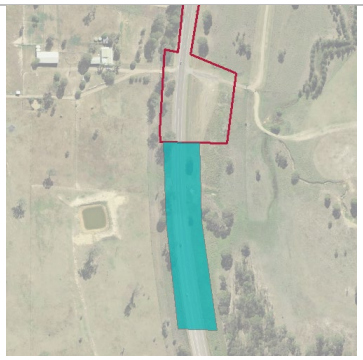
These features are further described in Table 3-1 for each of the proposed modification areas.

Table 3-1 Key features of the proposed modification

Proposed modification area (north to south)	Construction footprint boundary change	Key features
1		Installation of southbound directional signage in advance of the northern connection. This would include ground clearance/excavation and installation of poles and signs.
2		Construction of upgraded intersection and relocation of utilities along Sandy Creek Road including: • Left-hand and right-hand turn lanes • Intersection resealing • Line marking adjustments • Extension of utility pits and relocation of light pole.
3		Utilisation of existing access tracks and construction of new access tracks and working platforms. This would include: • Laying gravel on existing tracks, if required, and on new tracks • Relocating existing utility assets • Potential modifications to the culvert • Trimming/removing vegetation as required
4		Modification of the existing dam and realignment of the watercourse feeding the dam to outside of the proposed road corridor. This would include: • Draining the dam • Realigning the dam walls with a suitable material • Installing additional earth between the proposed road corridor (toe of the batter) and the edge of the dam.

Proposed modification area (north to south)	Construction footprint boundary change	Key features
5		Utilisation of existing access tracks and construction of new access tracks and working platforms. This would include: • Laying gravel on existing tracks, if required, and on new tracks • Relocating existing utility assets • Trimming/removing vegetation as required
6		Pavement maintenance and reconstruction along Coal Road. This would include the relocation of existing utility assets and vegetation trimming/removal as required.
7		Utilisation of existing access tracks and construction of new access tracks and working platforms. This would include: • Laying gravel on existing tracks, if required, and on new tracks • Relocating existing utility assets • Trimming/removing vegetation as required • Removal and relocation of existing dam further from the proposed road corridor.
8		Utilisation of existing access tracks and construction of new access tracks and working platforms. This would include: • Laying gravel on existing tracks, if required, and on new tracks • Relocating existing utility assets • Trimming/removing vegetation as required

Proposed modification area (north to south)	Construction footprint boundary change	Key features
9		Construction of new dam. This would include stripping topsoil, constructing the dam wall and reforming the upstream earth to feed into the dam (if required).
10		Construction of temporary construction compound site (including storage, laydown area, offices, parking and material construction yard) Relocation of utilities, if required, for safe operation and access.
11		Maintenance of Muscle Creek Road, including pavement repair, sealing, linemarking, signage/delineation and vegetation trimming as required.
12		Installation of directional signage, which would include ground clearance/excavation and installation of poles and signs.

Proposed modification area (north to south)	Construction footprint boundary change	Key features
13		Maintenance of Milperra Drive, including pavement repair, sealing, linemarking, signage/delineation and vegetation trimming as required. Construction of temporary satellite construction compound site (including storage, laydown area, offices, parking and material construction yard).
14		Widening of Milpera Drive between the existing and proposed intersection including the installation of pipe culvert units in the drain on the western edge of Milpera Drive. Construction of temporary satellite construction compound site (including storage, laydown area, offices, parking and material construction yard).
15		Installation of northbound directional signage in advance of the southern connection. This would include ground clearance/excavation and installation of poles and signs.
Temporary instream structures	 	Installation of temporary in stream crossing structures have been conceptualised consistent with recommended crossing types for the characteristic of waterway types identified in Table 1 of the document titled "*Why do Fish Need to Cross the Road, Fish Passage Requirements for Waterway Crossings* (NSW Fisheries, January 2003)". The final structures would be determined by the construction contractor.

Proposed modification area (north to south)	Construction footprint boundary change	Key features
		

3.2 Design

3.2.1 Design criteria

The proposed modification does not involve any design changes to the bypass. However, there are new road works proposed as part of the proposed modification, including:

- Construction of an upgraded Sandy Creek Road / New England Highway intersection
- Pavement maintenance and reconstruction along Coal Road
- Widening of Milpera Drive.

This work would be designed to meet the relevant road standards identified in Section 3.2.1 in the project REF.

3.2.2 Engineering constraints

Section 3.2.2 of the project REF identifies the engineering constraints that apply to the proposed modification.

3.2.3 Main features of the modification

The key features of the proposed modification are detailed in Section 3.1.

3.3 Construction activities

3.3.1 Work methodology

An indicative work methodology is described in Section 3.3.1 of the project REF, and included the following general work sequencing:

- Site establishment including set up of temporary ancillary facilities including site offices, site compounds, stockpile sites, laydown areas, concrete and asphalt batch plants, and temporary access tracks including creek crossings
- Utility adjustments
- Building demolition
- Vegetation clearing
- Earthworks and drainage
- Processing of materials
- Bridge construction including approaches
- Pavement construction
- Landscaping and finishing work
- Removal of ancillary facilities and site rehabilitation.

The proposed modification would generally not change this sequencing.

As briefly mentioned in Section 3.3.1 of the project REF, one dam located on the proposed road corridor would be filled. The proposed modification would result in three dams requiring dewatering, infilling and relocation.

The proposed modification would also require temporary instream crossing structures located within the construction footprint at:

- Sandy Creek at CH 89700
- CH89100
- Muscle Creek at CH 83250

- CH82650 in location of proposed SW Culvert.

The temporary in stream crossing structures have been conceptualised consistent with recommended crossing types for the characteristic of waterway types identified in Table 1 of the document titled "*Why do Fish Need to Cross the Road, Fish Passage Requirements for Waterway Crossings* (NSW Fisheries, January 2003)". The Construction Contractor would determine the final structure based on detailed designs, which may require additional impact assessment to support consultation with the relevant authority in seeking permit and approval for the activity. This is discussed in section 4.2.6 and 6.1.

Detailed work methodologies would be determined by the construction contractor when developing construction staging plans for the project.

3.3.2 Construction hours and duration

Section 3.3.3 of the project REF outlines the construction hours for the project. Consistent with the project REF, the proposed modification would be carried out largely within standard construction hours, with some activities likely to take place outside of these hours.

Standard construction working hours would be in accordance with the Interim Construction Noise Guideline (DECC, 2009):

- Monday to Friday: 7am to 6pm
- Saturday: 8am to 1pm
- Sundays and public holidays: no work.

Activities which were included in the project REF to be carried out outside of standard construction hours include intersection and tie-in activities. For the proposed modification, construction of the upgraded Sandy Creek Road / New England Highway intersection would occur as night works to minimise disruption to daily traffic and disturbance to surrounding landowners and businesses. Operation of the proposed additional construction compound sites may also occur outside of standard construction hours to support work occurring at these times, as identified in the project REF.

Construction is expected to start in mid to late 2023 with enabling works. The main works are expected to start in late 2024 to early 2025 and would take about three and a half years to complete.

3.3.3 Plant and equipment

An indicative list of plant and equipment which would be used during construction is provided in Table 3-3 of the project REF. No new plant or equipment is required for construction of the proposed modification; however, the final equipment and plant requirements would be determined by the construction contractor.

The list of indicative plant and equipment from the project REF included:

- Asphalt truck and sprayer
- Backhoe
- Bulldozer D9
- Chainsaw
- Compressor
- Concrete pump and track
- Concrete saw
- Concrete truck
- Crane (up to 600 tonne)
- Crushing and screening equipment
- Dump truck
- Excavator (up to 40 tonne)
- Excavator with hydraulic hammer
- Excavator tracked (up to 80 tonne)
- Franna crane (up to 20 tonne)
- Front end loader (up to 23 tonne)
- Grader
- Hydraulic hammer
- Medium rigid truck
- Mulcher
- Pavement laying machine
- Pilling rig (driven and bored)
- Pneumatic hammer
- Road truck
- Vacuum truck
- Vibratory roller
- Welding equipment
- Wheel loaders.

3.3.4 Earthworks

Earthworks activities for the proposed modification would include excavation for the installation of signage, construction of roads (including upgrading Sandy Creek Road and New England Highway intersection, reconstruction of Coal Road and widening of Milpera Drive), modification and construction of dams, construction of new access tracks and relocation of utilities.

There are no cut and fill earthwork quantities for this work. The estimated quantities of materials associated with earthworks for the proposed modification are expected to be negligible compared to the project REF. Precise quantities would be identified during detailed design.

3.3.5 Source and quantity of materials

Construction of the proposed modification would not require any materials in addition to those listed in Section 3.3.6 of the project REF. However, it is likely that the proposed modification would alter the estimated quantities of required materials. The proposed modification is not expected to alter the availability of materials for the project.

The exact quantities of materials required for the project, including the proposed modification, would be confirmed during detailed design.

3.3.6 Traffic management and access

Traffic numbers, management and access during construction would be consistent with the arrangements discussed in Section 3.3.7 of the REF, with the addition of new access tracks or use of existing access tracks (not assessed in the project REF) proposed in modification areas 3, 5, 7, 8 and 10 (refer to Section 3.1).

Traffic and access would be managed in accordance with a Traffic Management Plan (TMP) as proposed in the project REF. This plan would be implemented as part of the Construction Environment Management Plan (CEMP).

3.4 Ancillary facilities

Section 3.4 of the project REF details the ancillary facilities required for the project. As part of the proposed modification, an additional three areas (modification area 10, 13 and 14) have been identified to locate ancillary facilities. These areas are described in Section 3.4.1 and Section 3.4.2.

The proposed ancillary facility locations were selected using the same criteria identified in the project REF, as outlined below:

- Proximity to the proposal
- Where possible, away from residential and sensitive receivers
- Where possible, outside of the 1 in 10-year Average Recurrence Interval (ARI) floodplain
- At least 40 metres away from the nearest waterway
- On land of low heritage conservation significance
- Away from ecologically sensitive areas, including the Striped Legless Lizard habitat
- On land which does not require clearing of native vegetation
- Relatively flat ground that does not require substantial reshaping
- In plain view of the public to deter theft and illegal dumping.

All three areas would be used for the installation and use of a temporary construction compound site including storage, laydown area, offices, parking and material construction yard. These construction compound sites may also include asphalt and concrete batching plants.

Consistent with the project REF, construction compound sites would include portable buildings with amenities such as toilets, secure and bunded storage areas for site materials including fuel and chemicals, office space for on-site personnel and associated parking. Construction compound sites would be securely fenced with temporary fencing and signage erected advising the general public of access restrictions.

Upon completion of construction, the proposed ancillary facilities would be removed, cleared of all rubbish and construction materials and rehabilitated.

An overview of the key construction activities to be carried out at the proposed new ancillary facilities is provided in Table 3-2. Ancillary facilities as assessed in the project REF and proposed as part of this addendum are shown on Figure 3-1 .

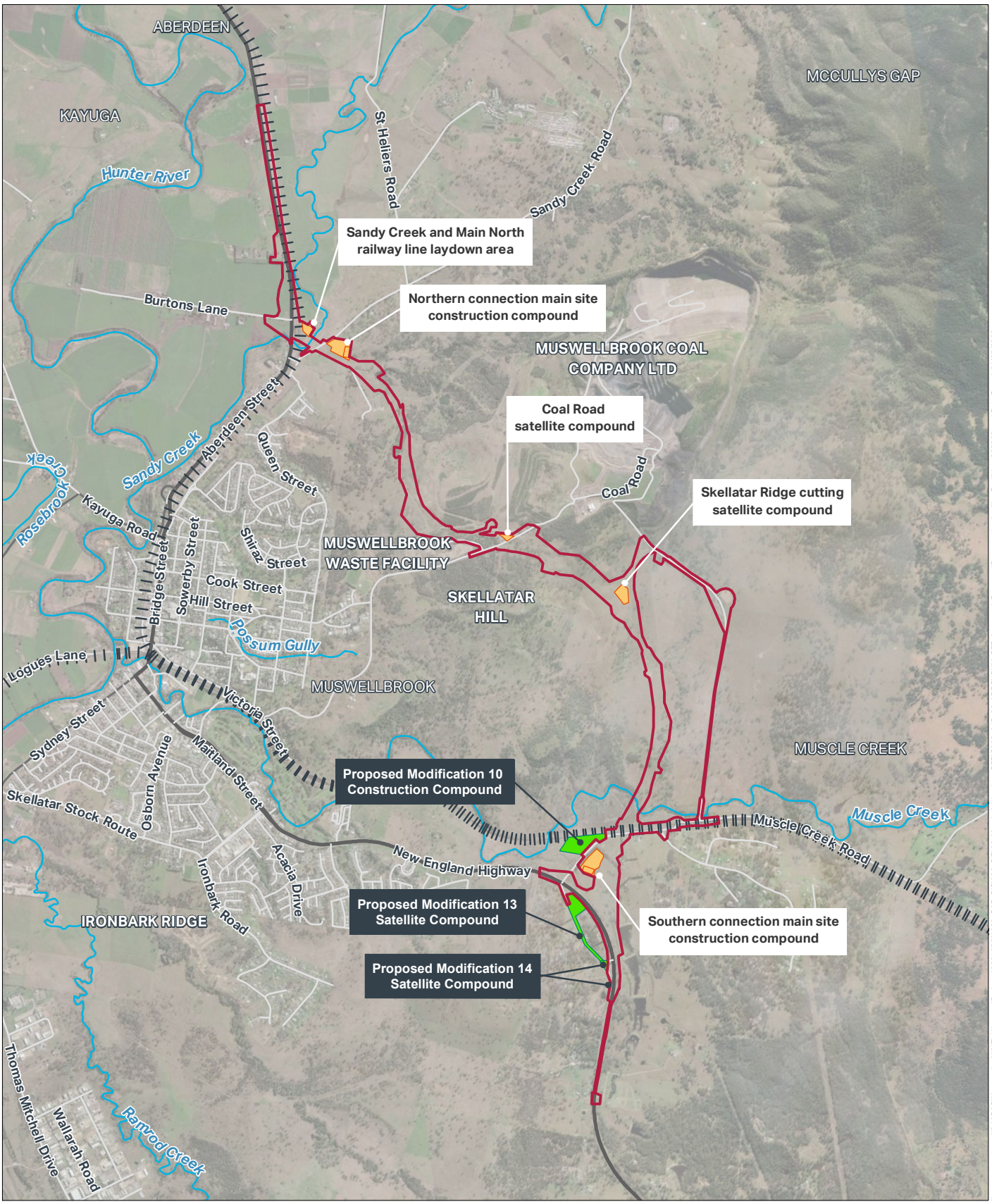


FIGURE 3-1: APPROVED AND PROPOSED ANCILLARY FACILITIES

Legend

- Construction Footprint
- Proposed Modification Ancillary Facilities
- Project REF Ancillary Facilities
- State Road
- Regional Road
- Local Road
- Railway
- Watercourse

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Table 3-2: Summary of construction activities at new ancillary facilities

Construction activities	Modification area 10	Modification area 13	Modification area 14
Native vegetation clearing	Yes	Yes	Yes
Utility works including protection and/or adjustment of existing utilities, removal of redundant utilities and installation of new utilities	Yes	Yes	Yes
Establishment of site offices, amenities and temporary infrastructure including fencing	Yes	No	No
Laydown and storage of materials	Yes	Yes	Yes
Secure and bunded storage areas for refuelling and chemical storage	Yes	Yes	Yes
Processing of materials	Yes	No	No
Concrete batching plant	Yes	No	No
Delivery of materials, plant and equipment	Yes	Yes	Yes
Stockpiling	Yes	Yes	Yes
Demobilisation	Yes	Yes	Yes

3.4.1 Modification area 10

Modification area 10 is located within Lot 5 DP 1134398 between Muscle Creek Road and Muscle Creek. The area is mostly cleared grassland with a scattering of trees throughout. Modification Area 10 would be used as a main construction compound.

The Main North railway line traverses the northern extent of this area with electrical utilities running parallel to the railway line as well as across the western corner of this area. Existing utilities would be relocated, where required, to ensure safe operation and access of the ancillary facility.

The proposed ancillary facility would be located to the south of the Main North railway line and is likely to cover an area of about 51,470 square metres. Access to the ancillary facility would be via Muscle Creek Road.

3.4.2 Modification area 13 and 14

Modification area 13 and 14 are located between Milpera Drive and New England Highway, area 13 being at the northern end of Milpera Drive and area 14 being at the southern end. Modification area 13 and 14 would be used as Satellite Compounds.

Modification area 13 is located within Lot 7 DP 249566 which is owned by Transport for NSW. The area is about 20,383 square metres and is mostly cleared with some trees and shrubs located throughout. Access to the ancillary facility would be via Milpera Drive.

Modification area 14 is located within the road corridor and includes a cleared corner of a larger parcel of land. Access to the ancillary facility would be via the New England Highway.

Both these areas are located within proximity of residential receivers located along Milpera Drive. Potential noise and traffic impacts to residential receivers as a result of the proposed modification are assessed in Section 6.

3.5 Public utility adjustment

Consultation with public utility authorities was carried out as part of the development of the concept design and project REF to identify and locate existing utilities and incorporate utility authority requirements for relocations and/or adjustments. The following existing utilities were found to be within the extents of the project:

- Overhead and underground electricity – Ausgrid
- Water services – Muswellbrook Shire Council
- Telecommunications – Telstra and the NBN Corporation
- MCC utilities including electricity, telecommunications (Telstra) and water supply
- Rail infrastructure – ARTC telecommunications and signals.

As part of the proposed modification existing utilities belonging to Ausgrid, Telstra, Muswellbrook Shire Council and MCC would require relocation as detailed in Table 3-3. The proposed modification may also impact on the ability of utility providers to access maintenance locations for their utilities and services during construction.

Table 3-3: Proposed changes to utilities

Proposed modification area	Utility impact	Utility owner
1	Overhead electrical to be relocated	Ausgrid
2	Street lighting to be relocated Telecommunication pit to be modified (raised)	Ausgrid Telstra
6	Water services to be relocated Telecommunication to be relocated Electrical overhead to be relocated	Muswellbrook Shire Council Telstra MCC
10	Utilities associated with construction compound site setup Overhead electrical to be relocated Telecommunications to be relocated	Ausgrid Telstra
11	Overhead electrical to be relocated	Ausgrid

Consultation would continue with the public utility providers during the detailed design and construction planning phase. This consultation would allow the public utility providers to have input into the most appropriate relocation options for the services and utilities. Modifications to the affected utilities would be in accordance with the design and construction methods approved by the relevant utility stakeholder.

3.6 Property acquisition

No property acquisition is required as part of the proposed modification.

Where the proposed modification is not located within the existing road corridor operated by Transport for NSW, Transport for NSW would carry out work either with landowner consent or under a lease arrangement with the landowner. Arrangements would be negotiated with each property owner.

Land leased for the purposes of construction would be restored following the construction phase and would be available for future agriculture or other use.

4. Statutory and planning framework

4.1 Environmental Planning and Assessment Act 1979

4.1.1 State Environmental Planning Policies

State Environmental Planning Policy (Transport and Infrastructure) 2021

Chapter 2 (Infrastructure) of State Environmental Planning Policy (SEPP) (Transport and Infrastructure) aims to facilitate the effective delivery of infrastructure across the State.

Section 2.108 of SEPP (Transport and Infrastructure) permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent.

As the proposed modification is for a road and is to be carried out by Transport for NSW, it can be assessed under Division 5.1 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 require development consent or approval under:

- State Environmental Planning Policy (Resilience and Hazards) 2021
- State Environmental Planning Policy (Planning Systems) 2021
- State Environmental Planning Policy (Precincts – Central River City)
- State Environmental Planning Policy (Precincts – Eastern Harbour City)
- State Environmental Planning Policy (Precincts – Regional) 2021
- State Environmental Planning Policy (Precincts – Western Parkland City) 2021.

Section 2.10 to 2.15 of SEPP (Transport and Infrastructure) 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 SEPP (Transport and Infrastructure) (where applicable), is discussed in section 5 of this addendum REF.

4.1.2 Local Environmental Plans

Muswellbrook Local Environmental Plan 2009

The proposed modification is located within the Muswellbrook local government area (LGA). The planning instrument that applies to the Muswellbrook LGA is the *Muswellbrook Local Environmental Plan 2009* (Muswellbrook LEP).

As outlined above, Section 2.108 of SEPP (Transport and Infrastructure) overrides the requirement for development consent from Muswellbrook Shire Council and therefore the consent requirements of the Muswellbrook LEP do not apply.

However, Table 4-1 in the project REF considered the development in accordance with the affected land zones and the objectives for each zone prescribed by the Muswellbrook LEP. The proposed modification is considered consistent with the considerations outlined in that table as the modification areas are mostly located on the same land zonings: RU1 Primary Production, SP2 Infrastructure and E3 Environment Management.

Part of proposed modification area 2 is located on R1 General Residential. Consistent with the project REF, the proposed modification is considered unlikely to impact on the objectives of this land zoning given the small area being impacted and that the proposed modification would not fragment this land zoning.

4.2 Other relevant NSW legislation

4.2.1 Aboriginal Land Rights Act 1983

The *Aboriginal Land Rights Act 1983* (ALR Act) provides for the land rights for Aboriginal persons and for representative Aboriginal Land Councils in NSW. Crown Land that is not lawfully being used or occupied, not (likely) needed for residential or essential public purposes and not the subject of a registered native title claim or determination can be claimed under the ALR Act.

One parcel of Crown Land adjacent to Coal Road was identified in the project REF as requiring partial acquisition to allow construction of the proposed road corridor. The proposed modification would require temporary lease of an additional section of this parcel of Crown Land for modification area 7 which includes the use of access tracks and relocation of an existing dam.

This parcel of land is Crown Land and is therefore unable to be claimed under the ALR Act. Further, there are no active Aboriginal land claims under the ALR Act on this parcel of Crown Land.

4.2.2 Biodiversity Conservation Act 2016

The purpose of the BC Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community consistent with the principles of ecologically sustainable development (ESD).

Under Part 2 of the BC Act, it is an offence to harm animals and plants; damage areas of outstanding biodiversity value; damage habitat of threatened species or ecological communities. Under Part 2, Division 2 of the BC Act, it is a defence to a prosecution if the harm or damage was necessary for the carrying out of a Division 5.1 EP&A Act activity undertaken in compliance with the determination or undertaken consistent with a state significant infrastructure approval under Division 5.2 of the EP&A Act.

Section 7.3 of the BC Act establishes a test to determine whether a proposed development or activity is 'likely to significantly affect threatened species'. If an activity under Division 5.1 of the EP&A Act is likely to significantly affect threatened species, then a Species Impact Statement (SIS) or a Biodiversity Development Assessment Report (BDAR) is required to be prepared.

An assessment of the potential impacts to biodiversity and measures to manage potential impacts are discussed in Section 6.1. The assessment found that the proposed modification is unlikely to have a significant impact on any threatened species or communities under the BC Act, therefore an SIS or BDAR is not required. This is consistent with the biodiversity assessment undertaken as part of the project REF.

4.2.3 Biosecurity Act 2015

The *Biosecurity Act 2015* (Biosecurity Act) covers all biosecurity risks, including pest animals, plant diseases and noxious weeds and introduces the legally enforceable concept of a General Biosecurity Duty. As outlined in Section 6.1, a number of weed species have been identified in the proposed modification areas during biodiversity inspections. Management measures identified in the project REF to manage weed species in accordance with the requirements of the Biosecurity Act are considered suitable for the proposed modification.

4.2.4 Coal Mine Subsidence Compensation Act 2017

The *Coal Mine Subsidence Compensation Act 2017* (CMSC Act) provides controls for certain development within mine subsidence districts. Clause 21 of the CMSC Act specifies that a person must not carry out work, or cause work to be done, in connection with the erection or alteration of an improvement within a mine subsidence district, except in accordance with the approval of the Chief Executive.

An improvement as defined by the Act includes any building or work erected or constructed on land or infrastructure whether above or below the surface of the land.

The project is located within the Muswellbrook subsidence district and constitutes 'improvements' as it is for the purpose of constructing infrastructure. A Mining Assessment Report was prepared by AECOM in 2021 to facilitate the approval process with Subsidence Advisory pursuant to Clause 21 of the CMSC Act (discussed in Section 6.4 of the project REF). The Mining Assessment Report provides an assessment of the potential impacts of the former underground mine workings on the performance of the proposed bypass.

Although the proposed modification includes additional areas within the Muswellbrook subsidence district and would also constitute 'improvements', further consultation with Subsidence Advisory specific to the proposed modification is not required, given that there are no proposed changes to the design of the bypass.

Potential mine subsidence risk to infrastructure proposed as part of the modification would be managed through geotechnical treatments which have been proposed as part of the concept design and would be further developed during detailed design.

4.2.5 Contaminated Lands Management Act 1997

The *Contaminated Lands Management Act 1997* (CLM Act) establishes a process for investigating and remediating land where required. The CLM Act allows the NSW Environmental Protection Authority (EPA) to declare land as significantly contaminated land. The EPA may order a public authority to carry out actions or prepare a plan of management for significantly contaminated land. The CLM Act imposes a duty on landowners to notify the EPA and potentially investigate and remediate land contamination if levels are above EPA guidelines.

A search of the NSW EPA Contaminated land register on 21 February 2023 indicated there are no previously registered contaminated lands within the Muswellbrook LGA. Refer to Section 6.5.3 for consideration of contamination.

4.2.6 Fisheries Management Act 1994

The Fisheries Management Act (FM Act) provides for the protection of threatened fish and marine vegetation and for the management of associated threatening processes. Part 7A Division 4 of the FM Act prohibits, without a licence or permit, activities that damage habitats or harm threatened species, populations or ecological communities. Activities which may require a permit under the FM Act include, but are not limited to, dredging works, reclamation work and works that would block fish passage.

Two of the proposed modification areas are located near waterways identified as Key Fish Habitat under the FM Act, being a tributary of Muscle Creek (modification area 11) and a tributary of Sandy Creek (modification area 2 and 3). The project REF considered Sandy Creek and its tributaries to be Type 3 (minimally sensitive key fish habitat) and Muscle Creek to be a Class 2 watercourse (moderate key fish habitat).

Instream works which may occur within these modification areas include a culvert upgrade along the existing access track within modification area 3. Temporary instream crossing structures may be required for access tracks at Sandy Creek, Muscle Creek and other unnamed drainage lines. One of the dams (located in modification area 4) is in a section of waterway which is identified as Key Fish Habitat under the FM Act. As part of the relocation of this dam, the waterway, which is a tributary of Sandy Creek, would also involve realigning to move it further from the proposed road corridor.

The proposal involves works within waterways and the adjacent riparian zone. Depending on construction methodology, the proposal would likely require an approval or require notice to be given under the FM Act, being:

- Works that involve dredging or reclamation work (section 199 of the FM Act)
- Works that would block fish passage, including temporary blockage during construction (section 219 of the FM Act).

Section 199 of the FM Act states the public authority is required to give the Minister written notice of the proposed work and consider any matter received from the Minister within 21 days of the notice prior to carrying out dredging work or reclamation work. Section 219 of the FM Act makes it an offence to obstruct fish passage, which includes construction or alterations to a dam, without a permit issued under Part 7 of the FM Act.

Consultation was carried out with Department of Primary Industries – Fisheries (DPI – Fisheries) as part of the project REF. Any work required near Key Fish Habitat would be carried out in accordance with advice previously received from DPI – Fisheries (refer to Table 5-5 of the project REF). Additional consultation would be carried out by the construction contractor prior to any dredging, reclamation work, or construction of any temporary instream crossing structure commencing. Further, once the methodology for dam work is known, if it is deemed likely that fish passage would be obstructed, the construction contractor would need to apply for a permit prior to this work commencing (refer to Section 7.3).

4.2.7 Heritage Act 1977

The *Heritage Act 1977* (Heritage Act) aims to protect and conserve non-Aboriginal cultural heritage, including scheduled heritage items, sites and relics. The Heritage Act makes provision for a place, building, work, relic, moveable object, precinct, or land to

be listed on the State Heritage Register. If an item is the subject of an interim listing, or is listed on the State Heritage Register, a person must obtain approval under section 60 of the Heritage Act for works or activities that may impact on these items.

Searches of relevant historic heritage registers and lists, both statutory and non-statutory, was conducted on 24 February 2023 to identify if any new historic heritage items had been listed since the project REF. No new historic heritage items were identified. A review of potential impacts to historic heritage as a result of the proposed modification is provided in Section 6.9.

4.2.8 Land Acquisition (Just Terms Compensation) Act 1991

The *Land Acquisition (Just Terms Compensation) Act 1991* (Land Acquisition Act) applies to the acquisition of land (by agreement or compulsory process) by a public authority authorised to acquire the land by compulsory process. It provides a guarantee that, when a public authority requires the acquisition of land, the amount of compensation would not be less than the market value of the land.

No property acquisition is required as part of the proposed modification.

4.2.9 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NP&W Act) governs the establishment, preservation and management of national parks, state reserves, historic sites and certain other areas, and the protection of certain fauna, native plants and Aboriginal heritage.

The NP&W Act, administered by the Heritage Division, Department of Premier & Cabinet, is the primary legislation for the protection of Aboriginal cultural heritage in NSW. The NP&W Act gives the Secretary of the Department of Premier & Cabinet responsibility for the proper care, preservation and protection of 'Aboriginal objects' and 'Aboriginal places'. Section 86 of the NP&W Act identifies offences relating to the harm of Aboriginal objects or places. An Aboriginal Heritage Impact Permit (AHIP) issued under section 90 of the NP&W Act is required if impacts to Aboriginal objects and/or places cannot be avoided.

Potential impacts to Aboriginal cultural heritage as a result of the proposal have been assessed in accordance with Transport for NSW's Procedure for Aboriginal Cultural Heritage Consultation and Investigation (NSW Roads and Maritime Services, 2011) (PACHCI).

An AHIP is required for the approved project as outlined in section 4.2.7 of the project REF. The proposed modification would not require an additional AHIP as there is no change in impact from the project REF. The Aboriginal cultural heritage assessment undertaken for the proposal is summarised in Section 6.3.

4.2.10 Protection of the Environment and Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) aims to protect, restore, and enhance the environments of NSW and reduce potential risks to human health and the environment. The POEO Act outlines pollution offences relating to land, water, air, and noise pollution and includes a duty to report pollution incidents.

Under the provisions of the POEO Act, Transport for NSW is required to notify the EPA if a 'pollution incident' occurs that causes or threatens 'material harm' to the environment.

Under Section 120 of the POEO Act, a person who pollutes any waters is guilty of an offence and Transport is obliged not to pollute during the construction period or when the site is operational.

Under Part 3.2 of the POEO Act, an environmental protection licence (EPL) is required for scheduled activities or scheduled development work as defined in Schedule 1. Road construction is defined by Clause 35(1) as '…the construction, widening or re-routing of roads, but does not apply to the maintenance or operation of any such road'. Road construction is considered a scheduled activity under Clause 35(3)(a)(i) where extraction of more than 50,000 tonnes of materials is proposed over the life of the proposal, where the proposal would be carried out in the regulated area.

In the project REF, the project was assessed as requiring an EPL, given that the POEO Act regulated area definition includes the Muswellbrook LGA and the project is expected to require extraction of material which is over the 50,000 tonnes threshold. Earthworks volumes would increase as a consequence of the proposed modification. Therefore, there is no change to the requirement of an EPL for the project.

4.2.11 Roads Act 1993

The objects of the *Roads Act 1993* (Roads Act) include classifying roads, declaring Transport and other public authorities as roads authorities, and regulation of various activities on public roads.

Under section 143 of the Roads Act, a roads authority can use a public road in the exercise of a function conferred by the Roads Act, so long as the function is exercised in a way that would not unduly interfere with the rights of passage and access that exist with respect to the public road.

As outlined in Section 6.8, there would be additional short term construction impacts to traffic movements as a result of the proposed modification to those that have been assessed in the project REF, however safe access would be maintained throughout the construction period.

4.2.12 Water Management Act 2000

The *Water Management Act 2000* (WM Act) provides for the management of surface water and groundwater in NSW. The project, including the proposed modification, is located within the area of the Water Sharing Plan for the Hunter Regulated River.

Section 56 of the WM Act establishes access licences for the take of water within a particular water management area. Under clause 21(1) of the Water Management (General) Regulation 2018 (Water Management Regulation) and schedule 4 part 1, Transport for NSW, as a 'roads authority', is exempt from the need to obtain an access licence in relation to water required for road construction and road maintenance.

Sections 89 to 91 of the WM Act establish three types of approvals that a proponent may be required to obtain. These are water use approvals, water management work approvals (including water supply work approvals, drainage work approvals and flood work approvals) and activity approvals (including controlled activity approvals and aquifer interference approvals).

'Controlled activities' include the erection of a building or carrying out of a work, removal of material or vegetation, the deposition of material, and the carrying out of an activity that affects the quantity or flow of water in a water source. Typically a controlled activity approval would be required under section 91E(1) of the WM Act to allow for construction within 40 metres of a watercourse. However, Clause 41 of the Water Management Regulation, exempts public authorities such as Transport for NSW from section 91E(1) of the WM Act in relation to all controlled activities that it carries out in, on or under waterfront land. This allows Transport for NSW to carry out controlled activities on waterfront land.

Under the NSW Aquifer Interference Policy, the proposed modification is exempt from requiring an aquifer interference approval. Section 3.3 of the policy states that cuttings, trenches and pipelines (intersecting the water table) would be considered as having a minimal impact on water-dependent assets, if a water access licence is not required. Therefore, the proposed modification would be defined as a minimal impact aquifer interference activity given that a water access licence is not required.

An assessment of the potential impacts to surface water and groundwater and measures to manage potential impacts are discussed in Section 6.4 and Section 6.5.

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the EPBC Act a referral is required to the Australian Government for *proposed 'actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land'*. These are considered in Appendix A and section 6 of the addendum REF.

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

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

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

The assessment of the proposed modification's impact on matters of national environmental significance and the environment of Commonwealth land found that there would be no change to the findings of the determined activity and would be unlikely

to cause a significant impact on matters of national environmental significance or the environment of Commonwealth land. A referral to the Australian Department of Climate Change, Energy, the Environment and Water is not required.

4.3.2 Other relevant Commonwealth legislation

Native Title Act 1993

The *Native Title Act 1993* recognises and protects native title. The Act covers actions affecting native title and the processes for determining whether native title exists and compensation for actions affecting native title. It establishes the Native Title Registrar, the National Native Title Tribunal, the Register of Native Title Claims and the Register of Indigenous Land Use Agreements, and the National Native Title Register.

Under the Act, a future act includes proposed public infrastructure on land or waters that affects native title rights or interest.

A search of the Native Title Tribunal Native Title Vision website was undertaken, with no Native Title holders/claimants identified.

4.4 Confirmation of statutory position

The proposed modification is categorised as development for the purpose of a road or road infrastructure facilities and is being carried out by or on behalf of a public authority. Under section 2.108 of SEPP (Transport and Infrastructure) the proposed modification is permissible without consent. The proposed modification is not State significant infrastructure or State significant development. The proposed modification can be assessed under Division 5.1 of the EP&A Act. Consent from Council is not required.

5. Consultation

5.1 Consultation strategy

Transport has kept the community and stakeholders informed and proactively consulted throughout the development of the project. Consultation has been carried out in accordance with the Community and Stakeholder Engagement Plan prepared for the project. The purpose of consultation is to:

- Keep the community informed and increase understanding of the project
- Gain local knowledge and consider comments and issues relating to the project
- Ensure stakeholders potentially impacted by the project are provided with clear information
- Provide clear and timely information
- Advise the community on how they may obtain information, and communicate concerns, complaints, and suggestions.

5.2 Consultation outcomes

5.2.1 Community consultation

Community involvement in the project is detailed in Section 5.2 of the project REF and has been carried out since the Australian Government first announced a preferred option for a Muswellbrook bypass in 2005. Consultation with the community has been carried out during the following stages:

- Preferred bypass route selection
- Concept design planning phase
- Preparation of the REF
- Display of the REF and preparation of the submissions report.

A summary of consultation activities undertaken to date during these stages is provided in Table 5-1.

Table 5-1: Summary of community consultation carried out to date

Stage	Summary of consultation activities
Preferred bypass route selection	In 2016, community consultation was carried out on a draft corridor strategy for the New England Highway, including the Muswellbrook bypass. A preferred option for the bypass was displayed for community and stakeholder feedback between 23 November and 8 December 2020 and 22 submissions were received.
Concept design planning phase and preparation of the REF	Consultation activities which were carried out during the preparation of the concept design and REF, included: • Community updates distributed in November 2020 • Operation of a dedicated web page for the project • Operation of a dedicated project phone number and email address to allow the community to ask questions and provide feedback • Meetings with landowners and local businesses • Consultation with government agencies • Briefings with Muswellbrook Shire Council and local Members of Parliament. Key issues raised during this phase are summarised in Table 5-1 of the project REF and taken into consideration during the development of the concept design and project REF.

Stage	Summary of consultation activities
Display of the REF and preparation of the submissions report	The REF was publicly displayed for feedback for 40 days between 8 November 2021 and 17 December 2021 and 24 submissions were received, including 18 from the community. These submissions are addressed in the submissions report (AECOM 2022). The REF was placed on the Transport for NSW project website, available via the interactive online portal and made available for download. A virtual engagement room was made available on the online portal and two virtual information sessions were held on 24 November 2021 and 25 November 2021. An invitation to comment and a notification of the REF display were sent directly to all affected property owners and key stakeholders. A number of online and in person meetings were also held directly with affected property owners.

Consultation on the project, including the proposed modification, is ongoing with private landowners in relation to additional properties requiring lease agreements and/or arrangements and dam relocation work.

5.2.2 Aboriginal community consultation

The Aboriginal community has been involved throughout the development of the project in accordance with the requirements of the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010) and Transport for NSW's PACHCI as detailed in Section 5.3 of the project REF.

Consultation has included meetings (online and face to face), phone calls, general project updates, as well as direct communications between Transport and Registered Aboriginal Parties for the project REF.

Following the completion of the additional site assessment undertaken as part of the proposed modification, an Aboriginal Cultural Heritage Assessment Report (CHAR) (Appendix) was prepared by Kelleher Nightingale Consulting Pty Ltd (KNC) (2023) to assess the potential impacts to Aboriginal cultural heritage as a result of the proposed modification.

The proposed modification would result in no change in impact to Aboriginal archaeological sites or areas of Aboriginal cultural values, as described in section 6.3 of the modification. Therefore, no further consultation with the Aboriginal community is required as a result of the proposed modification.

5.2.3 SEPP (Transport and Infrastructure)

Consultation with councils and other public authorities is provided for by section 2.10 to 2.15 of the SEPP (Transport and Infrastructure), which applies to development carried out by or on behalf of a public authority that may be carried out without consent. As part of the project REF, the following SEPP (Transport and Infrastructure) consultation was carried out:

- Muswellbrook Shire Council under section 2.10, 2.11 and 2.12 requirements
- NSW State Emergency Services (SES) under section 2.13 requirements
- Subsidence Advisory NSW under section 2.15 requirements.

Additional consultation has been carried out as part of the proposed modification and is discussed below.

Muswellbrook Shire Council

Muswellbrook Shire Council has been consulted throughout the development of the project. Where comments were received, they were considered and addressed in the project REF. Further council input was received through the exhibition period for the REF with Transport's responses to those comments being addressed and captured in the Submissions Report.

Muswellbrook Shire Council has been consulted with regards to the proposed modification, specifically the Sandy Creek Road and Milpera Drive road where council owned and maintained assets are impacted.

Muswellbrook shire Council has provided feedback in meetings and formal responses as summarised in Table 5-2. See Appendix D for correspondence from Muswellbrook Shire Council.

Table 5-2: Muswellbrook Shire Council Consultation

Date	Issue raised	Response / where addressed in addendum REF
April 2023	New England Highway and Sandy Creek Road intersection – design review by Muswellbrook Shire Council	n/a
June 2023	Sandy Creek Road Intersection Design – limited queue length for right turning (northbound) off New England Highway into Sandy Creek Road during construction and post-construction phases. Council requested modification to proposed design	The intersection works are a safety initiative, as no turning lane currently exists for traffic turning right (northbound) off the New England Highway into Sandy Creek Road. The design has incorporated the maximum possible turning lane / queue length within the constraints. The updated design was provided to Muswellbrook Shire Council by Transport with the consultation letter. The works would be delivered ahead of the main Muswellbrook Bypass project and would provide a safer intersection during construction. Once the Muswellbrook Bypass is operational, traffic volumes are expected to significantly decrease at the intersection.

NSW State Emergency Services

The NSW State Emergency Service (NSW SES) is the agency responsible for dealing with floods, storms, and tsunami in NSW. This role includes, planning for, responding to, and coordinating the initial recovery from floods. As such, the NSW SES has an interest in the public safety aspects of the development of flood prone land, particularly the potential for changes to land use to either exacerbate existing flood risk or create new flood risk for communities in NSW.

The NSW SES was consulted during the development of the REF in accordance with the Notification clause 2.13 of the *State Environmental Planning Policy (Transport and Infrastructure)* 2021 in relation to the proposed project.

The NSW SES noted "*the proposed works appear to have minimal risk to NSW SES response operations"* and requested a review of the Flood Impact Assessment to provide informed advice. The Flood Risk Assessment was available for review as part of the exhibition of the REF. No response from the NSW SES were received during the exhibition period.

A review of the Flood Risk Assessment technical reports was carried out to understand the existing features of the environment surrounding the project in relation to surface water, hydrology and flooding and identify any new potential impacts associated with the proposed modification.

Flood events under existing conditions are not expected to have changed substantially to those described in the project REF. This is discussed in section 6.4.

Further consultation with the NSW SES specific to the proposed modification is not required.

Subsidence Advisory NSW

The project is located entirely within the Muswellbrook mine subsidence district. In accordance with the CMSC Act, Subsidence Advisory NSW regulates development within mine subsidence districts to help protect homes, buildings and infrastructure from potential subsidence damage.

A Mining Assessment Report was prepared by AECOM in 2021 to facilitate the approval process with Subsidence Advisory (discussed in Section 6.4 of the project REF). The Mining Assessment Report provides an assessment of the potential impacts of the former underground mine workings on the performance of the proposed bypass.

Subsidence Advisory NSW provided a response to Transport from the public display of the REF. Subsidence Advisory NSW requested the geotechnical assessment of mine subsidence risk must be undertaken in accordance with the requirements of the Subsidence Advisory NSW Merit Assessment Policy.

In response to Subsidence Advisory NSW submission, the Mine Assessment Report was updated to include a sensitivity analysis on the pillar geometry, uncertainty calculations in accordance with SA NSW Merit Assessment Policy and further analysis to assess the consequences of pillar failure. In addition, the Mine Assessment report was updated with further

information on the geotechnical investigations undertaken on the underground mine workings, including the 3d cavity sonar survey.

The updated Mine Assessment Report confirmed that no further works would be required to stabilise the underground workings and the impacts were consistent with those in the project REF.

A review of the Mine Subsidence Assessment and other technical reports in the project REF was carried out as part of the proposed modification to understand the existing features in relation to potential contamination and subsidence risks. No additional risk were identified (refer section 6.6).

Given the extensive consultation with Subsidence Advisory NSW and the nature of works in the proposed modification areas, further consultation with Subsidence Advisory specific to the proposed modification is not deemed necessary.

5.2.4 Other agency consultation

Various other government agencies and stakeholders have been consulted as part of the project REF, including:

- Australian Rail Track Corporation (ARTC)
- DPI – Fisheries
- EPA
- Hunter Local Land Services
- DPI – Agriculture
- Water group, DPE
- Environment, Energy and Science (EES), DPE
- Natural Resources Access Regulator (NRAR).

As part of the proposed modifications, consultation is required with DPI Fisheries for the use of temporary instream structures within waterways under Sections 199 and 219 of the FM Act. A meeting was held on the 19 October and key documents were sent to DPI Fisheries for review. Issues raised by DPI Fisheries are outlined in Table 5-3.

Table 5-3: Issues raised through other agency consultation

Agency	Issue raised	Response / where addressed in addendum REF
DPI Fisheries	DPI Fisheries reviewed the aquatic habitat assessment within the draft Biodiversity Assessment Report (BAR) and the proposed environmental safeguards and management measures within the draft Addendum REF. The detail was considered sufficient to capture DPI Fisheries key issues. No issues or changes to the proposed modification were requested.	DPI Fisheries noted consultation with DPI Fisheries under section 199 of the FM Act will need to occur prior to relevant work happening (temporary in-stream crossings), and the Transport contractual mechanism 'hold point' would ensure this occurs. No separate permit for section 219 (obstruction of fish passage) under the FM Act would be required. This requirement would be covered in the section 199 consultation with DPI Fisheries.

5.3 Ongoing or future consultation

Transport would continue to inform and consult with the community and relevant stakeholders during construction of the bypass. Transport is continuing to liaise with key stakeholders including but not limited to landowners, Aboriginal groups, MCC, utility providers, Subsidence Advisory NSW and Muswellbrook Shire Council.

6. Environmental assessment

This section of the addendum REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposed modification of the [insert name of the determined project]. All aspects of the environment potentially impacted upon by the proposed modification are considered. This includes consideration of the guidelines Roads and Related Facilities EIS Guideline (DUAP, 1996) and is an EIS required? (DUAP, 1999) the factors specified in section 171 of the Environmental Planning and Assessment Regulation 2021. The factors specified in section 171(2) of the Environmental Planning and Assessment Regulation 2021 are also considered in Appendix A.

Site-specific safeguards and management measures are provided to ameliorate the identified potential impacts.

6.1 Biodiversity

An Addendum Biodiversity Assessment Report (Addendum BAR) was prepared by (WSP, 2023) for the proposed modification to assess the biodiversity impacts from the proposed modification (see Appendix B)

6.1.1 Methodology

The biodiversity assessment aimed to identify and assess impacts on species, populations and ecological communities listed as Vulnerable, Endangered or Critically Endangered (collectively referred to as Threatened) under BC Act, FM Act or EPBC Act. The methodology for the assessment for the proposed modification involved the following:

- Desktop investigation to review records of threatened species, populations and ecological communities known or predicted to occur in the locality of the study area, including the following database searches:
  - BioNet Atlas of NSW Wildlife (WSP 2023), 10 km buffer around the study area and subregion
  - Protected Matters Search Tool (WSP 2023), 10 km buffer around the study area
  - PlantNet (WSP 2023), (WSP 2023), LGA spatial search
  - NSW Department of Primary Industries (Fishing and Aquaculture) spatial data (WSP 2023), 10 km buffer around the study area
  - Coastal State Environmental Planning Policies (SEPP) search NSW Department of Planning and Environment (WSP 2023), 10 km buffer around the study area
  - NSW Areas of Outstanding Biodiversity Value Register (WSP 2023), 10 km buffer around the study area
  - Australian Government Critical Habitat register (WSP 2023), 10 km buffer around the study area
  - NSW Department of Primary Industries, Critical Habitat Register (WSP 2023), 10 km buffer around the study area
  - Bureau of Meteorology Atlas of Groundwater Dependant Ecosystems (WSP 2023), 10 km buffer around the study area.
- Review of the existing assessment for relevant environmental information, including:
  - New England Highway – Muswellbrook Bypass Biodiversity Assessment Report (WSP, 2021)
  - New England Highway – Muswellbrook Bypass Review of Environmental Factors (AECOM, 2021)
  - Muswellbrook Bypass – Preliminary biodiversity investigation (WSP, 2020)
  - HW9 New England Highway Muswellbrook Bypass Preliminary Environmental Investigation (Hills Environmental, 2016)
  - Muswellbrook Bypass – Preliminary Environmental Investigation (Hills Environmental, (2013)
  - NSW State Vegetation Type Map (Department of Planning and Environment, 2022)
  - State Vegetation Type Map: Upper Hunter v1.0. VIS_ID 4894 (Department of Planning Industry and Environment, 2019)

  - The Vegetation of the Central Hunter Valley, New South Wales (Peake, 2006)
  - Hunter, Central and Lower North Coast Vegetation Classification and Mapping (Somerville, 2009)
  - Priority weed lists for the Hunter region (Department of Primary Industries, 2023c)
  - Topographic maps and aerial photographs.
  - NSW Department of Primary Industries Critical Habitat Register
  - Bureau of Meteorology Atlas of Groundwater Dependant Ecosystems.
- Habitat assessment to assess the likelihood of each threatened species, population, and community (threatened biodiversity) identified with the potential to occur in the proposed modification areas. All threatened biodiversity identified during the background research was also considered
- Field surveys of the proposed modification areas using a combination of vegetation integrity plots, rapid data points, supplementary plot and transect surveys, fauna and aquatic habitat assessments, and targeted searches for threatened flora species
- Identification and assessment of the potential impacts on biodiversity during the construction and operational phase as a result of the proposed modification
- Review and identification of the requirement for any additional or revised mitigation measures for the proposed modification compared to the approved project REF.

Study area

The study area for the Addendum BAR consists of the proposed modification area (comprising the 15 proposed modification areas, which are partially within but mostly extending outside the BAR construction footprint) and the revised construction footprint, as shown in Figure 6-1 and Figure 6-2.

The following areas are addressed within the Addendum BAR:

- **Construction footprint**: The development footprint of the proposed modification minus all exclusion zones and areas previously assessed in the project BAR (i.e. areas within the BAR construction footprint). This includes all areas of land that may be directly impacted upon by the proposed modification and subject to assessment in this report
- **BAR construction footprint**: The BAR construction footprint is the area required to build the project that was assessed in the project REF. This includes the area needed for temporary work, such as sedimentation basins, drainage channels, access roads, construction compounds and ancillary sites (Figure 6-1 and Figure 6-2)
- **Modification areas**: The 15 proposed modification areas, partially within but mostly extending outside the BAR construction footprint
- **Exclusion zones:** Areas identified within the proposed modification areas that have been excluded from the projects combined construction footprint avoided and not be impacted upon by the proposed modification. These areas were identified to avoid and minimise impacts on biodiversity values.

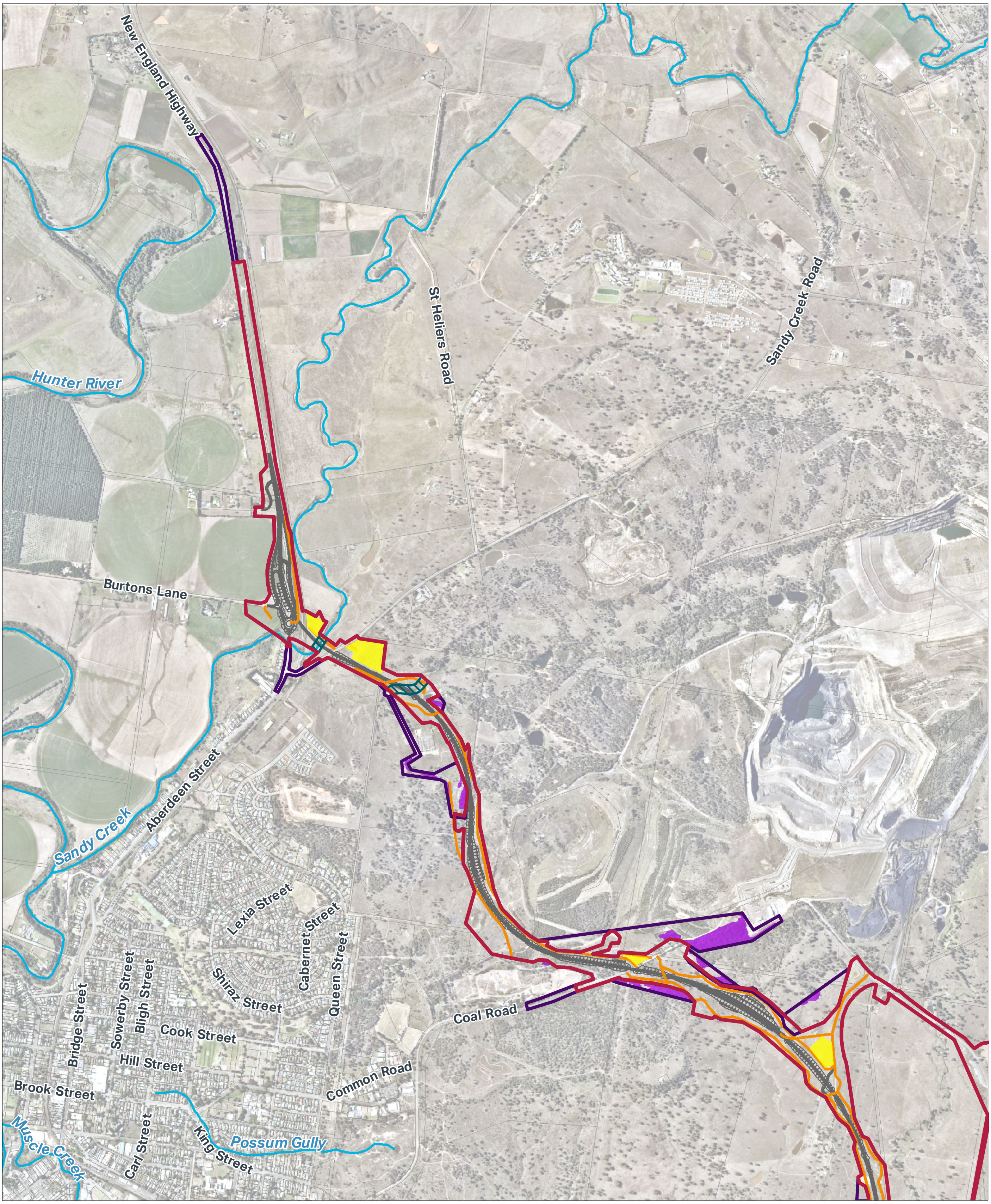

FIGURE 6-1: STUDY AREA USED IN THE ADDENDUM BAR

N

0 0.5 1 km

AECOM

Legend

- Revised Construction Footprint
- Temporary Water Crossings
- Exclusion Zones
- Project REF Construction Compounds
- Modification Areas
- Cadastre
- Access Tracks
- Concept Design
- Watercourse

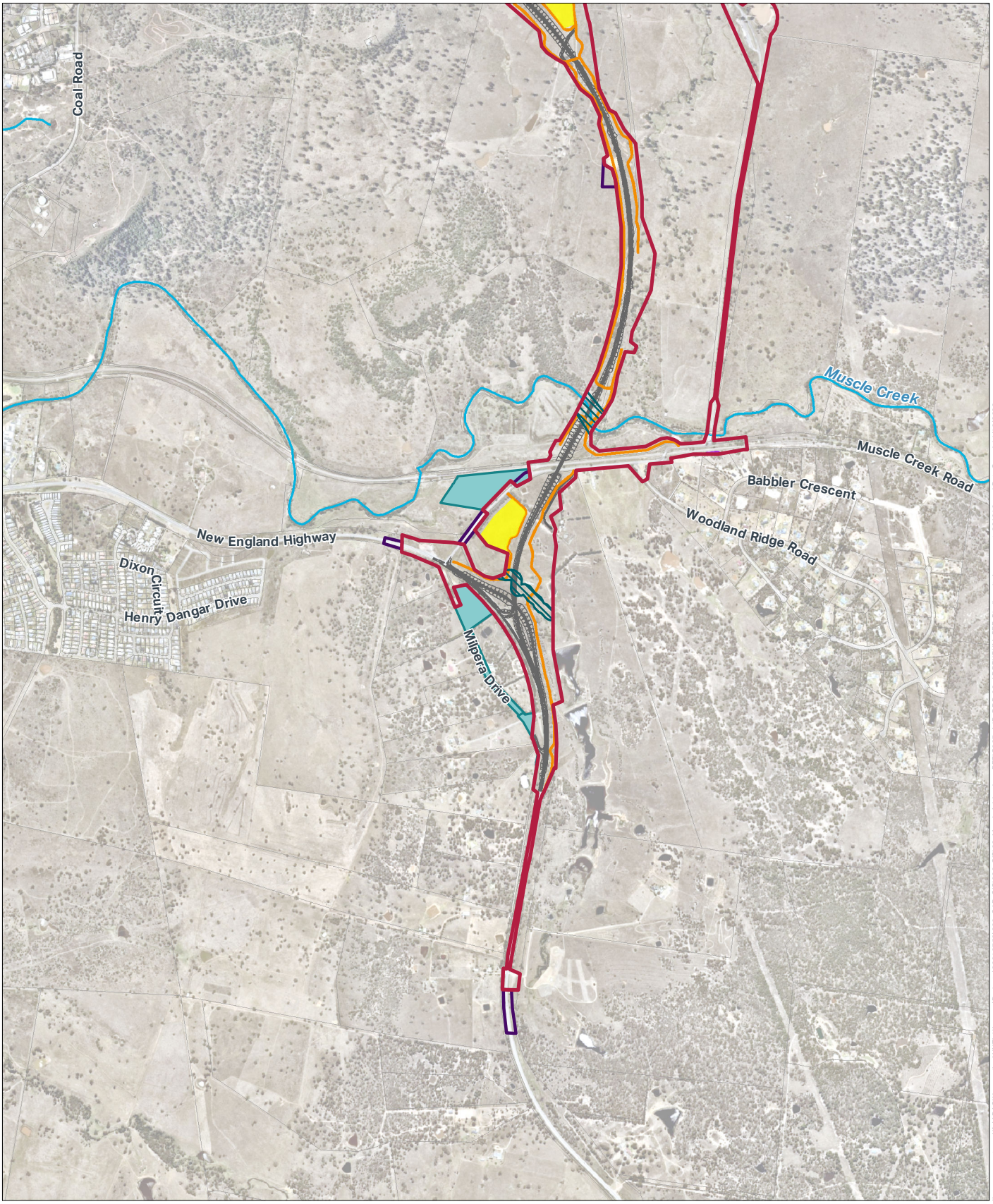

FIGURE 6-2: STUDY AREA USED IN THE ADDENDUM BAR

Legend

- Revised Construction Footprint
- Temporary Water Crossings
- Exclusion Zones
- Project REF Construction Compounds
- Modification Areas
- Proposed Construction Compound
- Cadastre
- Access Tracks
- Concept Design
- Watercourse

N

0 0.5 1 km

AECOM

6.1.2 Existing environment

The existing environment of the proposed modification area is generally consistent with the existing environment described in section 6.1.2 of the approved project REF and summarised below.

Plant community types (PCT)

Within the study area, seven native PCTs and four non-native miscellaneous ecosystems have been documented and assigned to 17 distinct vegetation zones. Among these, six native PCTs (encompassing nine vegetation zones) and three non-native miscellaneous ecosystems were observed within the proposed modification area. A summary of the vegetation types recorded is outlined below:

- PCT 1691 Narrow-leaved Ironbark – Grey Box grassy woodland of the central and upper Hunter
- PCT 1604 Narrow-leaved Ironbark – Grey Box - Spotted Gum shrub – grass woodland of the central and lower Hunter
- PCT 1605 Narrow-leaved Ironbark – Native Olive shrubby open forest of the central and upper Hunter
- PCT 1607 Blakely's Red Gum – Narrow-leaved Ironbark – Rough-barked Apple shrubby woodland of the upper Hunter
- PCT 1693 Yellow Box – Rough-barked Apple grassy woodland of the upper Hunter and Liverpool Plains
- PCT 42 River Red Gum / River Oak riparian woodland wetland in the Hunter Valley
- PCT 485 River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin.

The extent of PCTs is shown in Figures 3.1a to 3.1l in the Addendum BAR (Appendix B).

Flora recorded

Within the proposed modification area, a total of 270 flora species were recorded during surveys. Among these, 93 species were exotic or native planted ornamental species, while 177 species were native. A previously identified threatened flora Endangered Population, Eucalyptus camaldulensis (River Red Gum), was recorded within the broader study area, listed under the BC Act. While planted specimens were noted within and immediately adjacent to Modification Area 2, no naturally occurring individuals were observed within the proposed modification area.

Of the 93 exotic species recorded, 11 are listed as Priority Weeds under the NSW Biosecurity Act 2015 (Biosecurity Act) for the Greater Hunter Local Land Service region, and four are listed as Weeds of National Significance (WONS) (see Appendix B).

Fauna recorded

A total of 156 fauna species have been documented within the study area, comprising 147 native species and nine introduced species. This encompasses 115 bird species, 23 mammals, ten reptiles, seven amphibians, and one fish species. Among these, twelve threatened fauna species have been identified in the study area (Table 6-1).

Table 6-1: Threatened or migratory fauna recorded in the study area

Scientific name	Common name	BC Act[1]	EPBC Act[2]
Daphoenositta chrysoptera	Varied Sittella	V	_
Glossopsitta pusilla	Little Lorikeet	V	_
Hirundapus caudacutus	White-throated Needle-tail	-	V, M, Ma
Artamus cyanopterus	Dusky Woodswallow	V	-
Hieraaetus morphnoides	Little Eagle	V	-
Pyrrholaemus sagittatus	Speckled Warbler	V	-
Delma impar	Striped Legless Lizard	V	V
Phascolarctos cinereus	Koala	E	E
Petaurus norfolcensis	Squirrel Glider	V	-
Myotis macropus	Southern Myotis	V	-
Pteropus poliocephalus	Grey-headed Flying-fox	V	V
Haliaeetus leucogaster	White-bellied Sea-eagle	V	-

1. Vulnerable (V), Endangered (E), Endangered Population (E2), Critically Endangered (CE) as listed on the BC Act

2. Vulnerable (V), Endangered (E), Critically Endangered (CE), Migratory (M) as listed on the EPBC Act.

Likelihood of occurrence assessments identified an additional 38 threatened fauna species as having a moderate or high likelihood of occurrence within the proposed modification areas that have potential to be impacted by the proposed modification. These species include:

- 16 woodland birds
- Three forest owls
- Five predatory birds
- Three arboreal and terrestrial mammals; and
- 11 yangochiropteran bat and flying-fox species.

Fauna habitat types

The habitat features documented within the modification areas align with the project REF (section 6.1.2). These areas are predominantly characterised by open forest/woodland, riparian woodland, native grasslands, and cleared land with scattered trees and/or native plantings. Additionally, there are aquatic fauna habitats, including artificially constructed dams and naturally occurring watercourses. Notably, Sandy Creek and Muscle Creek have been recognised as containing Key Fish Habitat. Aquatic fauna habitats are shown on Figure 3.2a and Figure 3.2b in the Addendum BAR (Appendix B).

Although some of the vegetated fauna habitat associated with the study area is highly disturbed and modified, it protects the integrity of adjoining remnants and supports wildlife movement within a fragmented mosaic landscape, which many fauna species locally depend upon. Table 6-2 outlines the presence of these habitat types within the proposed modification areas.

Table 6-2: Broad fauna habitat type and corresponding PCTs

Fauna habitat description	Corresponding PCT	Presence in modification areas
Open forest/woodland	PCT 1691 Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter PCT 1604 Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the central and lower Hunter PCT 1693 Yellow Box - Rough-barked Apple grassy woodland of the upper Hunter and Liverpool Plains PCT 1605 Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter PCT 1607 Blakely's Red Gum - Narrow-leaved Ironbark -Rough-barked Apple shrubby woodland of the upper Hunter	Modification Areas 3, 4, 5, 6, 7, 8, 10, 12, 13, 15 and water crossings 3 and 4
Riparian woodland	PCT 42 River Red Gum / River Oak riparian woodland wetland in the Hunter Valley PCT 485 River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion)	Modification Area 3 and water crossings 1 and 3
Native grassland	Low Derived Native Grassland (DNG) condition forms of native PCTs.	Modification Areas 3, 7, 8, 9, 10, 13 and all water crossings
Cleared land with scattered trees and/or native plantings	Highly disturbed areas with no or limited native vegetation Urban/exotic plantings Native plantings (including mine rehabilitation) Cropping	Modification Areas 1, 2, 3, 4, 5, 6, 8, 10, 11, 12, 13, 14 and 15 and water crossings 1 and 2
Aquatic habitat	Artificially constructed dams and natural watercourses, including Muscle Creek, Sandy Creek and their unnamed tributaries	Modification Areas 3, 11 and water crossings 1, 2, 3 and 4

Aquatic fauna habitats

In response to the potential impacts of the proposed modification on waterways, additional surveys of aquatic habitats were undertaken to verify the present condition and scope of the four designated temporary water crossing sites. Key Fish Habitat has been mapped as occurring along Sandy Creek, Muscle Creek and some unnamed tributaries, however, no threatened aquatic habitat was identified. The aquatic habitats remain consistent with those outlined in the project REF.

Fauna microhabitats

Out of the 38 threatened fauna species affected by the proposed modification, 15 of them use hollow tree resources for breeding and roosting. Surveys undertaken to target large hollows within the proposed modification areas identified an additional 23 hollow-bearing trees containing hollows larger than 20 centimetres. Six of these occur within the exclusion zones and would not be impacted by the proposed modification. The location of each hollow identified in the study area is presented in Figure 6-3 and Figure 6-4.

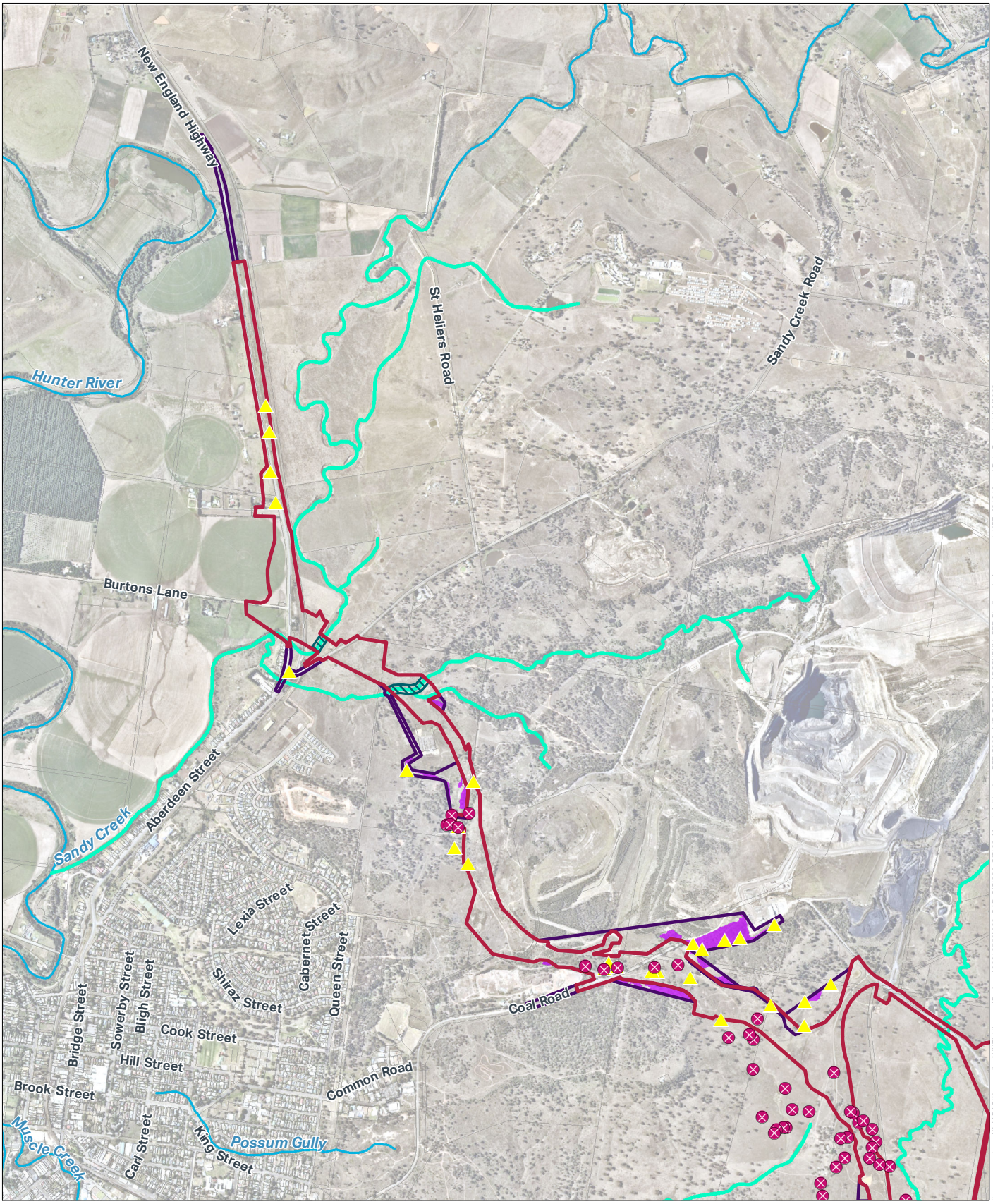

FIGURE 6-3: HOLLOW-BEARING TREES AND AQUATIC HABITAT

N

0 0.5 1 km

AECOM

Legend

- Revised Construction Footprint
- Modification Areas
- Exclusion Zones
- Temporary Water Crossings
- Cadastre
- Watercourse
- Key Fish Habitat
- Trees with Large Hollow(s) > 20cm
- Other Hollow-Bearing Trees

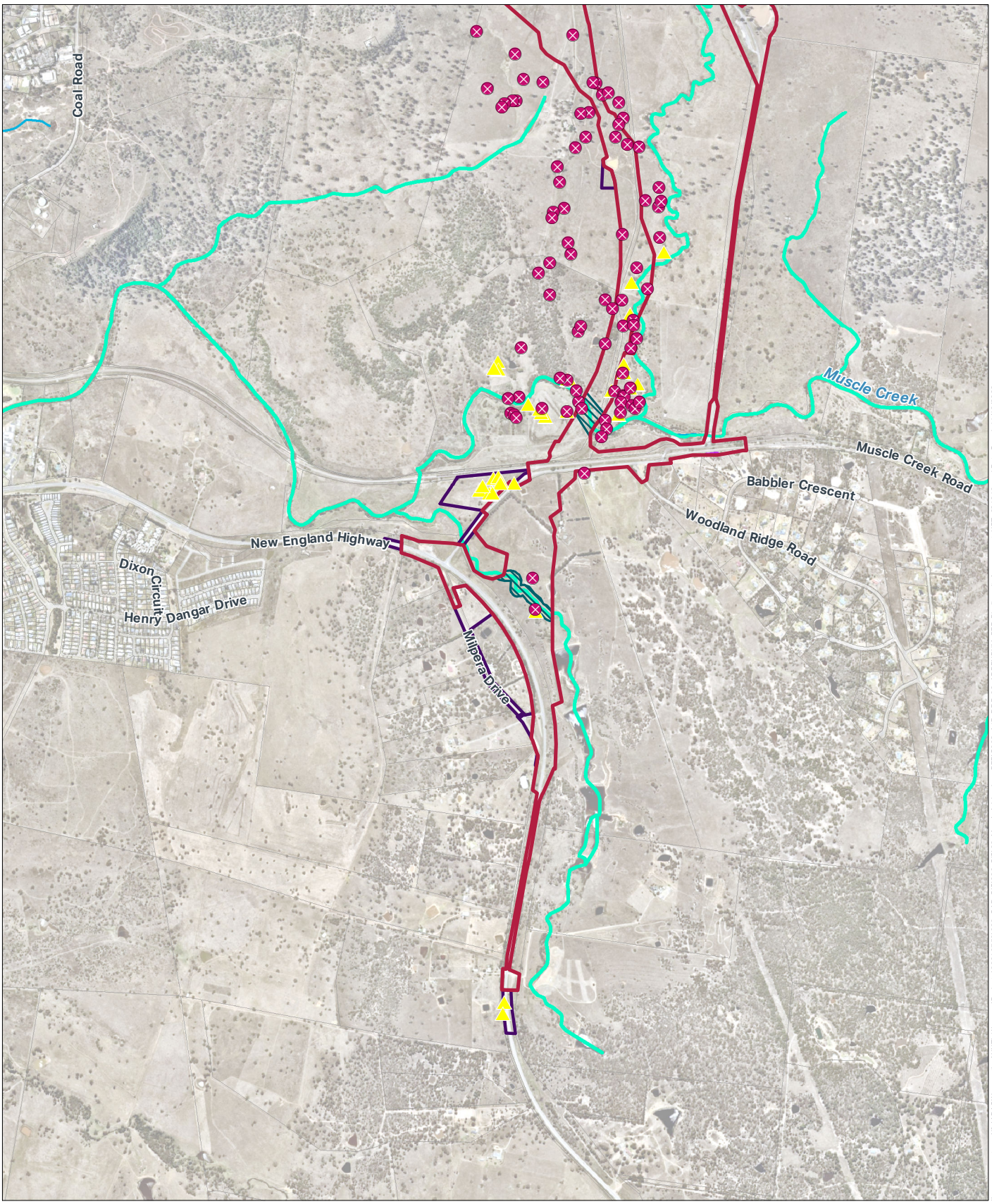

FIGURE 6-4: HOLLOW-BEARING TREES AND AQUATIC HABITAT

N 0 0.5 1 km

AECOM

Legend

- Revised Construction Footprint
- Modification Areas
- Exclusion Zones
- Temporary Water Crossings
- Cadastre
- Watercourse
- Key Fish Habitat
- Trees with Large Hollow(s) > 20cm
- Other Hollow-Bearing Trees

Numerous bird nests, mostly used by non-threatened bird species, were recorded, largely focused around Muscle Creek in the south of the study area where vegetation was in better condition. One large predatory stick nest was recorded in the study area. Although varied, foraging resources within the study area were largely restricted to canopy, sub-canopy and groundcover species. The shrub stratum was either absent or sparse in cover, except for vegetation along and immediately north of Muscle Creek.

Most of the vegetation likely to be impacted by the proposed modification consists of fragmented remnants, whilst the larger, more intact remnants within the study area have been avoided through detailed design.

While the study area includes several built structures, including a single-lane old wooden rail bridge and two concrete box culverts, that are known to occasionally provide habitat opportunities for threatened species such as Yangochiropteran bats, these structures do not occur within the proposed modification areas. As such, no additional impacts are expected to occur as a result of the proposed modification.

Two Southern Myotis (*Myotis macropus*) individuals were recorded roosting within one of the concrete box culverts within Modification Area 11.

Threatened ecological communities

Three Threatened Ecological Communities (TEC) (BC Act) were found within the proposed modification construction footprint as shown in Table 6-3. In summary:

- Central Hunter Grey Box- Ironbark Woodland was recorded at Modification Areas 3, 4, 5, 6, 7, 8, 9, 12, 14, and 15 and water crossing 1, 2 and 3.
- Central Hunter Ironbark – Spotted Gum – Grey Box Forest was recorded at Modification Area 3 only.
- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grasslands was recorded at Modification Areas 5, 6, 10, 13 and 15 and water crossings 3 and 4.
- Hunter Floodplain Red Gum Woodland was not recorded in any of the modification areas, only at a single temporary water crossing location (number 3).

Table 6-3: Extent of BC Act listed threatened ecological communities

Threatened ecological community	BC Act Listing	Condition	Project BAR construction footprint (ha)	Modification construction footprint (ha)	Cumulative impact (ha)
Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions	E	Remnant	13.63*	2.31	15.94
		DNG	38.39	7.11	45.50
Central Hunter Ironbark – Spotted Gum – Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions	E	Remnant	0.67	0.02	0.69
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grasslands	CE	Remnant	5.74	1.66	7.40
		DNG	32.21	4.87	37.08
Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions	E	Remnant	0.08	-	0.08
		DNG	3.38	-	3.38

** The impact area has been adjusted to take into consideration exclusion zones now added to the BAR construction footprint to minimise the impact on the Central Hunter Valley eucalypt forest and woodland Critically Endangered Ecological Community listed under the EPBC Act.*

Groundwater-dependent ecosystems

Three PCTs identified within the study area are considered likely to be classified as groundwater-dependent ecosystems (GDE) as follows:

- PCT 42 and PCT 485 are highly likely to be GDEs
- PCT 1693 is likely a terrestrial GDE which may access the water table on an intermittent basis
- The remaining PCTs (1604, 1605, 1607 and 1691) have low potential to be GDEs.

The proposed modification has the potential to, directly and indirectly, interfere with subsurface and groundwater flows associated with the GDEs identified within the study area, primarily at the four temporary water crossing locations.

In addition to the above, a wetland was identified bordering the northern boundary of the study area between Muscle Creek Road and the New England Highway. The wetland is an intermittent linear waterway that has been artificially modified (via the construction of dam walls) to allow water to pool for agriculture. This wetland is unlikely to be directly or indirectly impacted by the proposed modification as it occurs upstream and outside of the modification area.

No groundwater aquifer or cave systems were identified within the study area from the field surveys and desktop assessment.

Threatened species and populations

Threatened flora species

The listed threatened species are consistent with those mentioned in Section 6.1.2 of the project REF, with the exception of *Prasophyllum petilum* and *Pterostylis chaetophora*, which were not located in the proposed modification areas.

A population of 12 River Red Gum (*Eucalyptus camaldulensis*) was recorded within the study area and is listed as an Endangered Population in the Hunter catchment under the BC Act. None of the 12 individuals occur within the proposed modification area. They are however located upstream of temporary water crossing 3 and as a result the impacts of the proposed modification could include potential indirect impacts. Planted specimens of *Eucalyptus camaldulensis* recorded within some areas of native plantings and along Muscle Creek do not form part of this Endangered Population and, as such, have not been assessed further.

Threatened fauna species

The desktop assessment identified 91 BC Act threatened fauna species as being known or predicted to occur in the locality of the study area. Of these, 43 were considered to have a moderate to high likelihood of occurring within the proposed modification area (refer to Appendix A - Habitat Assessment of Appendix B) consistent with the project REF. These species became candidate species for detailed targeted surveys.

Critical habitat

No critical habitat was found within or in the locality of the study area or the proposed modification areas.

Wildlife connectivity corridors

Wildlife corridors within the study area are already subject to fragmentation due to the existing road and rail infrastructure, which may already limit regular fauna movement. Similarly, most native vegetation in the locality has been historically cleared or thinned, which has also fragmented local wildlife connectivity.

The main remaining connected wildlife corridors are located:

- Along Muscle Creek and associated areas
- Areas to the north and south of Coal Road
- Remnant treed areas between Sandy Creek and Coal Road.

While the study area and proposed modification areas are not likely to act as a key wildlife corridor in isolation, it nevertheless contains some important habitats and connectivity that have been considered as part of the project REF.

Matters of National Environmental Significance

Threatened communities listed under the EPBC Act

Two EPBC Act-listed TECs were identified within the study area and modification areas as shown in Table 6-4.

Table 6-4: Summary of EPBC Act listed threatened ecological communities' extent

EPBC Act listed threatened ecological community	EPBC Act Listing	Project REF construction footprint (ha)*	Modification area (ha)	Cumulative impact (ha)
Central Hunter Valley eucalypt forest and woodland	Critically Endangered	8.70	0.17	8.87
White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grasslands	Critically Endangered	0.58	-	0.58

** The impact area has been adjusted to consider exclusion zones now added to the BAR construction footprint to minimise the impact on the Central Hunter Valley eucalypt forest and woodland Critically Endangered Ecological Community listed under the EPBC Act.*

Threatened flora listed under the EPBC Act

Two listed threatened flora species under the EPBC Act were considered to have a moderate likelihood of occurrence within the modification areas (Appendix A of Appendix B and Table 6-5) based on the habitat available. No EPBC Act-listed threatened flora species were recorded within the study or proposed modification area during targeted surveys.

Table 6-5: Threatened flora species listed on the EPBC Act with moderate or higher likelihood of occurrence

Scientific name	Common name	BC Act	EPBC Act	Potential occurrence	Affected species?
Eucalyptus Glaucina	Slaty Red Gum	Vulnerable	Vulnerable	Moderate. Associated habitat is present in the form of PCT 1691 and PCT 1604. No individuals were recorded during targeted surveys.	No – surveyed
Ozothamnus tesselatus	-	Vulnerable	Vulnerable	Moderate. Associated habitat is present in the form of PCT 1691 and PCT 1604. No individuals were recorded during targeted surveys.	No – surveyed

Threatened fauna listed under the EPBC Act

Fifteen EPBC Act-listed threatened fauna species were recorded or are considered likely to utilise habitat identified within modification areas and outlined in Section 6.1 of the project REF.

Four EPBC Act-listed threatened fauna species were recorded within the study area during targeted surveys, including:

- Striped Legless Lizard (*Delma impar*)
- White-throated Needletail (*Hirundapus caudacutus*)
- Koala (*Phascolarctos cinereus*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*).

Migratory species

One migratory species listed under the EPBC Act was recorded within the study area, and six migratory species are considered to have a moderate likelihood of occurring within the study area, as shown in Table 6-6.

Table 6-6: Migratory fauna species recorded or with a moderate or higher likelihood of occurrence

Scientific name	Common name	BC Act	EPBC Act	Potential occurrence
Anthochaera phrygia	Regent Honeyeater	Critically Endangered	Critically Endangered, Migratory	Moderate
Gallinago hardwickii	Latham's Snipe	-	Migratory	Moderate
Hirundapus caudacutus	White-throated Needletail	-	Vulnerable, Migratory	Recorded
Monarcha melanopsis	Black-faced Monarch	-	Migratory	Moderate
Myiagra cyanoleuca	Satin Flycatcher	-	Migratory	Moderate
Rhipidura rufifrons	Rufous Fantail	-	Migratory	Moderate
Rostratula australis	Australian Painted Snipe	Endangered	Endangered, Migratory	Moderate

Consistent with the findings of the project REF, the White-throated Needletail was recorded foraging in airspaces above the study area, and it is considered likely that individuals would intermittently hunt in the aerial habitats associated with the locality during seasonal occurrences. This species has the potential to utilise a wide variety of habitats, including disturbed and modified areas.

The habitats within the study area are not considered important for any of the listed species since they are unlikely to support significant proportions of the population of any migratory species, nor are the habitats critical to any life stage of these species. Due to their mobile nature, the species are likely to utilise higher quality habitats within the wider area and where more extensive tracts of native vegetation occur. Thus, the proposed modification is unlikely to impact migratory species significantly.

Wetlands of international importance

Database searches revealed one wetland of international importance within proximity to the study area. The Hunter Estuary wetland is located about 50 – 100 km upstream from the study area. The study area does not contain waterways connected to this wetland; therefore, the proposed modification is considered unlikely to result in any impact.

World or national heritage

Database searches identified no world or national heritage places within 10 km of the study area. Therefore, none are likely to be impacted by the proposed modification.

6.1.3 Potential impacts

Construction

Removal of native vegetation

It is estimated that up to 15.99 ha of additional native vegetation (3.99 ha of remnant vegetation and 12 ha of DNG) would require removal by the proposed modification (see Table 6-7). This represents a total project impact of 113.73 ha of native vegetation and associated habitats. Of this, 87.66 ha is comprised of highly modified DNG, and 26.07 ha consists of low to high-condition remnant vegetation. It is noted that this clearing area represents a worst-case scenario as the modified construction footprint includes additional areas to allow flexibility in design and accommodate temporary structures and ancillary features, such as access tracks, site compounds and laydown areas, during construction. The proposed modification would also result in the removal of areas of vegetation including:

- Highly disturbed areas with no or limited native vegetation
- Native plantings (including mine rehabilitation)
- Urban/exotic plantings.

As part of the biodiversity assessment for the proposed modification, a substantial effort was made by Transport to avoid impacts on higher quality vegetation and associated habitats where possible. Where avoidance was possible, exclusion zones have been established as shown on Figure 6-1 and Figure 6-2, resulting in the reduction of impact to 0.18 ha of remnant vegetation within the construction footprint and 9.24 ha within the proposed modification areas. This has led to an overall reduction to the projects impact on Central Hunter Eucalypt Forest threatened ecological community listed under the EPBC Act compared to that previously assessed in the project REF.

Table 6-7: Comparative vegetation clearing areas on PCTs

Plant community type (PCT)	Condition class	TEC (BC Act)	TEC (EPBC Act)	Project REF construction footprint	Modification construction footprint (ha)	Cumulative project impact (ha)
Native plant community types						
PCT 1691 Narrow-leaved Ironbark – Grey Box grassy woodland of the central and upper Hunter	Moderate	Yes – Central Hunter Grey Box-Ironbark Woodland (Endangered)	Yes – Central Hunter Valley eucalypt forest and woodland (Critically Endangered)	8.64*	0.11	8.75
	Low (remnant)		Partial - Central Hunter Valley eucalypt forest and woodland (Critically Endangered)	4.93	2.14	7.07
	Low (DNG)		No	38.39	7.11	45.50
PCT 1604 Narrow-leaved Ironbark – Grey Box - Spotted Gum shrub – grass woodland of the central and lower Hunter	Low (remnant)	Yes – Central Hunter Ironbark – Spotted Gum -Grey Box Forest (Endangered)	No	0.67	0.02	0.69
PCT 1605 Narrow-leaved Ironbark – Native Olive shrubby open forest of the central and upper Hunter	Moderate	Yes – Central Hunter Grey Box – Ironbark Woodland (Endangered)	Yes – Central Hunter Valley eucalypt forest and woodland (Critically Endangered)	0.06	0.06	0.12
PCT 1607 Blakely's Red Gum – Narrow-leaved Ironbark – Rough-barked Apple shrubby woodland of the upper Hunter	Good	Yes – White Box – Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Critically Endangered)	Yes – White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland	0.56	-	0.56
	Low (remnant)		No	0.09	0.02	0.11
	Low (DNG)		No	1.02	-	1.02
PCT 1693 Yellow Box – Rough-barked Apple grassy woodland of the upper Hunter and Liverpool Plains	Good	Yes – White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Critically Endangered	Yes – White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland	-	-	-
	Moderate			0.02	-	0.02
	Low (remnant)		No	5.07	1.64	6.71
	Low (DNG)		No	31.19	4.87	36.06
PCT 42 River Red Gum / River Oak riparian woodland wetland in the Hunter Valley	Low (remnant)	Hunter Floodplain Red Gum Woodland (Endangered)	No	0.08	-	0.08
	Low (DNG)		No	3.38	-	3.38
PCT 485 River Oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion)	Moderate	No	No	1.78	-	1.78
	Low (remnant)	No	No	0.18	-	0.18
	Low (DNG)	No	No	1.68	0.02	1.70

Plant community type (PCT)	Condition class	TEC (BC Act)	TEC (EPBC Act)	Project REF construction footprint	Modification construction footprint (ha)	Cumulative project impact (ha)
Total extent of native vegetation				**97.74***	**15.99**	**113.73**
Total extent of native remnant vegetation				**22.08***	**3.99**	**26.07**
Total extent of native derived vegetation				**75.66**	**12.00**	**87.66**
Non-native miscellaneous ecosystems						
Highly disturbed areas with no or limited native vegetation	n/a	No	No	78.46	19.28	97.74
Urban/exotic plantings	n/a	No	No	0.48	0.18	0.66
Native plantings (including mine rehabilitation)	n/a	No	No	5.87	4.13	10.00
Cropping	n/a	No	No	5.36	-	5.36
Total extent of non-native vegetation				**90.17**	**23.59**	**113.76**

**The impact area has been adjusted to take into consideration exclusion zones now added to the BAR construction footprint to minimise the impact on the Central Hunter Valley eucalypt forest and woodland Critically Endangered Ecological Community listed under the EPBC Act (includes 0.18 ha of moderate condition PCT 1691). Areas of Central Hunter Valley eucalypt forest and woodland within these exclusion zones will not be removed by the project.*

Removal of threatened flora

The proposed modification is anticipated to have limited impacts, primarily confined to potential indirect effects related to the temporary water crossing along Muscle Creek, affecting the Endangered Population of Eucalyptus camaldulensis. Should such impacts arise, they would be minor and temporary. The project design has successfully avoided all direct impacts.

Removal of threatened fauna habitat

Vegetation provides suitable habitat and habitat features for a range of threatened fauna species listed under the BC Act and/or EPBC Act. As such, direct impacts to habitat for threatened fauna species would occur during construction due to vegetation removal. The direct impacts of the proposed modification on threatened fauna habitat have been estimated based on a worst-case scenario (i.e., removal of all vegetation within the construction footprint) (refer to Appendix B for a breakdown of direct impacts).

The key threatening processes, as listed under the BC Act, associated with the removal of fauna habitat features are listed below, with the additional impacts resulting from the proposed modification identified:

- **Loss of hollow-bearing trees**: Around 17 additional hollow-bearing trees containing large hollows would potentially require removal as part of the proposed modification.
- **Removal of dead wood and dead trees**: Consistent with the project REF, dead wood on the ground scattered through the proposed modification construction footprint would require removal/ translocation.
- **Bushrock removal:** Consistent with the project REF, areas containing surface and partially submerged bush rock are likely to require to be removed/translocated.
- **Clearing of native vegetation**: The proposed modification would contribute to this process through the clearing of up to an additional 15.99 ha of native vegetation (3.99 ha of remnant and 12.00 ha of DNG).
- **Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands:** The proposed modification has the potential to contribute to this process through the development of temporary crossings within four waterways, including Sandy Creek and Muscle Creek.

Aquatic impacts

Additional impacts on aquatic habitats are associated with the construction of four temporary water crossings included in the proposed modification. These water crossings are to assist with construction staging and access requirements. As discussed above (Section 6.1.2 under Aquatic fauna habitats), the two unnamed watercourses within the proposed modification area likely to be affected by the proposed modification are ephemeral and in poor condition. These waterways were either not classified as Key Fish Habitat (Department of Primary Industries, 2013) and/or, based on observations, were likely to align to Class 3 (minimal key fish habitat) or Class 4 (unlikely key fish habitat).

Sandy Creek and Muscle Creek are recognised as Key Fish Habitat and are assessed as a class 3 and class 2 watercourse, respectively. However, it is unlikely that threatened species would occur within any aquatic habitat based on the poor, and disturbed condition of the habitat present. The proposed modification may alter the hydrology; directly impact on substrate and ground cover vegetation resulting in erosion and sedimentation; lead to short-term shading of the waterway; or lead to the removal or relocation of the aquatic vegetation and microhabitats.

The potential impact resulting from the proposed modification would be relatively minor given the existing levels of disturbance within the waterways and with the implementation of appropriate mitigation measures. As such, the proposed modification is unlikely to significantly exacerbate existing impacts and the impacts resulting from the construction of temporary water crossings is expected to be consistent with the project REF.

Injury and mortality

Injury and mortality of fauna could occur during both construction activities and during the operation of the project. Specifically, injury and mortality may occur when:

- Vegetation and habitat are being cleared, and when trenches are dug
- Machinery and plant is moved to, from and on site
- During public use of the road during the operational phase of the project.

The impacts associated with the modification areas are consistent with those assessed in the project REF

Indirect/operational impacts

Alteration to wildlife connectivity and habitat fragmentation

Habitat fragmentation divides continuous habitats into smaller, often inhospitable fragments, impacting species and their populations. Newly created habitats are utilised by aggressive species, affecting wildlife in adjacent fragments.

The proposed modification would impact wildlife connectivity and habitat fragmentation, similar to the assessment in the project REF. Mitigation measures such as underpasses, overpasses, and fauna fencing were identified as suitable solutions in the original connectivity assessment. These options provide road mitigation that enables terrestrial wildlife movement across sections of the new highway while adhering to road safety guidelines. The proposed modification would not require any additional mitigation measures.

Edge effects on adjacent native vegetation and habitat

The proposed modification would contribute to the project's overall edge effect impacts and incrementally increase existing edge effects within the study area. However, given the highly modified nature of large areas that would be impacted, this increase is likely to be of low magnitude and no additional mitigation is required.

Invasion and spread of weeds

The spread of weed and pest species is likely to occur during construction as an indirect impact of the project REF. Impacts would be greatest during vegetation clearing associated with the construction phase of the proposal with the most likely causes of weed dispersal and importation being associated with earthworks, movement of soil, and attachment of seed (and other propagules) to vehicles and machinery.

The impacts of the proposed modification on the invasion and spread of weeds would be consistent with the project REF, and no additional impacts are expected

Invasion and spread of pests

The study area provides habitats for a range of commonly occurring pest species, including European foxes and rabbits. The proposed modification has the potential to disperse pest species across the surrounding landscape. However, the magnitude of this impact would be low, and mitigation measures are not deemed necessary. The proposed modification would not alter this assessment.

Invasion and spread of pathogens and disease

The following pathogens are considered to have the potential to affect biodiversity within the construction footprint:

- Amphibian Chytrid Fungus (Batrachochytrium dendrobatidis)
- Exotic Rust Fungi (order Pucciniales, e.g. Myrtle rust fungus Uredo rangelii)
- Phytophthora Root Rot Fungus (Phytophthora cinnamomi).

These pathogens may potentially exist within the construction footprint, consistent with those recorded in the project REF. No additional mitigation measures would be required for the proposed modification.

Changes to hydrology

The study area's natural soil infiltration features and properties have been used as a drainage design philosophy to minimise impacts associated with hydrology. However, the proposed modification would likely result in further localised alterations to the current hydrology at the four temporary water crossing locations. These impacts could include alterations to the stream banks to create cuttings to allow access, modification or removal of in-stream features, potential temporary dewatering or ponding of flows and installation of structures.

Groundwater dependent ecosystems

The proposed modification has the potential to directly and indirectly interfere with subsurface and/or groundwater flows associated with the GDEs. These impacts would mainly occur at the four temporary water crossing locations along Muscle Creek, Sandy Creek, and their tributaries. These impacts align with those assessed in the project REF and no additional mitigation measures are proposed.

The wetland located to the north of the study area is not expected to be affected by the proposed modification, as it is outside of the construction footprint.

Noise, light and vibration

The potential noise, light, and vibration effects of the proposed modification are in line with those evaluated in the project REF. While there might be some impacts on fauna due to noise and vibration during construction, these species are already accustomed to existing traffic noise, resulting in a minor additional impact. As such, no specific mitigation measures are considered necessary.

Cumulative impacts

The potential cumulative impact on biodiversity due to the project and proposed modification is assessed within the context of the existing environment. The project would not be the sole contributor to impacts, as other developments are also affecting biodiversity. The project would impact native vegetation and habitats, with the proposed modification further adding to this impact by removing additional native vegetation. However, while impacts would incrementally increase, they are not expected to significantly worsen existing impacts, and the project's overall effects are relatively low compared to other local developments.

Operation

The proposed modification is not expected to have additional impacts on the biodiversity when it is operational. This is consistent with the approved project REF.

Conclusion on the significance of impacts

Assessment of significance for threatened species, populations, or ecological communities that have been positively identified within the study area or that are considered to have a moderate or high likelihood of using habitat affected by the proposed modification indicates that impacts are consistent with the project REF. Therefore, a significant impact assessment wasn't completed.

The additional impacts of the proposed modification to threatened biodiversity are unlikely to be significant. Given the proposed modification is not considered likely to lead to a significant impact on threatened species, populations, ecological communities or their habitats, a Species Impact Statement (SIS) is not required under the BC Act to support this proposal.

In respect to Matter of National Environmental Significance including threatened flora, fauna and communities, a referral of the proposal for consideration as a controlled action under the EPBC Act is not required.

6.1.4 Safeguards and management measures

Safeguards and management measures specific to the proposed modification are provided in Table 6-8 below.

Table 6-8: Additional mitigation measures for the proposed modification

Impact	Environmental safeguards	Responsibility	Timing	Reference
Removal of native vegetation	• Clearing native vegetation consistent with threatened ecological communities (in particular the Central Hunter Eucalypt Forest) will be minimised via selective placement of ancillary infrastructure, i.e. preference is to avoid areas of higher biodiversity value and to select areas already subject to disturbance, such as areas mapped as miscellaneous ecosystems or DNG. • Exclusion zones will be established, prior to early works and construction commencement, around the 'exclusion zones' to demarcate the limit of clearing in accordance with *Guide 2: Exclusion zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (Roads and Traffic Authority, 2011). Clearing of native vegetation within these 'exclusion zones' will not be permitted. Track works within the modification 3 exclusion zone will be limited to the existing	Construction contractor	Prior to construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
	access track only and no native vegetation removal within this exclusion zone is permitted. • Clearing of native vegetation consistent with the Central Hunter Eucalypt Forest threatened ecological community will be minimised wherever practicable and not exceed the original impact assessed in the project BAR (i.e. 8.88 ha). Mapping depicting the occurrence of this community within the construction footprint and 'exclusion areas' not permitted to be cleared will be provided to assist with further avoidance during construction. Track works within the modification 3 exclusion zone will be limited to the existing access track and no native vegetation removal within this exclusion zone is permitted.			
Removal of threatened species habitat and habitat features	Hollow resources contained within the proposed modification area will be avoided where possible. If impacted, these hollow resources are to be included in the project's Nest Box Strategy. The tree clearing program will inform final hollow resource impacts and subsequent nest boxes required.	Construction contractor	Prior to construction	Additional safeguard
Biodiversity offsets	The project's Biodiversity Offset Strategy, prepared in accordance with Transport's Guidelines for Biodiversity Offsets (Roads and Maritime Services, 2016), will be revised to include additional residual impacts and subsequent offsetting requirements associated with the proposed modification.	Construction contractor	Prior to construction	Additional safeguard
Aquatic biodiversity	• Aquatic habitat will be protected in accordance with Guide 10: Aquatic habitats and riparian zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (Roads and Traffic Authority, 2011) and Section 3.3.2 Standard precautions and mitigation measures of the Policy and guidelines for fish habitat conservation and management Update 2013 (Department of Primary Industries, 2013). • If required, relevant approvals and permits required under the FM Act will be obtained prior to any impacts occurring. • Temporary in-stream structures are to be installed during low-flow periods, with management plans being submitted to DPI detailing how high-flow events will be managed to limit erosion of the structure and associated sedimentation of downstream waterways. An Environmental Work Method Statement will be prepared to manage this activity and submitted to Transport and DPI for review and approval. • Any aquatic habitat removed, such as woody debris, snags and river pebbles, would be relocated instream by a suitably qualified ecologist. • Structural crossing components are to be installed outside of the waterway where possible to avoid in-stream disturbance. • An Environmental Work Method Statement would be prepared to provide appropriate protocols to minimise impacts to any fish should dewatering be required for any temporary water crossings. If	Construction contractor	Construction	Additional safeguard

Impact	Environmental safeguards	Responsibility	Timing	Reference
	required, any dewatering of temporary in-stream structures will be undertaken in accordance with the following procedure: 1. DPI Fisheries to be notified seven days prior to any dewatering activities in order to organise potential fish rescue activities. 2. A separate section.37 permit may be required from DPI - Fisheries to relocate fish. 3. Water is to be pumped a minimum of 30 metres away from the waterway and treated as required. 4. A water quality monitoring program is to be provided to Transport prior to any water re-entering the waterway. Any water re-entering the waterway would be required to meet water quality criteria under this program. The project's Biodiversity Offset Strategy prepared in accordance with Transport's Guidelines for Biodiversity Offsets (Roads and Maritime Services, 2016) would be revised to include additional offsetting requirements for residual aquatic impacts.			

Biodiversity offsets

Transport for NSW would provide biodiversity offsets or where offsets are not reasonable or feasible, supplementary measures for additional impacts that exceed the thresholds in the Transport for NSW's 'Guideline for Biodiversity Offsets' (Roads and Maritime Services, 2016) associated with the proposed modification. A comparison of the project and proposed modification's combined residual impacts against the predetermined thresholds is provided in Table 6-9 The assessment indicates that additional offsets would be required as the impacts of the proposed modification further contribute to the project exceeding the biodiversity offset thresholds.

The proposed modification triggers the offsetting threshold for the following matters:

- Clearing of 1.66 ha of White box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC in moderate to good condition
- Clearing of 2.13 ha of Central Hunter Valley Grey Box – Ironbark Woodland TEC listed under the BC Act in moderate to good condition
- Clearing of 3.81 ha of habitat for national and NSW-listed threatened fauna species (including 3.99 ha of species credit habitat for the Squirrel Glider and Koala)
- Clearing of 1.73 ha of habitat for Southern Myotis
- Potential impacts to Type 1 key fish habitat, to be determined during project construction if needed.

The proposed modification would require an additional 132 ecosystem credits (including 55 PCT 1691, 1 PCT 1604, 2 PCT 1605, 1 PCT 1607 and 73 PCT 1693 ecosystem credits) and 298 species credits (including up to 62 Southern Myotis, 118 Koala and 118 Squirrel Glider species credits) to compensate for the additional residual impacts on biodiversity in accordance with Transports '*Guideline for Biodiversity Offsets'* (Roads and Maritime 2016). The project's Biodiversity Offset Strategy has been revised to include these additional residual impacts and subsequent offsetting requirements associated with the proposed modification.

Table 6-9: Transport for NSW offset thresholds

Description of activity or impact	Consider offsets or supplementary measures	Does the project BAR trigger an offset?	An additional offset requires for the proposed modification?
Works involving clearing of national or NSW listed critically endangered ecological communities (CEEC)	Where there is any clearing of a CEEC in moderate to good condition	Yes, areas of vegetation in moderate to good condition consistent with two CEECs would be impacted upon including: 5.74 ha of White box – Yellow Box –Blakely's Red Gum Grassy Woodland and Derived Native Grassland listed as CEEC under BC Act (of which 0.58 ha is consistent with equivalent EPBC Act CEEC) 8.88 ha (now 8.87 ha) of Central Hunter eucalypt forest and woodland (CEEC under EPBC Act only). The project would also remove up to 22.26 ha (now 22.08 ha) of habitat for nationally listed threatened species.	Yes – additional impacts to one CEEC i.e. White box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland listed as CEEC under BC Act (1.66 ha) (equivalent to around 74 additional ecosystem credits). These areas do not meet the equivalent EPBC Act CEEC. Cumulative impacts on Central Hunter eucalypt forest and woodland CEEC listed under the EPBC Act remain under 8.88 ha due to avoidance measures implemented – no additional offsets anticipated for this CEEC.
Works involving clearing of national listed threatened ecologically community (TEC) or nationally listed threatened species habitat	E=Where clearing >1 ha of a TEC or habitat in moderate to good condition	Yes, 8.88 ha (now 8.87 ha) of a nationally listed TEC in moderate to good condition (i.e. Central Hunter Valley eucalypt forest and woodland) would be directly impacted upon by the project – as specified in the above section.	Yes – the proposed modification would remove up to an additional 3.81 ha (assuming savings of 0.18 ha are made within the BAR construction footprint) of habitat in moderate to good condition for the nationally listed threatened species (this is equivalent to around 130 additional ecosystem credits). Cumulative impacts on nationally listed TECs will remain under the BAR assessed impact due to avoidance measures implemented – no additional offsets anticipated for these TECs.
Works involving clearing of NSW endangered or vulnerable ecological community	Where clearing > 5ha or where the ecological community is subject to an SIS	Yes, 13.81 ha (now 13.67 ha) of Central Hunter Grey Box – Ironbark Woodland EEC in moderate to good condition would require removal. Vegetation clearing of the remaining BC Act listed TECs would be <5 ha or are listed as CEECs and considered in the above sections.	Yes – an additional 2.13 ha of Central Hunter Grey Box – Ironbark Woodland EEC in moderate to good condition would require removal (assuming savings of 0.18 ha are made within the BAR construction footprint) (equivalent to around 55 additional ecosystem credits). Vegetation clearing of the remaining BC Act listed TECs would remain below 5ha or are listed as CEECs and considered in the above sections.
Works involving clearing of NSW listed threatened species habitat where the species is a species credit species as defined in the OEH Threatened Species Profile Database (TSPD)	Where clearing > 1ha or where the species is the subject of an SIS	Yes – up to 22.26 ha (now 22.08 ha) of habitat in moderate to good condition for the following species credit species: 22.26 ha of Squirrel Glider habitat 22.26 ha (now 22.08 ha) of habitat for the Koala 12.27 ha (now 12.12 ha) of habitat for the Southern Myotis.	Yes – up to an additional 3.81 ha (assuming savings are made within the BAR construction footprint) of habitat in moderate to good condition for the following species credit species: 3.81 ha of Squirrel Glider habitat (equivalent to an additional 119 species credits) 3.81 ha of habitat for the Koala (equivalent to an additional 119 species credits)

Description of activity or impact	Consider offsets or supplementary measures	Does the project BAR trigger an offset?	An additional offset requires for the proposed modification?
			1.73 ha of habitat for the Southern Myotis (equivalent to an additional 57 species credits).
Works involving clearing of NSW listed threatened species habitat and the species is an ecosystem credit species as defined in OEH's Threatened Species Profile Database (TSPD)	Where clearing > 5ha or where the species is the subject of an SIS	Yes, up to 22.26 ha (now 22.08 ha) of NSW listed threatened species habitat in moderate to good condition.	Yes - an additional 3.81 ha of NSW listed threatened species habitat in moderate to good condition (assuming savings of 0.18 ha are made within the BAR construction footprint). As mentioned above, this would be equivalent to around 130 ecosystem credits.
Type 1 or Type 2 key fish habitats (as defined by NSW Fisheries)	Where there is any net loss of habitat	No, all impacts to key fish habitat would be avoided.	To be determined during the construction phase of the project. Will only be required if temporary water crossing impact these habitats.

6.2 Noise and vibration

A Noise and Vibration Technical Report Addendum (AECOM, 2023) (Appendix E) was prepared for the proposed modification to assess the noise and vibration impacts from the proposed modification.

6.2.1 Methodology

The noise and vibration assessment involved a quantitative assessment of construction noise and vibration and operational noise, prepared with consideration of the guidelines as outlined in the approved project REF.

The noise and vibration assessment involved the following methodology:

- Reviewing existing assessments for relevant existing environment information such as sensitive receivers and existing noise environment, including:
  - Noise and Vibration Technical Report – Muswellbrook Bypass – Construction and Operational Noise and Vibration Assessment (Technical Report) (2021)
- Assessing potential noise and vibration impacts
- Reviewing existing mitigation measure and providing additional mitigation where required.

6.2.2 Existing environment

Section 6.6.2 of the approved project REF describes the existing noise and vibration environment. A summary is provided below.

Noise sensitive receivers

The noise sensitive receivers are provided in Appendix A of Appendix L of the approved project REF. Three noise catchment areas (NCAs) were established for the approved project REF and were used consistently for the noise assessment within the proposed modification. These are shown on Figure 6-5.

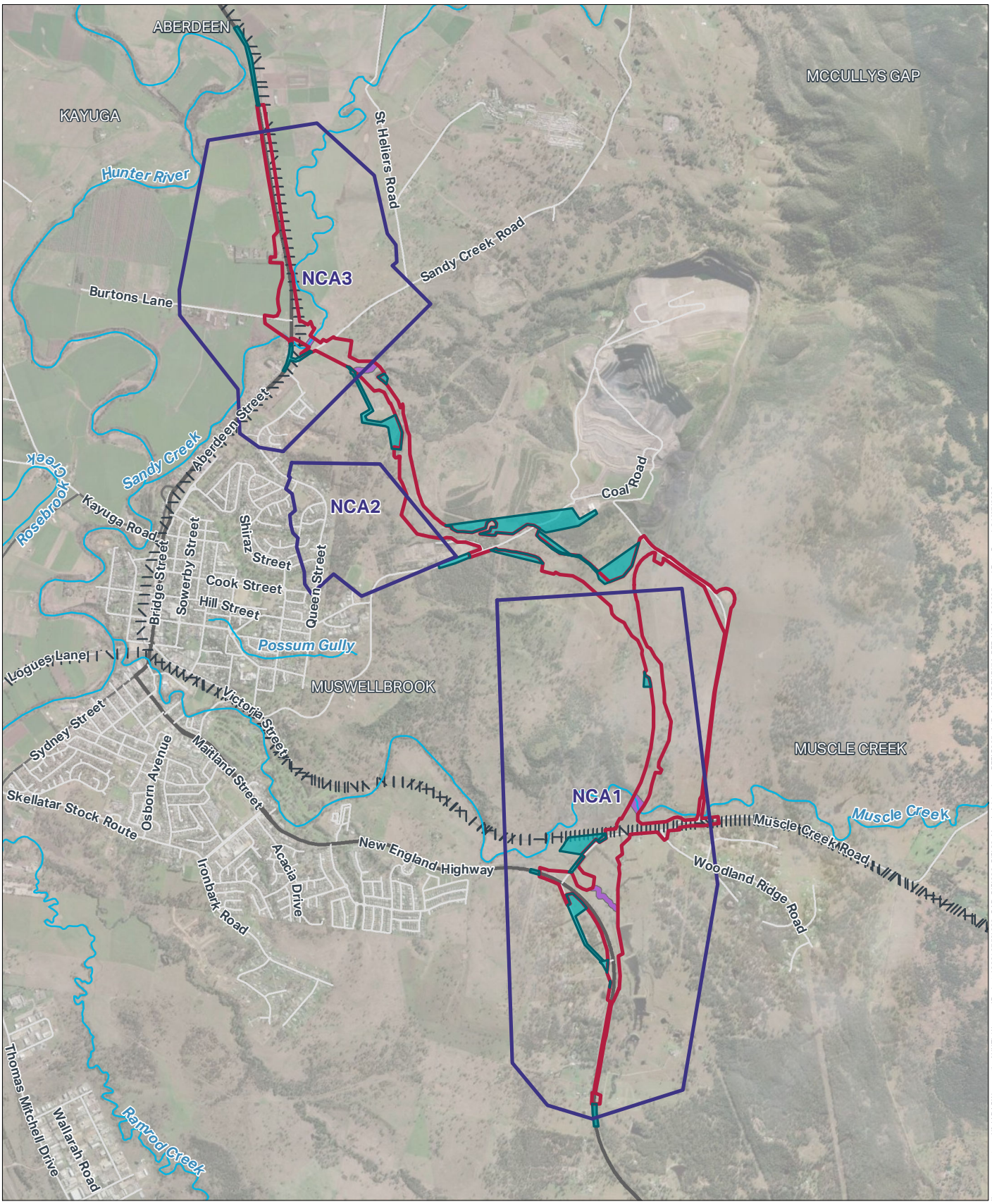

FIGURE 6-5: NCAS ESTABLISHED IN THE APPROVED

PROJECT REF

Legend

- Construction Footprint
- Proposed modification area
- Indicative location of temporary instream structures
- Noise catchment area
- State Road
- Regional Road
- Local Road
- Railway
- Watercourse

Background noise levels

The ambient and background noise levels were established for the approved project REF and are provided in summary below.

Table 6-10: Ambient and background noise levels

NCA	Rating background level dB(A)			Ambient noise level, dB(A)		
	Day[1] $L_{A90,15min}$	Evening[1] $L_{A90,15min}$	Night[1] $L_{A90,15min}$	Day[1] $L_{Aeq,15hr}$	Evening[1] $L_{Aeq,4\ hr}$	Night[1] $L_{Aeq,9\ hr}$
NCA1	33	32	29	55	52	49
NCA2	36	36	35	55	51	46
NCA3	32	35	32	51	47	46

Notes: 1. Day is defined as 7:00 am to 6:00 pm, Monday to Saturday and 8:00 am to 6:00 pm Sundays and public holidays; Evening is defined as 6:00 pm to 10:00 pm, Monday to Sunday and public holidays; Night is defined as 10:00 pm to 7:00 am, Monday to Saturday and 10:00 pm to 8:00 am Sundays and public holidays.

6.2.3 Criteria

Construction noise management levels were developed for the approved project REF for standard construction hours (day) and outside of standard construction hours (evening and night) in accordance with the *Interim Construction Noise Guideline*. These are provided below.

Table 6-11: Noise catchment areas and construction noise management levels

NCA	Period[1]	Rating background level, dB(A)[3]	Construction noise management level
NCA1	Day	33	43
	Evening	32	37
	Night	30[2]	35
NCA2	Day	36	46
	Evening	36	41
	Night	35	40
NCA3	Day	32	42
	Evening	32	37
	Night	32	37

Notes:
1. Day is defined as 7:00 am to 6:00 pm, Monday to Saturday and 8:00 am to 6:00 pm Sundays and public holidays; Evening is defined as 6:00 pm to 10:00 pm, Monday to Sunday and public holidays; Night is defined as 10:00 pm to 7:00 am, Monday to Saturday and 10:00 pm to 8:00 am Sundays and public holidays.
2. In accordance with Noise Policy for Industry Table 2.1, a minimum RBL has been adopted where the measured RBL is less than 35 dB(A) during the day, 30 dB(A) in the evening, or 30 dB(A) at night.
3. The Noise Policy for Industry notes that the community generally expects a greater control of noise during the evening and night as compared to the daytime. Therefore, the evening RBL is set to no more than that for the daytime and the night time to no more than the evening.

The construction noise management levels that apply to other sensitive receivers (when in use) include:

- Schools, hospital, and places of worship – 45 dB(A) internal noise level
- Active recreation – 65 dB(A) external noise level
- Passive recreation – 60dB(A) external noise level
- Industrial properties – 75 dBA(A) external noise level
- Commercial properties – 70 dB(A) external noise level.

Construction road traffic noise

The construction road traffic noise criteria are consistent with the approved project REF, as stated in Section 2.2 of Appendix E.

Construction vibration criteria

Humans are sensitive to vibration such that they can detect vibration levels well below those required to cause any risk of damage to a building or its contents. Aligning with the *German Standard Structural Vibration Part 3: Effects of vibration on structures, DIN 4150-3 -1999 (DIN 4150) and BS 7385-2*, the construction vibration standards for the proposed modification are in Table 6-12 and Table 6-13.

Table 6-12: DIN 4150: Structural damage safe limits for building vibration

Group	Type of structure	At foundation at a frequency of:			Vibration at the horizontal plane of the highest floor
		Less than 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz	All frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	50
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to hose listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

Table 6-13: BS 7385-2: Transient vibration guide values for cosmetic damage

Group	Type of structure	Peak component particle velocity range of predominant pulse	
		4 Hz to 15 Hz	4 Hz to 15 Hz
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Ground-borne noise

Recommended ground-borne noise goals for construction are outlined in Table 6-14.

Table 6-14: Recommended ground-borne noise goals for construction

Time	Ground borne noise goals
Evening (6pm to 10 pm)	40 dB(A) $L_{Aeq, (15\ min)}$
Night time (10 pm to 7 am)	35 dB(A) $L_{Aeq, (15\ min)}$

Blasting

The air blast pressure for the proposed modification must not exceed the limits outlined in the approved project REF, specifically 133 dB (linear) peak for any blasts.

The following site asset protection PPV limit should apply within the substation boundary:

- 20 mm/s for 90 per cent of blasting events over a rolling period of 12 months
- Maximum 25 mm/s for any one blasting event.

Sleep disturbance

The sleep disturbance criteria for the approved project REF is provided in Table 6-15, and would be applied to the proposed modification.

Table 6-15: Construction noise sleep disturbance criteria

NCA	Rating background level, dB(A)	Sleep disturbance screening LA1(1min) criteria, dB(A)	Sleep disturbance awakening reaction LA1(1min) criteria, dB(A)
NCA1	30	45	65
NCA2	35	50	65
NCA3	32	47	65

Operational road traffic noise criteria

For the approved project REF, the operational road traffic noise criteria were assigned to sensitive receivers using the Roads and Maritime's Noise Criteria Guideline. The same criteria would be used for the proposed modification, as summarised below.

Table 6-16: Operational noise criteria

Noise logger	Type of proposal/land use	Measured road traffic noise level, dB(A)	
		Day (7am to 10pm),	Night (10pm to 7am),
Freeway/ arterial/ sub arterial	Existing residences affected by noise from new freeways/arterial/sub arterial road corridors	LA_{eq}(15 hr) 55 (external)	LA_{eq}(9 hr) 50 (external)
	Existing residences affected by noise from redevelopment of existing freeways/arterial/sub-arterial roads	LA_{eq}(15 hr) 60 (external)	LA_{eq}(9 hr) 55
	Existing residences affected by both new roads and the redevelopment of existing freeway/arterial/sub-arterial roads in a Transition Zone1	Between LA_{eq}(15 hr) 55-60 (external)	Between LA_{eq}(9 hr) 50-55 (external)
	Existing residences affected by increases in traffic noise of 12 dB(A) or more from new freeway/arterial/sub-arterial roads2	Ranges between LA_{eq}(15 hr) 42-55 dependent on existing traffic noise	Ranges between LA_{eq}(15 hr) 42-50

Notes:
1. The criteria assigned to a façade depend on the proportion of noise coming from the existing road. Refer Roads and Maritimes' Noise Criteria Guideline for further information
2. The criteria at each façade are determined from the existing traffic noise level plus 12 dB(A).

The criteria for non-residential sensitive receivers near the proposed modification is provided in section 6.6.3 of the approved project REF.

6.2.4 Potential impacts

Construction

Various construction work activities were assessed within section 6.6.4 of the approved project REF for the predicted noise levels for each construction scenario against the relevant noise criteria. It is noted that for the assessment, works to be undertaken at Modification Areas 1, 12 and 15 comprise installation of signage, which would be undertaken during standard construction hours only. This work is considered to produce relatively low noise levels compared to the noise levels produced in the adjacent areas in the approved project REF, and as such, Modification Areas 1, 12 and 15 have not been considered further within this assessment.

Standard hours

Modification area 10

Noise levels from the works associated with the additional compound within Modification Area 10 would slightly exceed the noise management levels at nearby receivers during a number of scenarios, such as utility relocations, vegetation clearing and establishment work. This exceedance would be less than 10 dB(A) and no residences would be highly affected.

Modification area 13

Noise levels from the work associated with the additional compound within Modification Area 13 would exceed the noise management levels at nearby receivers in NCA1 during a number of scenarios. Exceedances of less than 20 dB(A) are expected at one residence during utility relocation and vegetation clearing, and three residences during establishment works. No residences are predicted to be highly affected.

Modification area 14

Noise levels from the work associated with the additional compound within Modification Area 14 would exceed the noise management levels at nearby receivers within NCA1 during a number of scenarios. The majority of exceedances are less than 10dB(A), with exceedances of 20dB(A) expected at one residence during vegetation clearing and establishment. No residences are predicted to be highly affected.

Alignment works – proposed modification

Noise levels associated alignment works would exceed the NMLs at nearby receivers during a number of scenarios. The pavement works, utility relocations and earthworks are likely to cause the largest number of exceedances of the noise management levels. The majority of exceedances are less than 10 dB(A), however a number of exceedances are also expected in the 11-20 dB(A) range with some exceedances greater than 20 dB(A) predicted within the NCA3 catchment area, including:

- Up to 12 residences are predicted to be highly noise affected during earthworks. This is six more residences affected compared to the approved project.
- Up to nine residences are predicted to be highly noise affected during pavement works. This is an increase of eight compared to the approved project.
- Up to eight residences are predicted to be highly noise affected during finishing works and seven residences during utility relocations. No residences were predicted to be highly affected for these scenarios in the approved project.

Out of hours work

Modification area 10

Noise levels from the works associated with the Modification Area 10 additional compound may exceed the noise management levels by less than 5 dB(A) at nearby receivers within NCA1 during the laydown, storage and delivery works.

Modification area 13

Noise levels from the works associated with the Modification Area 13 additional compound may exceed the noise management levels by less than 15 dB(A) at nearby receivers within NCA1 during the laydown, storage and delivery works.

Modification area 14

Noise levels from the works associated with the Modification Area 14 additional compound may exceed the noise management levels by less than 15 dB(A) at nearby receivers within NCA1 during the laydown, storage and delivery works.

Alignment works – proposed modification

While the majority of the exceedances associated with alignment works are less than 15 dB(A), a number of exceedances are greater than 25 dB(A) mainly during pavement works. The majority of works along the alignment would be undertaken during standard hours, however, works out of hours is required to minimise disruption to usual traffic and rail movements.

Sleep disturbance

Modification area 10, 13 and 14

No exceedances of the sleep disturbance criteria are predicted due to the laydown works.

Alignment works – proposed modification

The pavement and utility relocation construction works are likely to cause the largest number of exceedances of the sleep disturbance criterion within NCA1 and NCA3. As the alignment works are progressive in nature, receivers would not be affected for the whole duration of construction works.

Construction road traffic noise

Construction traffic, traffic management arrangements and access during construction would be consistent with the arrangements for the approved project, with the proposed use of some new and existing access tracks. The predicted relative increase in traffic noise levels due to construction vehicle movements would be consistent with that in the project REF.

Construction vibration

Construction activities would result in a short-term increase in localised vibration levels. Vibration impacts focus on potential structural damage in close proximity to construction activities. Furthermore, it is possible that local sensitive receivers may perceive construction vibration at times. The level of annoyance, however, would depend on individuals.

In order to comply with the cosmetic/structural damage and human discomfort criteria, vibration intensive works should not be undertaken within the minimum working distances presented in Table 6-17.

Table 6-17: Recommended minimum working distances for vibration intensive plant

Plant	Rating/ description	Heritage (metres)	Cosmetic damage (metres)	Human response (metres)
Vibratory roller	< 50 kN (typically 1-2T)	8	5	15
	< 100 kN (typically 2-4T)	10	6	20
	< 200 kN (typically 4-6T)	20	12	40
	< 300 kN (typically 7-13T)	25	15	100
	> 300 kN (typically 13-18T)	30	20	100
	> 300 kN (>18T)	38	25	100
Drop hammer	3t enclosed (30kJ per blow assumed)	40	23	100
	5kJ per blow	17	10	35
Vibratory rig	50kJ per cycle	50	30	100
	10kJ per cycle	23	15	100
Pile boring	≤ 800 mm	4	2 nominal	N/A
Jack hammer	Handheld	1 nominal	Avoid contact with structure	Avoid contact with structure

Note:

1. *More stringent conditions may apply to heritage or other sensitive structures. Any heritage property would need to be considered on a case by case basis and assessed in accordance with DIN4150:3 Structural vibration - Effects of vibration on structures.*

Residential buildings and receivers

It is unlikely that vibration intensive works would be undertaken with the cosmetic damage minimum working distance (up to 30 metres for vibratory pile drivers). However, this should be confirmed during the detailed design with specific attention given to residential properties around Sandy Creek Road intersection works. Where vibration intensive works are proposed within minimum working distances, vibration monitoring should be undertaken to determine site specific minimum working distances and to ensure that appropriate thresholds are not exceeded.

Mitigation measures and safeguards as recommended in the approved project REF would appropriately minimise vibration impacts at residential buildings.

Heritage and other sensitive structures

Heritage and other sensitive structures (including any with Aboriginal significance) have the potential to be more sensitive to vibration than standard buildings. Mitigation measures and safeguards as recommended in the approved project REF would appropriately minimise vibration impacts at heritage structures.

Construction impact consistency with approved project REF

The proposed modification would result in:

- Up to 12 highly affected receivers during earthworks, including an additional six affected residences compared to the approved project
- Nine highly affected receivers during pavement works, resulting in an additional eight affected residences compared to the approved project
- Eight highly affected receivers during finishing works and seven residences during utility relocations. No residences were identified as highly affected for these scenarios for the approved project.

All construction works for the proposed modification are consistent with work previously assessed in the approved project REF. As there are no substantial change to equipment or the type of work to be undertaken, mitigation measure outlined in the Approved Project REF would manage potential noise impacts associated with the construction activities. No additional mitigation measures are required.

Operation

No additional receivers beyond those identified in the approved project REF are likely as a result of the proposed modification. Mitigation measures outlined in the approved project REF would manage potential impacts associated with road noise.

6.2.5 Safeguards and management measures

Safeguards and management measures outlined with the approved project REF would apply to the proposed modification. No additional mitigation measures are required.

6.3 Aboriginal heritage

An Aboriginal Cultural Heritage Assessment Report (CHAR) (Appendix F) was prepared by Kelleher Nightingale Consulting Pty Ltd (KNC) (2021) to assess the potential impacts to Aboriginal cultural heritage from the approved project, refer to Appendix C of the project REF.

The CHAR has been reviewed and updated by KNC (2023) (Appendix F) to assess whether there would be any potential additional impacts resulting from the proposed modification. The outcome of this review is summarised below.

6.3.1 Methodology

The methodology for the assessment of potential Aboriginal cultural heritage for the proposed modification involved:

- Desktop investigation, including Native title and Aboriginal Heritage Information Management System (AHIMS) database searches
- Review of approved project REF Aboriginal Cultural Heritage Assessment (KNC 2021), including:
  - Aboriginal Archaeological Survey Report – Stage 2 PACHCI
  - Aboriginal Archaeological Test Excavation Report – Stage 3 PACHCI (CHAR) (KNC, 2020)
- Review of Aboriginal Cultural Values Assessment (Waters Consultancy, 2020)
- Aboriginal stakeholder engagement with relevant registered Aboriginal parties (RAP) and stakeholders (ongoing since May 2019)
- Site survey of the proposed modification area, with representation from RAPs
- Assessment of Aboriginal heritage relevant to the proposed modification area

- Identification and assessment of potential impacts on Aboriginal heritage as a result of the proposed modification
- Review and identification of the need for any additional or revises mitigation measures compared to the approved project REF.

Study area

The study area for the CHAR assessment consists of the proposed modification area shown in Figure 1-2 and Figure 1-3.

6.3.2 Existing environment

The existing environment of the proposed modification area is generally consistent with the existing environment described in section 6.7.2 of the approved project REF and summarised below.

Aboriginal cultural heritage

Aboriginal sites and places identified by the AHIMS search 2023 in the modified study area are listed in Table 6-18 and Table 6-19.

Table 6-18: Aboriginal sites and places identified by the AHIMS search

Aboriginal site / place	Number identified for the approved project REF	Number identified for the proposed modification
Aboriginal sites are recorded in or near the above location	117	138
Aboriginal places have been declared in or near the above location	0	0

Table 6-19: Frequency of site types and context from the AHIMS search

Site context	Site feature	Frequency for the approved project REF	Frequency for the proposed modification
Open	Artefact	108	127
	Artefact; Potential Archaeological Deposit (PAD)	2	2
	Modified Tree (carved or scarred)	7	8
	Potential Archaeological Deposit	-	1
Total		117	138

The AHIMS search results revealed that there were 19 previous AHIMS registrations (comprising 13 Aboriginal archaeological sites) located within the original PACHCI Stage 3 assessment study area. All are open context sites featuring artefacts. The study area was subsequently refined (refer to Figure 1-1: and now contains 12 AHIMS registrations (comprising eight archaeological sites). These sites/places listed below are shown on Figure 6-20 and Figure 6-21:

- Muswellbrook Bypass AFT 1
- Muswellbrook Bypass AFT 2
- Muswellbrook Bypass AFT 3
- Muswellbrook Bypass AFT 4
- Muswellbrook Bypass AFT 5
- Muswellbrook Bypass AFT 6
- Muswellbrook Bypass AFT 7
- Muswellbrook Bypass AFT 8 (includes NH 1, NH 2 and NH 3)
- Muswellbrook Bypass AFT 9
- Muswellbrook Bypass AFT 10 (includes DMC 1, DMC 2 and DMC 3)

- Muswellbrook Bypass IF 1
- Muscle Creek.

No Aboriginal heritage items or places were listed on any other registers within or in the vicinity of the study area.

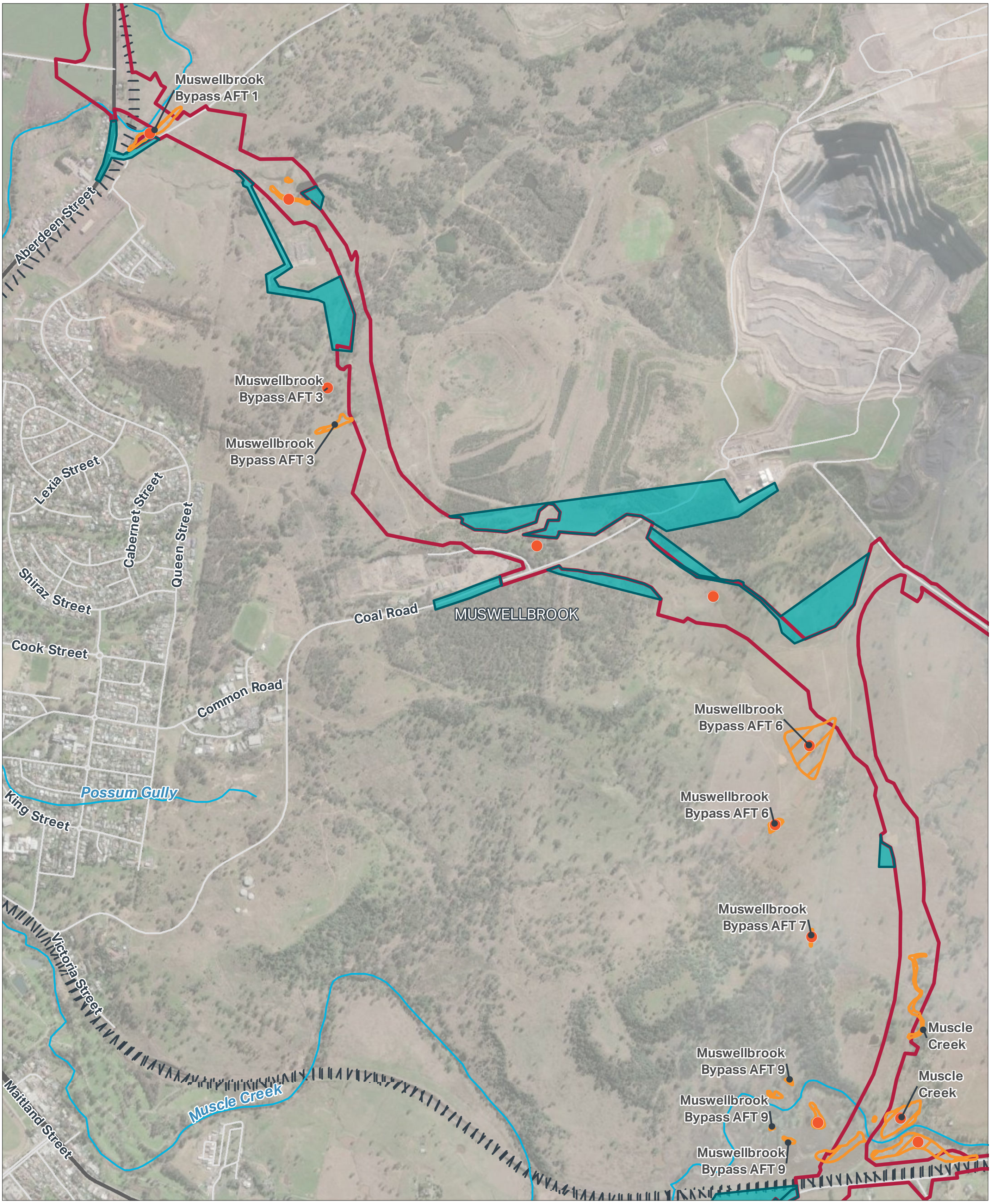

FIGURE 6-6: ABORIGINAL HERITAGE WITHIN THE STUDY AREA

N

0 250 500 m

Legend

- Construction Footprint
- Proposed modification area
- Archaeological Site
- Archaeological Site Location
- State Road
- Local Road
- Railway
- Watercourse

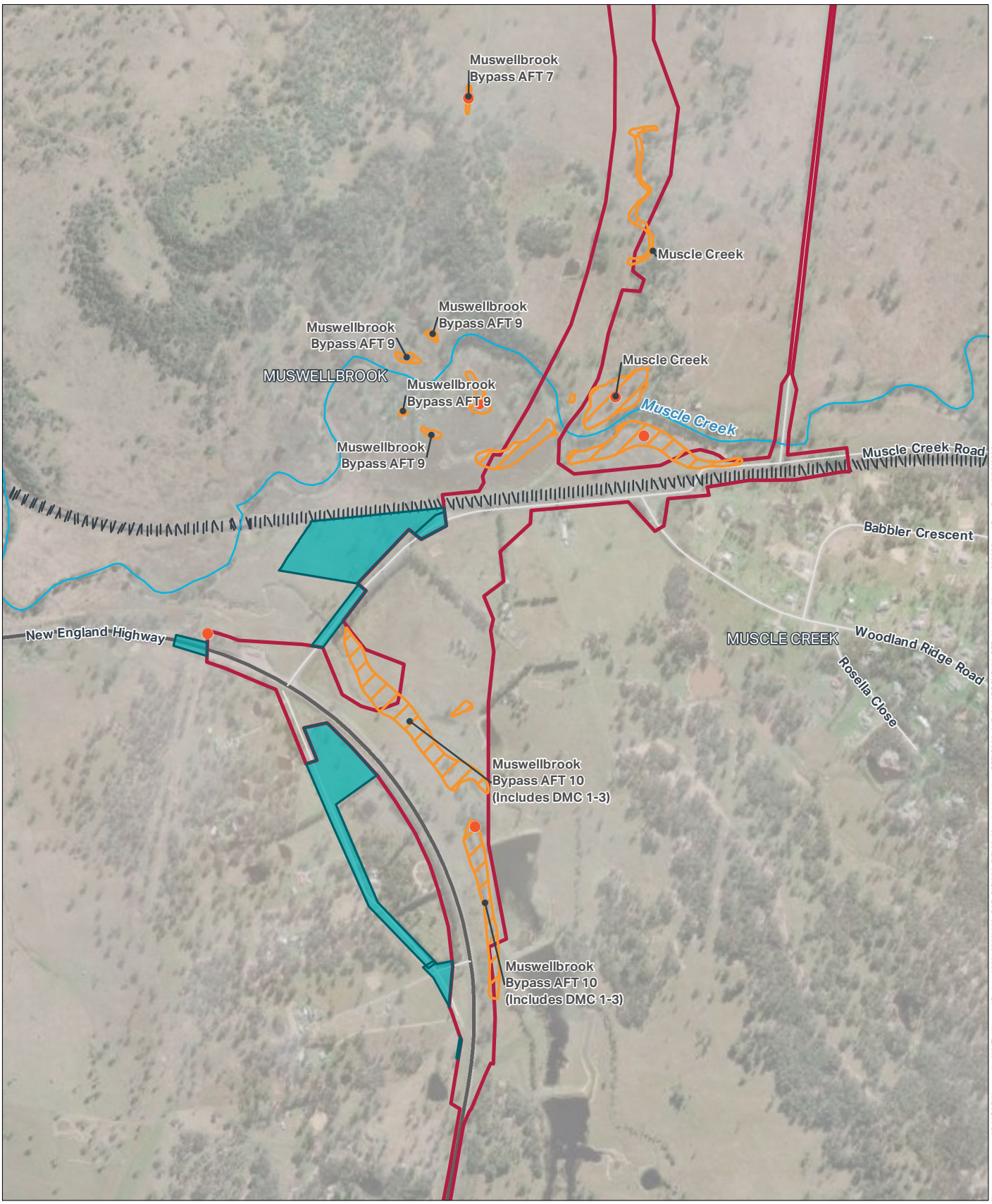

FIGURE 6-7: ABORIGINAL HERITAGE WITHIN THE STUDY AREA

N

0 250 500 m

AECOM

Legend

- Construction Footprint
- Proposed modification area
- Archaeological Site
- Archaeological Site Location
- State Road
- Local Road
- Railway
- Watercourse

Test excavations

As part of the PACHCI Stage 3 assessment, testing was undertaken at 11 of the 12 identified sites within the modified project area. Testing was not undertaken at Muswellbrook Bypass IF 1 as the site was determined to be located within a highly disturbed context and the recorded object was unlikely to be associated with any subsurface deposits.

The test excavation program confirmed the presence of subsurface archaeological deposit of varying density and integrity at all 11 of the test areas. The nature and extent of the archaeology was variable and illustrates the diverse array of Aboriginal activities which took place across the landforms contained within the study area.

Updates to the REF boundary as proposed within the proposed modification have resulted in the identification of another previously recorded site, also named Muscle Creek, within the additional work area along the creek line. To minimise impact, Transport has refined the modified proposal boundary to avoid the recorded site.

Aboriginal cultural values

As identified within the approved project REF, particular locations of intangible cultural significance as identified by knowledge holders during the cultural values assessment include:

- Site A: Sandy Creek Cultural Resource Area
- Site B: Skellatar Hill Line of Sight
- Site C: Pathway.

Sites A and C intersect the study area and site B is about 370 metres to the west.

6.3.3 Potential impacts

Construction

Aboriginal cultural heritage

The approved project REF assessed the likely impact of construction works on identified Aboriginal Archaeological sites. as shown in Table 6-22. The proposed modification would result in no additional impact.

Table 6-20 Impact assessment for identified Aboriginal archaeological sites

Site name	AHIMS	Significance	Type / degree of harm	Consequence of harm from the approved project REF	Consequence of harm from the proposed modification
Muswellbrook Bypass AFT 1	37-2-5952	Moderate	Direct / partial	Partial loss of value	Partial loss of value
Muswellbrook Bypass AFT 2	37-2-5953	Low	Direct / total	Total loss of value	Total loss of value
Muswellbrook Bypass AFT 3	37-2-5954	Low	Direct / partial	Partial loss of value	Partial loss of value
Muswellbrook Bypass AFT 4	37-2-5955	Low	Direct / total	Total loss of value	Total loss of value
Muswellbrook Bypass AFT 5	37-2-5957	Low	Direct / total	Total loss of value	Total loss of value
Muswellbrook Bypass AFT 6	37-2-5956	Moderate	Direct / partial	Partial loss of value	Partial loss of value
Muswellbrook Bypass AFT 7	37-2-5958	Moderate	None / none	No loss of value	No loss of value
Muswellbrook Bypass AFT 8 (includes NH 1, NH 2 & NH 3)	37-2-5959 (includes 37-2-1454, 37-2- 1455 & 37-2-1456)	Moderate	Direct / partial	Partial loss of value	Partial loss of value
Muswellbrook Bypass AFT 9	37-2-5960	Moderate	Direct / partial	Partial loss of value	Partial loss of value
Muswellbrook Bypass AFT 10	37-2-5961 (includes 37-2-	Low	Direct / partial	Partial loss of value	Partial loss of value

Site name	AHIMS	Significance	Type / degree of harm	Consequence of harm from the approved project REF	Consequence of harm from the proposed modification
(includes DMC 1, DMC 2 & DMC 3)	2631, 37-2- 2632 and 37-2-2633)				
Muswellbrook Bypass IF 1	37-2-5962	Low	Direct / total	Total loss of value	Total loss of value
Muscle Creek	37-2-0139	Moderate	Direct / partial	Partial loss of value	Partial loss of value
Muscle Creek	37-2-0101	Moderate	None / None	Not assessed in approved project REF	No loss of value

Aboriginal cultural values

The approved project REF assessed the impact of the approved project on Aboriginal cultural values within and surrounding the study area. The proposed modification would result in no change in impact, as detailed in Table 6-23.

Table 6-21: Impact assessment for identified Aboriginal cultural values

Item	Description	Cultural significance	Impact from the approved project REF	Impact from the proposed modification
Site A: Sandy Creek Cultural Resource Area	A traditional cultural resource area associated with nearby camps and pathways	This cultural resource area has Medium Significance to the local Aboriginal community as a traditional cultural resource gathering place with associated patterns of movement and residence	Yes	Yes
Site B: Skellatar Hill Line of Sight	A high point that provides a cultural line of sight to a number of key pathways and locations	The Skellatar Hill line of sight has High Significance to the local Aboriginal community as a traditional location for orienting people within the cultural landscape and making visible the links between significant cultural places	No	No
Site C: Pathway	A pathway associated with traditional movement patterns	This movement corridor has Medium Significance to the local Aboriginal community as the patterns of movement hold cultural value for their association with resource use, community gatherings and ceremonial cycles	Yes	Yes

Operation

The proposed modification is not expected to impact on any items of Aboriginal heritage of cultural values when it is operational. This is consistent with the approved project REF.

6.3.4 Safeguards and management measures

Safeguards and management measures recommended in the approved project REF and submissions report will apply to the proposed modification. No additional safeguards have been recommended.

6.4 Surface water, hydrology and flooding

6.4.1 Methodology

A Surface and Groundwater Assessment was prepared by AECOM in 2021 for the project and is attached as Appendix I to the project REF. A Flood Risk Assessment was also undertaken by BMT Commercial Australia Pty Ltd in 2021 and is attached to the project REF as Appendix E.

A review of these technical reports was carried out as part of this addendum REF to understand the existing features of the environment surrounding the project in relation to surface water, hydrology and flooding and identify any new potential impacts associated with the proposed modification. Surface water, hydrology and flooding aspects are outlined in this chapter and groundwater aspects are covered in Section 6.2 of the project REF.

6.4.2 Existing environment

Section 6.2.2 of the project REF describes the hydrology, surface water quality and flooding aspects of the existing environment surrounding the project.

Hydrology

Three of the proposed modification areas traverse watercourses including a tributary of Muscle Creek (proposed modification area 11) and a tributary of Sandy Creek (proposed modification area 2 and 3). Sandy Creek is located about 50 metres north of modification area 2 at its closest point to the proposed modification.

Temporary structures in waterways are potentially required at various locations as shown in Figure 1-1 as part of the proposed modification to allow for better access and movement around the construction footprint. Multiple farm dams are located within the surrounding land, including three which require reconstruction or relocation as part of the proposed modification as they are located within or too near to the proposed road corridor (proposed modification area 4 and proposed modification area 9).

Surface water quality

As identified in the project REF, upstream land use that could potentially impact water quality within the Hunter River predominantly comprises agriculture and localised mining activities.

As part of the project REF, the baseline water quality results obtained from the July to December 2020 monthly sampling events carried out by Transport for NSW were used. This monitoring continued over a 12-month period (July 2020 to June 2021) to establish and define baseline water quality conditions (i.e. pre-construction).

The results from the June 2020 to July 2021 sampling events indicated that the baseline water quality was generally below the adopted water quality criteria. Some marginal exceedances of the adopted criteria were also observed. Existing water quality remains similar to that of which is described in the project REF.

Consistent with the project REF, the ecosystem condition category is assumed to fall into the 'slightly to moderately disturbed' category (refer to Table 3-4 in Appendix I of the project REF).

Flooding

Flood events under existing conditions are not expected to have changed substantially to those described in the project REF. Existing flood events in areas of the proposed modification are identified below.

At Spring Creek, flood events larger than the five per cent annual exceedance probability (AEP) result in the Sandy Creek Road and New England Highway intersection being submerged.

At Muscle Creek, during the 0.05 per cent AEP event minor impacts to grass paddocks were experienced at properties adjacent to Muscle Creek and tributaries of Muscle Creek.

6.4.3 Potential impacts

Construction

Construction impacts for the proposed modification would mostly be in accordance with those described in the project REF, with the exception of relocating three dams, and construction and use of temporary instream crossing structures in waterways. Relocating of dams would involve dewatering and backfilling the three existing dams (as described in Section 3.1). If not managed correctly, dewatering dams can result in releasing contaminated or low-quality water and/or weeds or pest species into the environment. Additional management measures are recommended in Section 6.4.4. This work may also result in displaced fauna requiring relocation. Impacts to aquatic flora and fauna are discussed in Section 6.1.

One of the dams (located in modification area 4) is in a section of waterway which is identified as Key Fish Habitat under the FM Act. As part of the relocation of this dam, the waterway, which is a tributary of Sandy Creek, would also involve realigning to move it further from the proposed road corridor. This work would result in direct disturbance of the waterway which could

increase erosion and sedimentation risk and turbidity if not managed correctly. There would also be potential impacts to aquatic habitat and fauna which are discussed in Section 6.1.

The temporary instream crossing structures may result in loss of small areas of aquatic habitat, as well as present minor barriers to fish movements within a waterway. The initial placing of the temporary instream crossing structure may result in a temporary increase in turbidity levels through disturbance of sediments on the waterway bed. Structures would be put in place to allow the flow of water and movement of aquatic wildlife as stipulated by consultation with DPI-Fisheries.

As assessed in the project REF, construction activities present the risk of sediment, chemicals stored on site and construction waste entering waterways during runoff or flood events. The proposed modification would have similar risk with the inclusion of a construction compound site in modification area 10 which traverses Muscle Creek and is also in an area which is subject to flooding, as well as the use of access tracks and road maintenance work in modification areas 2, 3 and 11 which traverse waterways. A number of erosion control and sediment management measures have been identified as part of the project REF.

The proposed modification would result in temporary instream crossings across two unnamed waterways, and Sandy Creek and Muscle Creek. As discussed in Section 6.1.3, the temporary instream structures would likely result in minor aquatic habitat impacts consistent with the project REF.

During all flood events, land adjacent to Muscle Creek is inundated (ranging from 0.5 to 2 metres). The area which is impacted increases in size during the larger AEP events. This area includes the western corner of proposed modification area 10 where the Main North railway line crosses Muscle Creek. This may result in the existing access track adjacent to Muscle Creek being restricted for use.

During a probable maximum flood (PMF) event, the entire proposed modification area 10 would be inundated up to five metres. As discussed in the project REF, flood behaviour around Muswellbrook is well understood and there would be adequate advance flood warning likely to be available to remove staff and equipment and protect the work prior to inundation.

Mitigation measures including controlled management of stormwater and drainage patterns, locating stockpiles outside the floodplain and drainage lines, flood evacuation and response protocols and the maintenance of access for all workers, residences, and livestock, have been proposed in the project REF to mitigate the potential impact of construction on flooding and stormwater.

Operation

A review of existing flood mapping in Appendix E of the project REF shows that flooding (ranging from 0.5 to 2.0 metres) is experienced during all flood AEP events along the tributary of Sandy Creek which requires realignment as part of the proposed modification. The land which is inundated includes the tributary from the confluence with Sandy Creek (to the west) up until just before the location of the dam which requires relocation (to the east). Proposed changes to this tributary and any other waterways would be designed to maintain existing stormwater flow paths where practical and consider drainage and potential flood events, which would result in minor impacts to surface water flows.

Moving the waterway (tributary of Sandy Creek) further from the proposed road corridor would reduce the risk of saturation and failure of the road embankment. It would also reduce operational road impacts on the waterway such as pollutants and contaminants from the surface of the road being conveyed during runoff events to receiving waters as assessed in the project REF.

6.4.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Working in waterways	An Environmental Work Method Statement will be prepared for temporary instream crossing structures and will include protocols to minimise impacts to fish and fish passage. Temporary instream crossing structures will be designed in accordance with the requirements of the *Policy and Guidelines for Fish Habitat Conservation and Management* (NSW Department of Primary Industries, 2013). As outlined in section 199 of the FM Act, the Minister for Primary Industries will be notified prior to any dredging or reclamation works taking place and any matters raised by the Minister will be considered within 21 days of the notice	Construction contractor	Construction	Additional safeguard
Dewatering	A Dewatering Management Plan (DMP) will be prepared as part of the CEMP and will include off-site disposal transfer or discharge arrangements for dam dewatering. The DMP will include measures to manage: • Quality of any water to be discharged/ disposed of • Water flows from any water discharged • Quality of water, stream health, riparian vegetation health and channel stability of creeks and other water bodies that could potentially be affected by discharges • Sediment and erosion from dewatering of the dams.	Construction contractor	Construction	Additional safeguard
Water quality	Prior to discharge of any dam waters, a water quality monitoring program will be developed to measure water quality parameters against the relevant water quality criteria.	Construction contractor and Transport	Construction	Additional safeguard

Other safeguards and management measures that would address dewatering impacts are identified in Section 6.6.

6.5 Groundwater

6.5.1 Methodology

As mentioned above, a Surface and Groundwater Assessment was prepared by AECOM in 2021 and is attached as Appendix I to the project REF. A review of this technical report was carried out as part of this addendum REF in relation to potential groundwater impacts associated with the proposed modification.

A Detailed Site Investigation (DSI) was carried out by AECOM in 2023 as part of the Addendum REF (Appendix G).

6.5.2 Existing environment

Section 6.3.2 of the project REF describes the regional and local hydrogeology, registered groundwater bores, groundwater dependent ecosystems (GDEs) and groundwater quality aspects of the existing environment surrounding the project.

Regional and local hydrogeology

The regional and local hydrogeology as described in the project REF remains consistent for the proposed modification.

Registered groundwater bores

The registered groundwater bores identified in the project REF have the following characteristics:

- Final installed depths of the groundwater bores ranged between 6.7 metres to 24.0 metres
- Standing water levels of the groundwater bores recorded within ranges of 4.3 metres to 15.0 metres.

None of the groundwater bores identified in the project REF are located within the proposed modification areas.

Groundwater dependent ecosystems

As discussed in Section 6.1.3, additional impacts to GDEs are likely to occur at the four temporary stream crossing locations. Although, likely impacts would remain consistent to those assessed by the project REF. Other impacts to GDEs remain consistent with those described in the project REF and include:

- PCT 42 River Red Gum / River oak riparian woodland wetland in the Hunter Valley and PCT 485 River oak riparian grassy tall woodland of the western Hunter Valley (Brigalow Belt South Bioregion and Sydney Basin Bioregion) which are highly likely to be reliant on surface expressions of groundwater or on subsurface groundwater
- PCT 1693 Yellow Box – Rough-barked Apple grassy woodland of the Upper Hunter and Liverpool Plains which is likely to be a terrestrial GDE which may access the water table on an intermittent basis.

Groundwater quality

Consistent with the project REF, potential contamination sources surrounding the proposed modification include restored mining land, a former timber mill, dairy farms, Muswellbrook substation and former power station, an open cut coal mine operated by MCC, a quarry and the Muswellbrook Waste Management Facility.

A Detailed Site Investigation (DSI) carried out by AECOM as part of the Addendum REF in 2023 identified concentrations of per- and poly-fluoroalkyl substances (PFAS) in the areas which used to be the former Power Station and former Muswellbrook Brickworks. Exceedances of contaminants of potential concern (CoPC) Cadmium, Copper, Nickel, and Lead above the ANZG 2018 *Freshwater Guideline Values* for 95 per cent species protection were noted within these areas, as well as at the Muswellbrook Waste Management Facility. These areas are within or adjacent to proposed modification areas 3, 4 and 6.

6.5.3 Potential impacts

Construction

Interaction with groundwater as a result of the proposed modification may occur when constructing dams, however this is considered to be limited due to the expected depth to groundwater surrounding the proposed modification. Dewatering and infilling of the existing dams would be carried out, however dewatering of groundwater is not expected to be required. When realigning the tributary of Sandy Creek in modification area 4, no excavation would be undertaken below the riverbed and no

dewatering of groundwater would occur. As such, the potential impact on groundwater or aquifers in the locality would be negligible.

The proposed modification is not expected to impact upon groundwater resource availability or the ability of a water access licence (WAL) holder to access groundwater from their bores.

Construction impacts for the proposed modification associated with potential sources of chemical contamination from leaching of spills into groundwater are consistent with those described in the project REF. The potential for impacts to groundwater from surface spills is considered low with the implementation of management measures and safeguards outlined in the project REF.

Consistent with the project REF, GDEs which are considered a sensitive receiving environment in connectivity with the Hunter River, Sandy Creek and Muscle Creek, could receive runoff, both directly and indirectly, from the proposed modification. However, through the implementation of appropriate environmental management measures, as recommended in the project REF, including sediment basins and spill management retention facilities, these potential impacts would be mitigated.

The PFAS and other CoPC levels would not present an unacceptable level of risk to future construction workers. As levels were marginally above the adopted assessment criteria, it is considered unlikely there would be an unacceptable risk to ecological receptors. However, further consideration of ecological risks is required should groundwater be extracted as part of dewatering activities in those areas. Refer to Section 6.4.4 of the approved project REF for relevant contamination safeguards.

Operation

Potential operational impacts for the proposed modification are consistent with the project REF.

6.5.4 Safeguards and management measures

No further safeguards or management measures are proposed. The measures provided in the project REF are considered suitable to manage the potential impacts of the proposed modification. These measures are provided in Chapter 7.

6.6 Soils and mine workings

6.6.1 Methodology

The following investigations of soil aspects and mine workings were carried out as part of the project REF:

- A desktop investigation of geology and soils which included review of publicly available information
- Geotechnical investigations which included targeting the former underground workings.

The following technical reports for soil aspects and mine workings were prepared as part of the project REF:

- Contaminated Soils Phase 1 Assessment (AECOM 2021) to address potential sources of contamination (attached as Appendix J of the project REF)
- Mine Assessment Report (AECOM 2021) which was amended as part of the submissions report in 2022 to assess the potential impacts of the former underground mine workings on the performance of the proposed road infrastructure (attached as Appendix A of the submissions report).

A review of these investigations and technical reports and the DSI (AECOM, 2023) was carried out as part of this addendum REF to identify potential risks associated with soil, contamination, and mine workings in relation to the proposed modification.

6.6.2 Existing environment

Section 6.4.2 of the project REF describes the geology, soil, contamination, and mine working aspects of the existing environment surrounding the project.

Regional geology and soil landscape

The regional geology and soil landscapes as described in the project REF remain consistent for the proposed modification.

Acid sulfate soils

The geotechnical investigations (AECOM, 2020) undertaken for the project REF identified no known occurrence of acid sulfate soils surrounding the project. The desktop review of acid sulfate soil mapping carried out for the project REF also identified low to extremely low probability of acid sulfate soils occurring. This is considered to remain consistent for the proposed modification.

Unexploded ordnance

A review of the Department of Defence unexploded ordnance (UXO) map was completed on 31 March 2020 for the project REF which identified that the township of Muswellbrook was once used as an advanced ordnance depot during WWII. A review of this map was again completed on 10 March 2023 which returned the same result. The closest known location of an UXO is to the west of the northern connection which crosses a small section of proposed modification area 2.

Per and poly fluoro alkyl substances

The Australian potential PFAS Chemicals Map was viewed on 31 March 2020 for the project REF which did not identify any sites impacted by PFAS contamination near the project. A review of this map was again completed on 10 March 2023 which returned the same result.

The Contaminated Soils Phase 1 Assessment (Appendix J of the project REF) found Aqueous Film Forming Foams containing PFAS could historically have been used during firefighting and/or fire training exercises.

As discussed in Section 6.5.2, PFAS was identified in areas including the former Power Station and former Muswellbrook Brickworks (DSI (AECOM, 2023).. Proposed modification area 3 travels through this area, and proposed modification area 4 is located adjacent to this area.

Salinity

As identified in the project REF, dryland salinity has been observed in the Upper Hunter area with the Salinity hazard report for Catchment Action Plan upgrade – Hunter Central Rivers CMA (Nicholson et al., 2012) identifying a very high hazard risk of salinity around Muswellbrook. The area encompasses the major coal extraction areas of the Hunter area, including the Muswellbrook Coal Mine.

Contamination

Consistent with the project REF, locations or structures identified as potentially containing contamination include market gardens; agricultural land (including dairy farms and pastoral land); the existing New England Highway and associated connecting roads; the Main North railway line and a former rail line; a former timber mill, former Muswellbrook Brick Works, Muswellbrook substation and Muswellbrook Waste Management Facility; Muswellbrook Coal Mine; a former power station as well as existing buildings and historical structures which may contain potential asbestos containing material.

The DSI (AECOM, 2023) identified Perfluorooctane sulfonic acid (PFOS) in the proposed modification area 3, and an area adjacent to proposed modification 4. All other contaminants of potential concern were below the adopted human health and ecological screening criteria.

Mine subsidence risk

Potential mine workings in the locality which may intercept with the proposed modifications are outlined in Table 6-22.

Table 6-22: Mine workings nearby the proposed modification

Mine working	Description
Areas of backfill	Modification area 5 passes over a small section of the old backfilled Open Cut No.1. As described in the project REF, the Open Cut No. 1 has been backfilled with various types of uncompacted mine waste from former open cut operations up to a depth of 70 metres.
Underground mine workings	As identified in the project REF, three underground mine workings are located north of Coal Road, in the Lewis, St Heliers and Muswellbrook Seams. None of the proposed modification areas are located over these underground mine workings.

6.6.3 Potential impacts

Construction

Construction impacts for the proposed modification would mostly be in accordance with those described in the project REF. As discussed above in Section 6.4, erosion and sedimentation would be a risk from the additional earthworks required as part of the proposed modification. However as assessed in the project REF, with the implementation of appropriate controls, erosion and sedimentation impacts would be minor.

Consistent with the project REF, acid sulphate soils are unlikely to be encountered during construction.

Dewatering dams has the potential to exacerbate impacts of salinity in low lying areas and along creek lines. Given the high risk of salinity around Muswellbrook, this presents a risk for the proposed dam work. This should be considered in the DMP proposed as part of this proposed modification (refer to Section 6.4.4).

Given the locations and nature of structures identified as potentially containing contamination, the dams have potential to be contaminated. Therefore, dewatering could result in the spread of contaminated water (discussed in Section 6.4) and sediment into the surrounding environment, if not managed correctly. An additional management measure is recommended in Section 6.6.4.

The project REF found there is a moderate risk of contamination from a range of potential contaminants and sources that may present an unacceptable risk to human health and/or the environment. These potential contaminants and sources are considered a consistent risk for the proposed modification. The DSI (AECOM, 2023) detected exceedances of PFOS and PFAS within proposed modification area 3. It found:

- Although the detected concentrations of PFOS exceed the ecological indirect criteria which is considered to be protective of a secondary consumer, the limited number of boreholes with this exceedance (limited to four boreholes) and the large area considered as a food resource, present an unlikely risk of unacceptable exposure to secondary consumers.
- The detected PFAS within soil was assessed as below the adopted assessment criteria for both human health and ecological receptors and as such it is considered unlikely there is an unacceptable risk to these receptors from PFAS.

Contamination risks would be managed in accordance with the environmental safeguards provided in the project REF.

Works within proposed modification area 5 involve use of existing access tracks to access power lines requiring relocation and to assist with the replacement of these power lines. The uncompacted and variable nature of the mine waste within the Open Cut No.1. is not expected to impact on this work. However, this risk would be managed through geotechnical treatments, where required, which have been proposed as part of the concept design and would be further developed during detailed design. This work is not expected to impact ongoing mine workings. Ongoing consultation with MCC regarding this work would continue during detailed design and construction regarding utility relocation to ensure impacts are limited (refer to Section 5).

Ground subsidence is not considered a risk, as the proposed modification is not located over underground mine workings.

Operation

Potential operational impacts for the proposed modification are consistent with the project REF.

6.6.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Contamination	Prior to disturbing any sediment within dams to be relocated, the sediment within the dam walls and bed should be assessed against the National Environmental Protection Measure (NEPM) 2013.	Construction contractor	Construction	Additional safeguard

Other safeguards and management measures that would address contamination impacts are identified in Section 6.4.4.

6.7 Property and land use

6.7.1 Methodology

Section 6.11 of the project REF discusses potential impacts to property and land use. This section was reviewed as part of this addendum REF to identify any potential new impacts to property and land use associated with the proposed modification.

6.7.2 Existing environment

The proposed modification is located predominately on greenfield land or existing road corridor owned by Transport for NSW, Ausgrid, MCC or the State of NSW.

Key infrastructure near or intersecting the proposed modification is consistent with those identified in the project REF including the Main North railway line, the existing New England Highway, the Ausgrid and MCC substations and the Muswellbrook Waste Management Facility. The operational section of Muswellbrook Coal Mine is located to the north east of the proposed modification. There are a number of utility services within the proposed modification areas as described in Section 6.7.

Land use zones that occur within the proposed modification areas include:

- RU1 Primary production
- SP2 Infrastructure
- E3 Environmental management
- R1 General residential.

This is consistent with the project REF, however the proposed modification is not located on R5 Large Lot Residential land zonings.

6.7.3 Potential impacts

Construction

As discussed in Section 3.6, where the proposed modification if not located within the existing road corridor operated by Transport for NSW or on land owned by Transport for NSW, work would be carried out either with landowner consent or under a lease arrangement with the landowner. Land temporarily use for the purposes of construction would be restored following the construction phase and would be available for future agriculture or other use.

Impacts to adjacent land uses during construction, such as amenity impacts, are discussed in Section 6.9 and are expected to be minor.

Operation

No additional operational impacts to property and land use would occur as a result of the proposed modification.

6.7.4 Safeguards and management measures

No further safeguards or management measures are proposed. The measures provided in the project REF are considered suitable to manage the potential impacts of the proposed modification. These measures are provided in Chapter 7.

6.8 Traffic and transport

6.8.1 Methodology

A Traffic and Options Modelling Report was prepared for the project by Arcadis in 2018. An addendum to this report prepared by Arcadis in 2021 provided the results of additional traffic modelling for the project. These reports are attached to the project REF as Appendix K. A review of these technical reports was carried out as part of this addendum REF to review the existing traffic and transport conditions surrounding the project and identify any new potential impacts.

6.8.2 Existing environment

Section 6.5.2 of the project REF describes the existing traffic and transport conditions of the surrounding network.

Road network

The existing road network surrounding the proposed modification, as described in the project REF, includes:

- The New England Highway (travels through the township of Muswellbrook)
- Denman Road and Wybong Road (travel west of the town along the Hunter River)
- Muscle Creek Road and Spring Creek Road (travel to the east of the town effectively joining the New England Highway at either end of the bypass corridor)
- Coal Road (travels east of the town and provides access to Muswellbrook Waste Management Facility)
- Bell Street and Victoria Street (travel east of the town and provide the current heavy vehicle bypass for Muswellbrook)
- Private haul road (travels to the east of the town within the mine property holdings and connects to Muscle Creek Road).

Traffic conditions

Based on the traffic data collected to support the traffic modelling prepared for the bypass, and as described in the project REF, on an average weekday the New England Highway carries 9,600 and 19,500 vehicles per day including between 1,600 and 2,700 heavy vehicles.

Intersection performance

Level of service (LoS) is the standard measure, based on the average delay per vehicle, used to assess the operational performance of intersections. There are six levels of service, ranging from LoS A (the best) to LoS F (the worst). In 2016, the Sandy Creek Road and New England Highway intersection was assessed as operating at LoS A.

Crash data

Crash data between January 2011 and December 2015 was reviewed as part of the project REF, which identified a total of 77 crashes recorded along the New England Highway within the project extents, and on Victoria Street between Bridge Street and Coal Road.

Crash data between 2017 and 2021 reviewed for this addendum REF identified 56 crashes recorded within the same area, including four at the intersection of Sandy Creek Road and the New England Highway.

Mode of travel

Travel characteristics for Muswellbrook were based on 2016 Census data. The Muswellbrook 2016 Census All persons QuickStats found 80.2 per cent of people travel to work by car as a driver or passenger. While this was reduced to 73.2 per cent in the 2021 Census, the car still remained the predominant mode of transport for travel to work in Muswellbrook.

Walking and cycling facilities

Walking and cycling facilities are not expected to have changed substantially to those described in the project REF.

Public transport services

Public transport services are not expected to have changed substantially to those described in the project REF.

6.8.3 Potential impacts

Construction

Construction impacts for the proposed modification would mostly be in accordance with those described in the project REF.

The proposed modification would not change the number of construction vehicles required for the overall project. Construction vehicles would still use arterial roads wherever possible to access the construction footprint and modification areas. Haulage routes are shown on Figure 3.6 in the project REF. The proposed modification requires additional access tracks to be used during construction. Access would be provided along new or existing tracks within private land located outside of the construction

footprint as assessed in the project REF. Consultation would occur with landowners to discuss access and/or lease arrangements where required (refer to Section 5).

Use of additional temporary ancillary facilities by construction personnel could increase the number of construction vehicles in the proximity of these areas. This would likely be most noticeable along Milpera Drive, with a Satellite Compound proposed at either end of this road. It is likely that these Satellite Compounds would be used predominantly for work along Milpera Drive, therefore would only be used during a short period of the construction phase. Residents along Milpera Drive would experience traffic impacts such as presence of construction vehicles, plant and equipment and temporary traffic controls installed during construction. As proposed as part of the project REF, all affected residents would be notified prior to any work commencing.

The proposed modification allows for a range of maintenance and improvement works to roads which would result in benefits to road users. Local roads Milpera Drive, Muscle Creek Road and Coal Road would be maintained during construction to ensure that any potential damages to pavement from construction vehicle usage are managed efficiently. The upgrades to the Sandy Creek Road and New England Highway intersection would also improve the safety profile of the intersection to cater for increased traffic volumes during construction of the bypass.

These road upgrades may also result in additional impacts to surrounding receivers. This would most likely occur at the Sandy Creek Road and New England Highway intersection and along Milpera Drive, given the proximity of surrounding receivers. Noise impacts and amenity impacts on receivers have been assessed in Section 6.2 and Section 6.9, respectively.

As for traffic impacts, during work hours there would be traffic control to facilitate the proposed road upgrades, where required, and to ensure the safety of construction personnel. Consistent with traffic impacts assessed in the project REF, this could result in:

- Increased travel time due to reduced speed limits
- Increased travel time due to increased truck and construction machinery movements
- Temporary lane closure and altered property accesses. Property access would be maintained as far as practicable throughout construction (discussed further in Section 6.9).

These impacts would be managed through the project TMP, which would be prepared prior to construction commencing.

The proposed modification is not expected to impact on any existing pedestrian and cycle routes or crossings or disrupt public transport any more than that assessed in the project REF.

Operation

Any road maintenance or improvements required during construction (as discussed above) would result in operational benefits for road users.

Otherwise, no other changes to operational traffic impacts are anticipated from the proposed modification.

6.8.4 Safeguards and management measures

No further safeguards or management measures are proposed. The measures provided in the project REF are considered suitable to manage the potential impacts of the proposed modification. These measures are provided in Chapter 7.

6.9 Other impacts

For the remaining environmental aspects where the potential impact of the proposed modification would be considered negligible to minor, a brief discussion and assessment was undertaken for each, as summarised in Table 6-25. These remaining environmental aspects include:

- Air quality
- Non-Aboriginal heritage
- Landscape character and visual impact
- Socio-economic
- Resource use and waste management
- Climate change
- Hazard and risk.

6.9.1 Existing environment and potential impacts

Table 6-23 Other environmental aspects

Environmental factor	Existing environment	Potential impacts
Air quality	The existing ambient air quality and local meteorology described in Section 6.9 of the project REF applies to the proposed modification.	**Construction** Earthworks or the use of access tracks and construction compounds may give rise to minor air quality impacts from the proposed modification. The nearest impacted receivers would include residential receivers along and near to Milpera Drive and receivers near the Sandy Creek Road and New England Highway intersection. Impacts are anticipated to be minor and would be managed with the mitigation measures proposed in the project REF. **Operation** No impacts are anticipated during operation of the proposed modification.

Environmental factor	Existing environment	Potential impacts
Non-Aboriginal heritage	Non-Aboriginal heritage within the surrounding environment is described in section 6.8 of the project REF. The closest item to the proposal modification is St Heliers which is located about 80 metres east of modification area 1 beyond the Main North railway line. Muswellbrook Brick Works Site is located about 220 metres east of modification area 3, and the Old Coal Rail Spur Bridge is located about 350 metres east of modification area 10 and 11. All other heritage items identified in the project REF are located over 500 metres from the proposed modification. Searches of relevant historic heritage registers and lists, both statutory and non-statutory, were conducted on 24 February 2023 to identify if any new historic heritage items had been listed since the project REF. No new historic heritage items surrounding the proposed modification were identified.	**Construction** No direct or indirect impacts to St Heliers are considered likely during construction of the proposed modification. As assessed in the project REF, although the LEP curtilage of this item is located near to modification area 1, the Corrective Services NSW S170 Heritage Conservation Register curtilage is considered more appropriate and is located at least 1.3 kilometres from the proposed modification. No direct or indirect impacts to the Muswellbrook Brick Works site are considered likely during construction of the proposed modification given the minor nature of work proposed for this area and the distance to this site and the intervening landform and vegetation, as assessed in the project REF. Given the distance to the remaining non-Aboriginal heritage items, including the Old Coal Rail Spur, no further impacts to those described in the project REF are anticipated as a result of the proposed modification. **Operation** No operational direct or indirect impacts are anticipated as a result of the proposed modification.
Landscape character and visual impact	The existing landscape and visual environment surrounding the proposed modification is consistent with that described in Section 6.10 of the project REF. Key elements include the agricultural Hunter River floodplain, large patches of regrowth and remnant forest communities, coal mining activities and open pastureland primarily subject to grazing.	**Construction** Given the temporary nature of the proposed modification, construction would not impact on the landscape character of the area. The proposed modification would result in additional construction related visual impacts to receivers, including receivers located along Milpera Drive, Muscle Creek Road, Coal Road and Sandy Creek Road, or road users travelling along these roads. Additional visual impacts would include views of the three new proposed construction compounds, construction vehicles using additional access tracks and the presence of construction plant, equipment and traffic control along local roads. These visual impacts would be minor in addition to those described in the project REF. **Operation** Addition directional signage at the northern end of the proposal would present a negligible visual and landscape impact in addition to impacts described in the project REF.

Environmental factor	Existing environment	Potential impacts
Socio-economic	The existing socio-economic environment is outlined in section 6.12 of the project REF and remains consistent for the proposed modification. The project REF identified the following social infrastructure to be located within 400 metres of the construction footprint: • Shelley's Family Day Care Centre • The Kingdom Hall of Jehovah's Witness. Shelley's Family Day Care Centre is located directly north of modification area 2, and the Kingdom Hall of Jehovah's Witness is located 520 metres from modification area 3. Some of the modification areas are also located closer to residential receivers and businesses located along Mipera Drive and Sandy Creek Road.	**Construction** Construction of the Sandy Creek Road and New England Highway intersection upgrade would have temporary noise, traffic and amenity impacts on nearby receivers, including Shelley's Family Day Care Centre. No work would occur on the western side of Sandy Creek Road, which is where Shelley's Family Day Care Centre and all other nearby receivers are located. The Kingdom Hall of Jehovah's Witness is not expected to be impacted by the proposed modification given the distance to this receiver. Proposed modification areas located to the south of the construction footprint are likely to result in additional noise, traffic and amenity impacts on nearby receivers, predominantly those located along Milperra Drive. This would be as a consequence of use of construction compounds, access tracks and local roads. Noise impacts are discussed in Section 6.2, traffic impacts are discussed in Section 6.8 and visual impacts are discussed above. Overall, socio-economic impacts during the construction of the proposed modification would be minor in addition to those described in the project REF. Access would be maintained for all surrounding receivers. If changes to access are required, consultation would occur with the affected landowner in accordance with the Communication Plan proposed to be prepared for the project. **Operation** No further socio-economic impacts are anticipated during operation as a result of the proposed modification. The proposed modification would allow for continued access along the travelling stock route (TSR) once the new Milpera Drive intersection is constructed (intersection approved under the project REF).

Environmental factor	Existing environment	Potential impacts
Resource use and waste management	The existing environment for the proposed modification in the context of resource use and waste management is consistent with that described in Section 6.13 of the project REF.	**Construction** Resource use and waste streams generated by construction of the proposed modification are expected to be generally consistent with that identified in the project REF. Quantities of materials required for construction and the volume of waste generated across the entire project may increase as a result of the proposed modification (refer to Section 3.3). Given the large scale of the entire project, the increase in relation to the proposed modification is expected to be minor. Exact quantities of materials and waste would be determined during detailed design and suitable waste management practices would be recommended according to the waste hierarchy. **Operation** No impacts to resource use and waste management would occur from the operation of the proposed modification.
Climate change	The existing environment for the proposed modification in the context of climate change is consistent with that described in Section 6.14 of the project REF.	No impacts are anticipated during construction or operation of the proposed modification.
Hazard and risk	Existing hazards and risks in the vicinity of the proposed modification are consistent with those described in Section 6.15 of the project REF.	No impacts are anticipated during construction or operation of the proposed modification.
Cumulative impacts	Section 6.16 of the project REF identified major projects with the potential to contribute to cumulative impacts with the project. A review of these projects was carried out on 22 March 2023 to identify if any further cumulative impacts would occur with the proposed modification. A review of the major projects register on DPE's website was also completed on 22 March 2023 to identify any new projects which may result in a cumulative impact with the proposed modification. Two projects were identified which included: • Muswellbrook Battery Energy Storage System (BESS) located in a similar location to modification area 3 • Muswellbrook Solar Farm located 700 metres east of modification area 9.	The proposed modification was considered unlikely to result in further cumulative impacts with most of the projects identified in the project REF, given the distance to these projects (three kilometres or more) and the scale of the proposed modification. As for the Waste Management Facility project, no information was available on DPE's website regarding further development of this project. **Construction** **Muswellbrook BESS** The development site for this project is located around the Ausgrid substation and utilises the existing partially sealed driveway which accesses the Ausgrid site. This boundary is very similar to proposed modification area 3 which would also use this access track and substation site for utility relocation. The construction timeframe for this project is likely to overlap with the enabling works for the bypass which are expected to commence in June 2023. Main works for the bypass would commence in late 2024 which is likely to coincide with this project. Therefore, there would be cumulative

<table>
<tr><th>Environmental factor</th><th>Existing environment</th><th>Potential impacts</th></tr>
<tr><td></td><td>
<table>
<tr><th>Project</th><th>Description</th><th>Status and timing</th></tr>
<tr><td>Muswellbrook BESS</td><td>Construction and operation of a BESS with an estimated capacity of approximately 150 MW / 600 MWh and associated infrastructure, including connection into the Muswellbrook substation</td><td>Submissions report has been issued to DPE for assessment

Construction is expected to commence in late 2023 and occur over a 12 month period</td></tr>
<tr><td>Muswellbrook Solar Farm</td><td>Construction, operation and decommissioning of a solar photovoltaic energy generating facility with an estimated capacity of 135 MW and associated infrastructure, including grid connection and battery storage of approximately 135 MW</td><td>SEARs issued. EIS is currently being prepared

No detail on timing available</td></tr>
</table>
</td><td>construction related impacts between these two projects, mostly in regard to traffic, air and noise.

Cumulative impacts would be temporary and would be managed with the mitigation measures proposed in the project REF. Ongoing consultation would need to continue with Ausgrid to ensure access is available for the substation site for both projects, when required.
Muswellbrook Solar Farm

Depending on the construction timeframe of this project, there may be cumulative impacts with the overall project from vehicles using the private haul road which accesses Muswellbrook Coal. Given that an EIS is currently being prepared for this project, it is considered likely that the Muswellbrook bypass would be considered in the cumulative impact assessment for this project.

As the proposed modification does not change the number of construction vehicles required for the overall project, there is not expected to be cumulative impacts with the proposed modification.
Operation

Muswellbrook BESS

The EIS prepared for this project considered the Muswellbrook bypass and ensured a reasonable setback for the design of the BESS. As part of the proposed modification, utility relocation is required at the Ausgrid substation (within modification area 3). Augmentation work with the Ausgrid substation site would be required to facilitate connection of the BESS. Therefore, consistent, and ongoing consultation with Ausgrid would be required to ensure these projects are carried out cohesively.

As the proposed modification is mostly construction related, no further cumulative impacts are expected with this project.
Muswellbrook Solar Farm

As mentioned above, it is considered likely that the Muswellbrook bypass would be considered in the cumulative impact assessment carried out for this project. As the proposed modification is mostly construction related, no cumulative impacts are expected with this project.</td></tr>
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6.9.2 Safeguards and management measures

Environmental safeguards and management measures for the project, including the proposed modification, are summarised in Section 7. These safeguards and management measures would minimise any potential adverse impacts arising from the proposed works on the surrounding environment.

7. Environmental management

7.1 Environmental management plans (or system)

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

7.2 Summary of environmental safeguards and management measures

Environmental safeguards and management measures for the New England Highway bypass of Muswellbrook are summarised in Table 7-1. Additional safeguards and management measures identified in this addendum REF are included in bold and italicised font. The safeguards and management measures will be incorporated into the detailed design phase of the proposed modification, the CEMP and the PEMP and implemented during construction and operation of the proposed modification, should it proceed. These safeguards and management measures will minimise any potential adverse impacts arising from the proposed works on the surrounding environment.

Table 7-1: Summary of safeguards and management measures

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
GEN1	Minimise environmental impacts during construction	A Construction Environmental Management Plan (CEMP) will be prepared and submitted for review and endorsement of the Transport Environment Manager prior to commencement of the activity As a minimum, the CEMP will include the following: • Any requirements associated with statutory approvals • Details of how the proposal will implement the identified safeguards outlined in the REF • Issue-specific environmental management plans • Roles and responsibilities • Communication requirements • Induction and training requirements • Procedures for monitoring and evaluating environmental performance, and for corrective action • Reporting requirements and record-keeping • Procedures for emergency and incident management • Procedures for audit and review. The endorsed CEMP will be implemented during the undertaking of the proposal	Construction contractor and Transport	Pre- construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
GEN2	Environmental awareness	All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the proposal. This will include up-front site induction and regular "toolbox" style briefings Site-specific training will be provided to personnel engaged in activities or areas of higher risk. These include (the following are examples only): • Areas of Aboriginal heritage sensitivity • Threatened species habitat • Adjoining residential areas requiring particular noise management measures.	~~Construction contractor and Transport~~ ***Construction contractor***	Pre- construction
B1	Biodiversity	A Flora and Fauna Management Plan (FFMP) will be prepared in accordance with Transport's *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (Roads and Traffic Authority, 2011a) and implemented as part of the CEMP. The FFMP will include, but not be limited to: • Plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas • Requirements set out in the *Landscape Design Guideline* (Roads and Maritime Services, 2018) • Pre-clearing survey requirements • Procedures for unexpected threatened species finds and fauna handling Procedures addressing relevant matters specified in the *Policy and guidelines for fish habitat conservation and management* (DPI Fisheries, 2013) • Protocols to manage weeds and pathogens.	Construction contractor	Detailed design and pre-construction
B2	Biodiversity	Measures to further avoid and minimise the construction footprint and native vegetation or habitat removal will be investigated during detailed design and implemented during construction where practicable and feasible	Construction contractor	Detailed design and pre-construction
B3	Pre-clearing survey	Pre-clearing surveys will be undertaken in accordance with Guide 1: Pre-clearing process of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (Roads and Traffic Authority, 2011a)	Construction contractor	Pre- construction
B4	Removal of native vegetation	The construction footprint is to be demarcated that clearly indicates what areas are to be cleared and not to be cleared. These areas including areas containing pathogens or disease are identified in accordance with Guide 2: Exclusion zones of the *Biodiversity*	Construction contractor	Construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
		Guidelines: Protecting and managing biodiversity on RTA projects (Roads and Traffic Authority, 2011a)		
B5	Removal of native vegetation	Vegetation removal will be undertaken in accordance with Guide 4: Clearing of vegetation and removal of bushrock of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (Roads and Traffic Authority, 2011a)	Construction contractor	Construction
B6	***Removal of native vegetation***	• ***Clearing native vegetation consistent with threatened ecological communities (in particular the Central Hunter Eucalypt Forest) will be minimised via selective placement of ancillary infrastructure, i.e. preference is to avoid areas of higher biodiversity value and to select areas already subject to disturbance, such as areas mapped as miscellaneous ecosystems or DNG.*** • ***Exclusion zones will be established, prior to early works and construction commencement, around the 'exclusion zones' to demarcate the limit of clearing in accordance with Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (Roads and Traffic Authority, 2011). Clearing of native vegetation within these 'exclusion zones' will not be permitted. Track works within the modification 3 exclusion zone will be limited to the existing access track only and no native vegetation removal within this exclusion zone is permitted.*** • ***Clearing of native vegetation consistent with the Central Hunter Eucalypt Forest threatened ecological community will be minimised wherever practicable and not exceed the original impact assessed in the project BAR (i.e. 8.88 ha). Mapping depicting the occurrence of this community within the construction footprint and 'exclusion areas' not permitted to be cleared will be provided to assist with further avoidance during construction. Track works within the modification 3 exclusion zone will be limited to the existing access track and no native vegetation removal within this exclusion zone is permitted.***	***Construction contractor***	***Prior to construction***
B7	Re-establishment of native vegetation	Native vegetation will be re-established (particularly along new road verges within proximity to known Striped Legless Lizard habitat) in accordance with Guide 3: Re-establishment of native vegetation of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (Roads and Traffic Authority, 2011a) to minimise weed encroachment (in particular perennial grass species)	Construction contractor	Construction and post construction
B8	Unexpected threatened species	The unexpected threatened species find procedure is to be followed under *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (Roads and Traffic Authority, 2011a) if threatened entities, not assessed in the biodiversity assessment, are identified in the construction footprint	Construction contractor	Construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
B9	***Removal of threatened species habitat and habitat features***	***Hollow resources contained within the proposed modification area would be avoided where possible. If impacted, these hollow resources are to be included in the project's Nest Box Strategy. The tree clearing program will inform final hollow resource impacts and subsequent nest boxes required.***	***Construction contractor***	***Prior to construction***
B10	Habitat replacement	Habitat will be replaced or re-instated in accordance with Guide 5: Re-use of woody debris and bushrock and Guide 8: Nest boxes of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (Roads and Traffic Authority, 2011a)	Construction contractor	Construction
B11	Striped Legless Lizard management	Site personnel working within proximity of Striped Legless Lizard habitat will be provided with an information sheet. An exclusion zone will be set up around known Striped Legless Lizard habitat during construction in accordance with Guide 2: Exclusion zones of the *Biodiversity Guidelines – Protecting and managing biodiversity on RTA projects* (Roads and Traffic Authority, 2011a)	Construction contractor	Pre- construction and construction
B12	Nest box strategy	A nest box strategy will be developed in accordance with Guide 8: Nest boxes of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (Roads and Traffic Authority, 2011a). The nest box strategy will primarily target the replacement of hollow resources being removed by the proposal on the Squirrel Glider. Final hollow resource impacts and subsequent nest boxes required will be informed by the tree clearing program	Construction contractor	Pre-construction
B13	Aquatic impacts	Aquatic habitat will be protected in accordance with *Guide 10: Aquatic habitats and riparian zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (Roads and Traffic Authority, 2011a) and Section 3.3.2 Standard precautions and mitigation measures of the *Policy and guidelines for fish habitat conservation and management Update 2013* (Department of Primary Industries, 2013)	Construction contractor	Construction
B14	***Aquatic biodiversity***	• ***Aquatic habitat will be protected in accordance with Guide 10: Aquatic habitats and riparian zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (Roads and Traffic Authority, 2011) and Section 3.3.2 Standard precautions and mitigation measures of the Policy and guidelines for fish habitat conservation and management Update 2013 (Department of Primary Industries, 2013).*** • ***If required, relevant approvals and permits required under the FM Act will be obtained prior to any impacts occurring.*** • ***Temporary in-stream structures are to be installed during low-flow periods, with management plans being submitted to DPI detailing how high-flow events will be managed to limit erosion of the structure and associated sedimentation of downstream waterways. An Environmental Work Method Statement will be***	***Construction contractor***	***Construction***

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
		prepared to manage this activity and submitted to Transport and DPI for review and approval. • ***Any aquatic habitat removed, such as woody debris, snags and river pebbles, will be relocated instream by a suitably qualified ecologist.*** • ***Structural crossing components are to be installed outside of the waterway where possible to avoid in-stream disturbance.*** • ***A Environmental Work Method Statement will be prepared to provide appropriate protocols to minimise impacts to any fish should dewatering be required for any temporary water crossings. If required, any dewatering of temporary in-stream structures will be undertaken in accordance with the following procedure:*** ***1. DPI-Fisheries to be notified seven days prior to any dewatering activities in order to organise potential fish rescue activities.*** ***2. A separate section.37 permit may be required from DPI to relocate fish.*** ***3. Water is to be pumped a minimum of 30 metres away from the waterway and treated as required.*** ***4. A water quality monitoring program is to be provided to Transport prior to the commencement of allowing any water re-entering the waterway. Any water re-entering the waterway will be required to meet water quality criteria under this program.*** • ***The project's Biodiversity Offset Strategy prepared in accordance with Transport's Guidelines for Biodiversity Offsets (Roads and Maritime Services, 2016) will be revised to include additional offsetting requirements for residual aquatic impacts.***		
B15	Fauna handling	A fauna rescue and release procedure is to be developed and implemented. Fauna handling will be carried out in accordance with Guide 9: Fauna handling of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (Roads and Traffic Authority, 2011a)	Construction contractor	Construction
B16	Wildlife Connectivity Strategy	A wildlife connectivity strategy will be developed and implemented in accordance with Transport's draft Wildlife Connectivity Guidelines. The strategy will be developed in consultation with MCC. At a minimum the wildlife connectivity strategy will include: • Installation of one aerial fauna crossing structure to retain fauna connectivity in the vicinity of where Squirrel Gliders have been recorded. The final location, design and type of structure will be determined during detailed design	Construction contractor and Transport	Detailed design, construction and post construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
		• Construction of a bridge over Muscle Creek to provide underpass fauna crossing for terrestrial fauna species such as the Koala • Consideration of fauna exclusion fencing in areas where fauna crossing structures are proposed for example near Muscle Creek and/or near known habitat for Striped Legless Lizard • Installation of 'Koala Warning Signs' or 'Injured Native of potential wildlife conflict areas or crossing points • Type and extent of any proposed landscaping features in line with the Urban Design Plan (see management measure LV5) • Consideration of MCC mine closure requirements and rehabilitation strategies where practicable and feasible.		
B17	Invasion and spread of weeds	Priority weed species will be managed in accordance with Guide 6: Weed management of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (Roads and Traffic Authority, 2011a)	Construction contractor	Construction
B18	Pathogen and disease management	Hygiene procedures will be implemented for the use of vehicles and the importation of materials to the proposal footprint in accordance with Guide 7: Pathogen management of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (Roads and Traffic Authority, 2011a)	Construction contractor	Construction
B19	Groundwater dependant ecosystems (GDE)	Impacts on groundwater dependent ecosystems (GDEs) will be minimised through detailed design, where practicable and feasible	Transport	Detailed design
B20	Biodiversity Offsets	A Biodiversity Offset Strategy (BOS) ~~will be prepared for the proposal~~ ***prepared*** in accordance with *Guidelines for Biodiversity Offsets* (Roads and Maritime Services, 2016) ***will be revised to include additional residual impacts and subsequent offsetting requirements associated with the proposed modification.***	Transport	Pre-construction
W1	Soil and Water	A Soil and Water Management Plan (SWMP) will be prepared in accordance with QA Specification G38 and implemented as part of the CEMP. The SWMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution associated with undertaking the activity and describe how these risks will be managed and minimised during construction, including arrangements for managing pollution risks associated with spillage or contamination on the site and adjoining areas, and monitoring during and post-construction.	Construction contractor	Pre-construction and construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
		In addition, the SWMP will address relevant requirements of the following guidelines and procedures: • Code of Practice for Water Management, the Roads and Maritime Erosion and Sedimentation Procedure • The NSW Soils and Construction – Managing Urban Stormwater Volume 1 "the Blue Book" (Landcom, 2004) and Volume 2 (Department of Environment and Climate Change, 2008) • Technical Guideline: Temporary Stormwater Drainage for Road Construction, (Roads and Maritime Services, 2011a) • Technical Guideline: Environmental Management of Construction Site Dewatering, (Roads and Traffic Authority, 2011c).		
W2	Surface water quality	Operational basins will be provided at flow discharge points associated with the bypass and bridges over Muscle Creek and Sandy Creek. Exact locations are to be confirmed during detailed design.	Construction contractor and Transport	Detailed design and construction
W3	Spill management	A Spill Management Plan (SMP) will be prepared and implemented as part of the CEMP to minimise the risk of pollution arising from spillage or contamination on the site and adjoining areas. The SMP will address, but not necessarily be limited to: • Management of chemicals and potentially polluting materials • Appropriate location and storage of construction materials, fuels and chemicals, including bunding where appropriate • Maintenance of plant and equipment • Emergency management, including notification, response and clean-up procedures in accordance with the *Code of Practice for Water Management* (RTA, 1999) and relevant EPA guidelines.	Construction contractor	Pre- construction and Construction
W4	Surface water quality	Water quality requirements will form part of the conditions stipulated in the EPL for the proposal. The current water quality monitoring program results will be used for baseline purposes	Construction contractor	Construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
W5	Flood mitigation	A Flood Risk Management Plan (FRMP) will be prepared as part of the CEMP. The FRMP will address, but not necessarily be limited to: • Processes for monitoring and mitigating flood risk • Steps to be taken in the event of a flood warning including removal or securing of loose material, equipment, fuels and chemicals.	Construction contractor	Construction
W6	Flood mitigation	Design mitigation options to minimise flooding impacts on the Sandy Creek impact area will be investigated during detail design	Transport for NSW	Detailed design
W7	***Working in waterways***	***An Environmental Work Method Statement will be prepared for temporary instream crossing structures and will include protocols to minimise impacts to fish and fish passage.*** ***Temporary instream crossing structures will be designed in accordance with the requirements of the Policy and Guidelines for Fish Habitat Conservation and Management (NSW Department of Primary Industries, 2013).*** ***As outlined in section 199 of the FM Act, the Minister for Primary Industries will be notified prior to any dredging or reclamation works taking place and any matters raised by the Minister will be considered within 21 days of the notice.***	***Construction contractor***	***Construction***
W8	***Dewatering***	***A Dewatering Management Plan (DMP) will be prepared as part of the CEMP and will include off-site disposal transfer or discharge arrangements for dam dewatering.*** ***The DMP will include measures to manage:*** • ***Quality of any water to be discharged/ disposed of*** • ***Water flows from any water discharged*** • ***Quality of water, stream health, riparian vegetation health and channel stability of creeks and other water bodies that could potentially be affected by discharges*** • ***Sediment and erosion from dewatering of the dams.***	***Construction contractor***	***Construction***
W9	***Water quality***	***Prior to discharge of any dam waters, a water quality monitoring program will be developed to measure water quality parameters against the relevant water quality criteria.***	***Construction contractor and Transport***	***Construction***

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
GW1	Dewatering	Practical and reasonable measures will be implemented to avoid and minimise discharge from sediment basins during construction and outlined in the SWMP. Where discharge from construction basins is required, a water pollution impact assessment consistent with the National Water Quality Guidelines would be prepared. Any dewatering activities will be undertaken in accordance with the *RTA Technical Guideline: Environmental management of construction site dewatering* in a manner that prevents pollution of waters	Construction contractor	Detailed design and construction
GW2	Groundwater	Additional investigations will be undertaken to determine the presence of groundwater and impacts from the Proposal and construction activities	~~Construction contractor and Transport~~ ***Construction contractor***	Detailed design
GW3	Groundwater	Where potential groundwater impacts are identified as a result of construction activities (see management measure GW2), measures to minimise impacts on groundwater must be developed and implemented, where practicable and feasible. For example, pile holes should be installed by advancing steel casing into the ground as they are advanced to reduce groundwater intrusion.	Construction contractor	Detailed design and construction
E1	Soil erosion and sedimentation	A site-specific Erosion and Sediment Control Plan (ESCP) will be prepared and implemented and included in the SWMP. The ESCP will identify detailed measures and controls to be applied to minimise erosion and sediment control risks including, but not necessarily limited to: • Runoff, diversion and drainage points • Sediment management devices, such as fencing, hay bales or sandbags • Scour protection and energy dissipaters at locations of high erosion risk • Stabilising disturbed areas as soon as possible, check dams, fencing and swales • Staged implementation arrangements. The ESCP will also include arrangements for managing wet weather events, including monitoring of potential high-risk events (such as storms), ~~and~~ specific controls and follow-up measures to be applied in the event of wet weather, and inspection and maintenance arrangements. The ESCPs will be progressively and regularly updated throughout the project and as the site conditions change or works progress onsite	Construction contractor	Construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
E2	Excess spoil	Excess spoil not required or able to be used for backfilling will be stockpiled in a suitable location or removed from the site, and disposed of appropriately in accordance with the NSW EPA *Waste Classification Guidelines* (2014)	Construction contractor	Construction
E3	Erosion and sedimentation	Erosion and sediment controls will be implemented before any construction starts and inspected regularly, particularly after a rainfall event. Maintenance work will be carried out as needed	Construction contractor	Construction
E4	Erosion and sedimentation	All stockpiles will be designed, established, operated and decommissioned in accordance with *Roads and Maritime Stockpile Management* Guideline (Roads and Traffic Authority, 2011b)	Construction contractor	Construction
E5	Erosion and sedimentation	The rehabilitation of disturbed areas will be undertaken progressively as construction stages are completed, in accordance with: • The NSW Soils and Construction – Managing Urban Stormwater Volume 1 "the Blue Book" (Landcom, 2004) and Volume 2 (Department of Environment and Climate Change, 2008) • Landscape Guideline (RTA 2018) • Guideline for Batter Surface Stabilisation using Vegetation (Roads and Maritime, 2015a).	Construction contractor	Construction
E6	Erosion and sedimentation	Batters will be designed and constructed to minimise risk of exposure, instability and erosion, and to support long-term, on-going best practice management, in accordance with *Guideline for Batter Surface Stabilisation using Vegetation* (Roads and Maritime, 2015a)	Transport and Construction contractor	Detailed design and construction
E7	Tracking of soil off site	Controls will be implemented at exit points to minimise the tracking of soil and particulates onto pavement surfaces	Construction contractor	Construction
E8	Contamination	A Phase II Environmental Site Assessment (ESA) will be prepared to quantify potential areas of contamination identified within the Preliminary Conceptual Site Model (CSM) of the Phase I Contamination Assessment and to better inform the CEMP. The Phase II detailed site contamination investigations will be carried out to: • Determine the extent of contamination present • Identify potential impacts on workers during construction • Assess the suitability of the fill to be reused on the site	Transport	Pre- construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
		• Identify if remedial works are required • Develop management strategies for the identified contamination including methods for classification and disposal. Investigations will be completed by an appropriately qualified and experienced environmental consultant in accordance with the *State Environmental Planning Policy 55* (SEPP 55), relevant NSW EPA Guidelines, and the *National Environment Protection Measure (Assessment of Site Contamination) 1999* (revised 2013) Should a Remediation Action Plan (RAP) be required this would also be completed by an appropriately qualified and experienced consultant in accordance with the *State Environmental Planning Policy 55* (SEPP 55), relevant NSW EPA Guidelines, and the *National Environment Protection Measure (Assessment of Site Contamination) 1999* (revised 2013)		
E9	Contamination	A Soil Contamination Management sub-plan (SCMP) will be prepared as part of the CEMP, prior to the commencement of works, which documents specific soil contamination mitigation and management measures to be employed during the construction of the proposed works	Construction contractor	Construction
E10	Contamination	The SCMP will include an unexpected finds protocol for potentially contaminated material encountered during construction, ~~work~~ developed in accordance with *Guideline for the Management of Contamination* (Roads and Maritime 2013) Should contamination which may pose potential risk to human health and the environment be encountered during construction, further assessment and management measures may be required following consultation with Transport	Construction contractor	Construction
E11	Contamination	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. This may include but not be limited to: • Diversion of surface runoff • Capture of any contaminated runoff • Temporary capping. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls (for the proposed road corridor) or further actions identified in consultation with the Transport Environment Manager and/or the EPA are implemented	Construction contractor	Construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
E12	Contamination	An Asbestos Management Plan will be developed and implemented to manage asbestos and asbestos containing material if encountered during the construction. The plan will include: • Identification of potential asbestos on site • Procedures to manage and handle any asbestos • Mitigation measures if asbestos is encountered during construction • Procedures for disposal of asbestos in accordance with the NSW EPA guidelines, Australian Standards and relevant industry codes of practice.	Construction contractor	Construction
E13	***Contamination***	***Prior to disturbing any sediment within the dams, the sediment within the dam walls and bed should be assessed against the National Environmental Protection Measure (NEPM) 2013.***	***Construction contractor***	***Construction***
T1	Construction traffic management	A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the *Transport Traffic Control at Work Sites Manual* (Transport for NSW, 2020b) and *QA Specification G10 Control of Traffic* (Transport for NSW, 2020a). The TMP will include: • Confirmation of haulage routes • Measures to maintain access to local roads and properties • Site specific traffic control measures (including signage) to manage and regulate traffic movement • Measures to maintain pedestrian and cyclist access • Requirements and methods to consult and inform the local community of impacts on the local road network • Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. • A response plan for any construction traffic incident • Consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic • Monitoring, review and amendment mechanisms.	Construction contractor	Pre- construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
T2	Access to properties	Disruptions to property access and traffic will be notified to landowners at least five days prior in accordance with the relevant community consultation processes outlined in the TMP	Construction contractor and Transport	Detailed design and Construction
T3	Access to properties	Where any legal access to property is permanently affected, arrangements for appropriate alternative access will be determined in consultation with the affected landowner and local road authority.	Construction contractor and Transport	Detailed design
T4	Access to properties	Access to properties will be maintained during construction. Where that is not feasible or necessary, temporary alternative access arrangements will be provided following consultation with affected landowners and the relevant local road authority	Construction contractor and Transport	Construction
T5	Local road condition	Pre-construction and post construction road condition reports for local roads likely to be used during construction will be prepared. Any damage resulting from construction (not normal wear and tear) will be repaired unless alternative arrangements are made with the relevant road authority. Copies of road condition reports will be provided to the local roads authority	Construction contractor	Pre and post construction
T6	Pedestrian and cyclist access	Pedestrian and cyclist access will be maintained throughout construction. Where that is not feasible or necessary, temporary alternative access arrangements will be provided following consultation with affected landowners and the local road authority	Construction contractor	Construction
NV1	Noise and vibration	The Noise and Vibration Technical Report will be re-evaluated based on the detailed design in order to reaffirm noise predictions and potential impacts as a result of the proposal. The report will also consider any mitigation measures following consultation with landowners such as earth bunds.	Transport	Pre- construction
NV2	Noise and vibration	A Construction Noise and Vibration Management Plan (CNVMP) will be prepared and implemented as part of the CEMP. The CNVMP will identify: • All potential significant noise and vibration generating activities associated with the activity • Noise and vibration sensitive receivers • Measures to be implemented during construction to minimise noise and vibration impacts, such as restrictions on working hours, staging, placement and operation of work compounds, parking and storage areas, temporary noise barriers, haul road maintenance and controlling the location and use of vibration generating equipment	Construction contactor	Pre- construction and construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
		• Feasible and reasonable mitigation measures to be implemented, taking into account *Beyond the Pavement: urban design policy, process and principles* (Transport for NSW, 2014) • A monitoring program to assess performance against relevant noise and vibration criteria • Arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures • An out of hours works procedure, including approval process and proposed mitigation measures.		
NV3	Noise and vibration	All sensitive receivers likely to be affected will be notified at least five days prior to commencement of any works associated with the scenario that may have an adverse noise or vibration impact. The notification will include details of: • The proposal • Construction period and construction hours • Contact information for proposal management staff • Complaint and incident reporting and how to obtain further information.	Construction contactor	Construction
NV4	Noise and vibration	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: • All relevant proposal specific and standard noise and vibration mitigation measures • Relevant licence and approval conditions • Permissible hours of work • Any limitations on high noise generating activities • Location of nearest sensitive receivers • Construction employee parking areas • Designated loading/unloading areas and procedures • Site opening/closing times (including deliveries) • Environmental incident procedures.	Construction contactor	Construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
NV5	Noise and vibration	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Works generating high noise and/or vibration levels should be scheduled during less sensitive time periods Any variations to the standard construction hours will follow the approach in *Roads and Maritime Services – Construction Noise and Vibration Guideline*, including consultation with the affected local community	Construction contactor	Construction
NV6	High noise generating work – standard construction hours	Where feasible and reasonable, high noise generating work (75 dB(A) LAeq at receiver) will be carried out during standard construction hours and in continuous blocks of no more than three hours with at least one hour respite between each block of work generating high noise impact, where the location of the work is likely to impact the same receiver	Construction contactor	Construction
NV7	High noise generating activities – out of hours	Where high noise generating activities (75 dB(A) LAeq at receiver) are required out of hours, the following will be implemented: • The equipment will be used prior to 10pm where feasible and reasonable • Where the above cannot be achieved the equipment will be used prior to midnight where feasible and reasonable • It is not proposed to apply a three hour on and a one hour off respite approach in an effort to ensure that the use of such equipment is completed as early in the night as possible.	Construction contactor	Construction
NV8	Noise treatments	Where properties have been identified for architectural treatment and these properties will be impacted by noise from construction works, Transport will consult with those property owners on the early installation of treatments to provide noise mitigation during the construction of the proposal, where feasible	Transport	Pre-construction
NV9	Noise from deliveries	The following will be implemented for deliveries to and from the proposal: • Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers • Dedicated loading/unloading areas are to be shielded if close to sensitive receivers • Delivery vehicles are to be fitted with straps rather than chains for unloading, wherever possible • Construction sites will be arranged to limit the need for reversing associated with regular/repeatable movements.	Construction contactor	Construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
NV10	Noise from construction vehicles/plant	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work	Construction contactor	Construction
NV11	Noise from construction ancillary facilities	The noise associated with the operation of construction ancillary facilities will primarily result from the operation of fixed and mobile plant and truck movements. Consideration will be given to the layout of the site (positioning of site sheds, earth bunds and hoarding) in order to maximise distance and shielding to nearby receivers	Construction contactor	Pre- construction and construction
NV12	Noise sensitive receivers	Where practicable, noise and vibration generating activities that have the potential to impact on local schools, should be scheduled to avoid major student examination periods such as before or during Higher School Certificate and at the end of higher education semesters	Construction contactor	Construction
NV13	Noise mitigations	In circumstances where the noise levels are predicted to exceed construction noise management levels after implementation of the general work practices, additional mitigation measures are required. These measures include the following: • Monitoring • Notification (letterbox drop or equivalent) • Specific notifications • Phone calls • Individual briefings • Respite offers • Respite periods • Duration respite • Alternative accommodation.	Construction contactor	Construction
NV14	Vibration	Vibration intensive equipment size will be considered to avoid working within the structural damage minimum working distances. The use of less vibration intensive methods of construction or equipment will be considered where feasible and reasonable	Construction contactor	Construction
NV15	Vibration	Where the use of vibration intensive equipment within the relevant minimum working distances cannot be avoided, prior to the commencement of vibration intensive work, a detailed inspection will be carried out and a written and photographic report prepared	Construction contactor	Pre- construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
		to document the condition of buildings and structures within the minimum working distances. A copy of the report will be provided to the relevant landowner or land manager		
NV16	Operational noise	To confirm that the noise levels targets are achieved, a post-construction noise monitoring program will be carried out in accordance with the *Noise Mitigation Guideline* within 12 months of opening to traffic	~~Construction contractor and Transport~~ ***Construction contractor***	Operation
A1	Aboriginal cultural heritage	An application for an Aboriginal Heritage Impact Permit (AHIP) will be made under section 90A of the *National Parks and Wildlife Act 1974*. The application will be prepared in accordance with the *Heritage NSW Applying for an Aboriginal Heritage Impact Permit: Guide for Applicants* (Office of Environment and Heritage 2011). An AHIP will be sought for the land and associated objects within the boundaries of the construction footprint	Transport	Pre- construction
A2	Aboriginal cultural heritage	The AHIP will include provision for impact mitigation through archaeological salvage excavation at Muswellbrook Bypass AFT 1 and Muswellbrook Bypass AFT 9. Salvage excavations will be completed prior to any activities (including pre- construction activities) which may harm Aboriginal objects at these site locations. Salvage excavation activities will be undertaken in accordance with the approved methodology	Transport	Pre- construction
A3	Aboriginal cultural heritage	The AHIP will also include provision for community surface collection at all impacted site areas. The collection must be completed prior to any activities which may harm Aboriginal objects at these site locations and will be conducted as part of the overall salvage program, following the issue of the AHIP the collected objects will be recorded as part of the excavation report and included in the excavation assemblage for long term storage. The collection of surface artefacts will be undertaken in accordance with the approved methodology	Transport	Pre- construction
A4	Aboriginal cultural heritage	The short term management of collected Aboriginal objects will be as follows: • Any Aboriginal objects that are removed from the land by actions authorised by an AHIP, must be moved as soon as practicable to the temporary storage location pending any agreement reached about the long term management of the Aboriginal objects • The temporary storage location will be KNC, Level 10, 25 Bligh Street, Sydney NSW 2000 • Any Aboriginal objects stored at the temporary storage location must not be further harmed, except in accordance with the conditions of the AHIP	Transport	Pre- construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
		• The long term management of collected Aboriginal objects is as follows: – Recovered objects will be lodged with the Australian Museum in the first instance in accordance with the *Australian Museum Archaeological Collection Deposition Policy* – If required, a variation will be sought for recovered objects to be held by the Aboriginal community or reburied. If reburial is to take place, RAPs will be notified and given the opportunity to attend – Requirement 26 "Stone artefact deposition and storage" in the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* must be complied with.		
A5	Aboriginal cultural heritage	An Aboriginal Heritage Management Plan (AHMP) will be prepared and implemented as part of the CEMP. The AHMP will provide specific guidance on measures and controls to be undertaken to avoid and mitigate impacts on Aboriginal cultural heritage during construction. This should include protection measures to be applied during construction, including but not limited to the recommendations set out in this table, as well as contractor training in general Aboriginal cultural heritage awareness and management of Aboriginal heritage values	Construction contractor	Pre- construction and construction
A6	Aboriginal cultural heritage	The non-impacted portion of partially impacted sites (outside of construction footprint and AHIP boundary) will be marked on the CEMP prior to construction activities to ensure these parts of the sites are avoided and not impacted by the proposal. The site areas will be marked as environmentally sensitive "no-go zones" Temporary fencing will be installed around the edge of the non-impacted archaeological site areas and AHIP boundary during construction to provide a physical barrier against accidental access or impact. Workers will be inducted as to appropriate Aboriginal heritage protection measures	Construction contractor	Pre- construction
A7	Aboriginal cultural heritage	An Aboriginal cultural heritage awareness training package will be delivered as part of the site induction for all contractor(s) and maintenance personnel involved in the construction works The training package will be developed by a cultural heritage specialist in consultation with the RAPs and Aboriginal cultural knowledge holders. The training package will at a minimum ensure awareness of the cultural significance of the construction footprint, the requirements of the AHMP and relevant statutory responsibilities, and the identification of unexpected heritage items and appropriate management procedures	Construction contractor	Pre- construction and construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
A8	Aboriginal cultural heritage	A cultural heritage specialist will be engaged to develop interpretative materials on the cultural values and historical records relating to Site A: Sandy Creek Cultural Resource Area; Site B Skellatar Hill Line of Sight; and Site C Pathway cultural sites and the cultural landscape they sit within The form of the interpretative materials will be determined in consultation with the Aboriginal cultural knowledge holders and RAPs following investigation of options with Muswellbrook Shire Council. Options to be considered include interpretative signage, an educational booklet, and input into (aesthetic) design elements to reflect the Aboriginal cultural values of the area	Transport	Pre- construction
A9	Aboriginal cultural heritage	The proposed bridge to be constructed near Site A: Sandy Creek Resource Area will be named in recognition of the Aboriginal cultural values and history of the region. A range of potential names with supporting explanations will be developed by a cultural heritage specialist in consultation with the Aboriginal cultural knowledge holders and RAPs, with the options to be presented to the Aboriginal cultural knowledge holders and RAPs for their review and nomination of a preferred option to Transport	***Construction contractor and*** Transport	Pre- construction
A10	Aboriginal cultural heritage	The AHMP will include an *Unexpected Heritage Items Procedure* (Roads and Maritime, 2015b) requiring notification of the identified knowledge holders within 48 hours of any discovery of potential archaeological Aboriginal skeletal remains during the proposed works	Transport	As required
A11	Aboriginal cultural heritage	If there is a confirmed discovery of archaeological Aboriginal human remains, consultation will occur with the RAPS and Aboriginal cultural knowledge holders in relation to: the development of a Management Plan for proposed works in the relevant area; cultural ceremonies in relation to the human remains and the site of their occurrence; and repatriation of the human remains	~~Transport~~ ***Construction contractor***	As required
H1	Non-Aboriginal Heritage	A Non-Aboriginal Heritage Management Plan (NAHMP) will be prepared and implemented as part of the CEMP. The NAHMP will provide specific guidance on measures and controls to be implemented to avoid and mitigate impacts to Non-Aboriginal heritage	Construction contractor	Pre- construction
H2	Non-Aboriginal heritage	The *Standard Management Procedure -Unexpected Heritage Items* (Transport for NSW, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of Non-Aboriginal origin are encountered. Work will only re-commence once the requirements of that Procedure have been satisfied	Construction contractor	During construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
H3	Non-Aboriginal heritage	Two buffer zones will be set up around the old coal rail spur bridge over Muscle Creek and its associated elements, including: • A 25 metre radius exclusion zone that is made known to all workers operating near the site • A 50 metre radius limited works area. All those operating within the area will be made aware of the existence of the heritage items and that they are not to be disturbed An archival recording of the former bridge, to be carried out on the bridge prior to the commencement of works, will be considered in consultation with the landowner, MCC. This recording will record, in detail, the bridge and all fabric associated with it. This recording will also be used as a baseline assessment that will allow for a comparison of the bridge and specific elements before and after construction works Vibration monitoring will be undertaken within close proximity of the bridge. This is to record any actual vibration that is encountered in the vicinity of the bridge from construction. This monitoring will be done in conjunction with a visual inspection of the bridge to assess any potential vibration impacts. This monitoring will be added to the CEMP for the proposal.	Construction contractor	During construction
AQ1	Air Quality	An Air Quality Management Plan (AQMP) will be prepared and implemented as part of the CEMP. The AQMP will identify: • Potential sources of air pollution (such as dust, vehicles transporting waste, plant and equipment) during construction • Air quality management objectives consistent with relevant published EPA and/or DP~~I~~E guidelines including: – No Dust, No Fuss – Guidelines for controlling dust from construction sites. NSW EPA – Best Practice Erosion and Sediment Control. IECA, November 2008 – The “Blue Book” -Managing Urban Stormwater: Soils and Construction, Landcom (2004) 4th Ed • Mitigation and suppression measures to be implemented, such as spraying or covering exposed surfaces, provision of vehicle clean down areas, covering of loads, road cleaning, use of dust screens, maintenance of plant in accordance with manufacturer's instructions	Construction contractor	During construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
		• Methods to manage works during strong winds or other adverse weather conditions • A progressive rehabilitation strategy for exposed surfaces • When the air quality, suppression and management measures need to be applied, who is responsible, and how the effectiveness of measures will be assessed • Community notification and complaint handling procedures.		
AQ2	Air Quality	As part of the AQMP, a monitoring program will be developed to monitor construction dust from the proposal. The monitoring plan will be implemented prior to construction and during the construction period, to assess effective implementation of air quality safeguards, identify any unexpected or inadvertent impacts, and identify recommended revisions or improvements	Construction contractor	During construction
AQ3	Air Quality	The AQMP will also need to: • Clearly identify periods of time when MCC activities may coincide with road construction activities • Define methods by which the source of the dust can be attributed between MCC activities and road construction footprint • Define methods whereby MCC compliance measurements could be adjusted to reflect dust that may have bene generated in the direction of the road construction activities (keeping in mind that there are many dust sources that may also contribute to dust in the area around the Bypass construction) • Outline contingency measures that can be implemented if it is shown that cumulative impacts are occurring due to the road construction activities occurring at the same time as MCC activities.	Construction contractor	Pre-construction
LV1	Landscape and visual	Visual impact mitigation at Muscle Creek Road will include: • Tree planting along the proposed relocated driveway which will assist in reducing the visual impact of the proposal on receptors by partially screening the view to the bypass from these locations. Semi mature trees and shrubs will provide immediate screening post construction • Scattered tree or shrub planting to the batters of the proposed bypass road, particularly between Muscle Creek Road and Muscle Creek, which will visually 'break up' the flat expanse of the batter planted with pasture grasses.	Construction contractor	Detailed design

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
LV2	Landscape and visual	The landscape treatment south from the northern connection along the New England Highway will include rows of ornamental trees to assist in screening the changes within the view and increase visual amenity. Ornamental trees provide a 'gateway' landscape treatment to the township of Muswellbrook. The landscape treatment to the central connection (at Coal Road) will be more visually recessive, with scattered tree and shrub planting to match the length of the bypass and suggest a more local entry point to the township, rather than the 'gateway' statement at the northern and southern connections	Construction contractor	Detailed design
LV3	Landscape and visual	Consideration will be given to the inclusion of visual impact mitigation near Koolbury Flats Row, including scattered tree or shrub planting along the realignment of the road	Construction contractor	Detailed design
LV4	Landscape and visual	All plant material will be locally sourced (seed collection preferred), with any seed collection to commence within three months of construction contract award, where possible	Construction contractor	Detailed design
LV5	Landscape and visual	An Urban Design Plan will be prepared as part of the CEMP. The Plan will include: • Location and identification of vegetation in the proposal area to be retained and proposed landscaped areas • Details of the staging of built elements including bridges and concrete barriers • Details of the staging of landscape works • Maintenance measures for landscaped or rehabilitated areas, including timing of maintenance works • Consideration of MCC mine closure requirements and rehabilitation objectives • A landscape monitoring program including an inspection program and frequency of inspection.	Construction contractor	Detailed design and Pre-construction
P1	Property acquisition	All property acquisition will be carried out in accordance with the Land Acquisition Information Guide (Transport for NSW, 2012) and the *Land Acquisition (Just Terms Compensation) Act 1991*	Transport	Detailed design
P2	Property acquisition	Where possible, Transport will minimise impacts to property infrastructure. Where property adjustments are required including to fencing and property access, these adjustments will be developed in consultation with affected property owners and will be carried out prior to works that impact the property.	Construction contractor and Transport	Detailed design and construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
P3	Property acquisition	Transport will investigate the possibility of licencing land beneath the bridge to be situated over Sandy Creek to impacted landowners to enable continued access for fragmented properties	Transport	Detailed design
SE1	Community information	A Communication Plan (CP) will be prepared and implemented as part of the CEMP to ensure provision of timely and accurate information to the community during construction. The CP will include (as a minimum): • Mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions • Contact name and number for complaints • How the proposal webpage will be maintained for the duration of the proposal. • Minimum consultation activities to be carried out • A complaints handling procedure.	Construction contractor	Pre- construction and construction
SE2	Business impacts	Transport will develop a signage strategy for the entrances to Muswellbrook, in consultation with Muswellbrook Shire Council to encourage motorists to visit Muswellbrook. This will include signage showing: • The travel distances and estimated times for travelling routes via the bypass compared to travelling via the Muswellbrook town centre • Services and facilities available within the Muswellbrook township • Visitor attractions within the Muswellbrook township.	Transport	Detailed design and operation
SE3	Business impacts	Transport will engage with Muswellbrook Shire Council and local businesses regarding the progress of the proposal to allow businesses time to prepare for changed traffic conditions through the town	Transport	Detailed design and construction
SE4	Employment	Construction workers will be sourced from the local area where feasible	Construction contractor	Construction
SE5	Business impacts	Access to businesses will be maintained throughout the proposal	Construction contractor	Construction
M1	Resource use	Use of recycled-content materials will be considered during the detailed design	~~Transport~~ ***Construction contractor***	Detailed design

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
M2	Construction waste	A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will provide specific guidance on measures and controls to be implemented to support minimising the amount of waste produced and appropriate handling and disposal of unavoidable waste. The WMP will include, but will not necessarily be limited to: • Measures to avoid and minimise waste associated with the proposal • Classification of wastes generated by the proposal and management options (re-use, recycle, stockpile, disposal) • Classification of wastes received from off-site for use in the proposal and management options • Any statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions • Procedures for storage, transport and disposal • Monitoring, record keeping and reporting, including any documentation management obligations arising from resource recovery exemptions. The WMP will be prepared taking into account the *Transport Environmental Procedure – Management of Wastes on Roads and Maritime Services Land* and relevant Transport Waste Fact Sheets	Construction contractor	Pre- construction and construction
M3	Construction waste	The following resource management hierarchy principles will be followed: • Avoid unnecessary resource consumption as a priority • Avoidance will be followed by resource recovery (including reuse of materials, reprocessing, and recycling and energy recovery) • Disposal will be a last report (in accordance with the *Waste Avoidance and Resource Recovery Act 2001*).	Construction contractor	Pre-construction and construction
CC1	Sustainability	Construction equipment, plant and vehicles will be appropriately sized for the task, serviced frequently and will not be left idling when not in use	Construction contractor	Construction
CC2	Sustainability	Opportunities to use low emission construction materials, such as recycled aggregates in road pavement and surfacing, and cement replacement materials will be investigated and incorporated where feasible.	Construction contractor	Construction
CC3	Sustainability	Construction site layouts will be designed to reduce travel distances and double handling of materials to reduce fuel usage and emission generation	Construction contractor	Construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
CC4	Sustainability	Raw materials will be managed to reduce energy requirements for their processing. For example, stockpiled materials will be covered or provided undercover storage where possible to reduce moisture content of materials, and therefore the processing and handling requirements	Construction contractor	Construction
CC5	Sustainability	Locally produced goods and services will be procured where feasible and cost effective to reduce transport fuel emissions	Construction contractor	Construction
CC6	Sustainability	A sustainability strategy will be developed to establish sustainability objectives, targets and processes to ensure integration of sustainability considerations during the detailed design and construction phase of the proposal.	Transport	Detailed design and construction
R1	Hazard and risk	Emergency response plans will be incorporated into the CEMP	Construction contractor	Pre- construction and construction
R2	Hazard and risk	A Hazard and Risk Management Plan will be prepared and implemented as part of the CEMP. The Plan will identify: • Hazards and risks associated with the activity • Measures to be implemented during construction to minimise these risks • Record keeping arrangements, including information on the materials present on the site, material safety data sheets, and personnel trained and authorised to use such materials • A monitoring program to assess performance in managing the identified risks, including equipment checking and maintenance requirements • Contingency measures to be implemented in the event of unexpected hazards or risks arising, including emergency situations.	Construction contractor	Pre- construction and construction
R3	Bushfires	A Bushfire Management Plan will be prepared and included as part of the CEMP. The Plan will identify: • Asset protection zone locations and management details • Landscaping requirements including indicative design layout and vegetation density thresholds • Access provisions such as locations, passing bays and alternate emergency access • Water supplies and bush fire suppression systems	Construction contractor	Pre- construction and construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
		• Details regarding the Bush Fire Emergency Management and Evacuation Plan and any other essential bush fire safety requirements.		
R4	Bushfires	Construction activities involving flammable materials and ignition sources (for example, welding) will be proactively managed to ensure that the potential for fire is effectively minimised. High risk construction activities, such as welding and metal work, will be subject to a risk assessment on total fire ban days and restricted or ceased as appropriate. Construction personnel will be inducted into the requirement to safely dispose of cigarette butts	Construction contractor	Construction

7.3 Licensing and approvals

All relevant licenses, permits, notifications and approvals needed for the New England Highway bypass of Muswellbrook and when they need to be obtained are listed in Table 7-2. Additional or changed licenses and approval requirements identified in this addendum REF are indicated by bolded and italic font.

Table 7-2: Summary of licensing and approval required

Instrument	Requirement	Timing
Protection of the Environment Operations Act 1997 (s43)	EPL for scheduled activities from NSW EPA	Prior to start of the activity
Fisheries Management Act 1994 (s199)	Notification to the Minister for Agriculture and Western NSW prior to any reclamation works	A minimum of 28 days prior to the start of work
Fisheries Management Act 1994 (s219)	***Permit to obstruct the free passage of fish (temporary or permanent) from the Minister for Agriculture and Western NSW.***	***Prior to start of the activity***
National Parks and Wildlife Act 1974 (s90)	An AHIP from the Chief Executive of Energy, Environment and Science for the disturbance of the Aboriginal sites that would be impacted by the proposal	Prior to start of the activity
Coal Mine Subsidence Compensation Act 2017	Approval to alter or erect improvements within a mine subsidence district from the Chief Executive of Subsidence Advisory, pursuant to Clause 21 of the *Coal Mine Subsidence Compensation Act*	Prior to start of the activity

8. Conclusion

8.1 Justification

The strategic importance and strategic need of the project is outlined in the project REF. The proposed modification is considered consistent with a number of relevant strategic planning and policy frameworks, as listed in Section 2.1 of the project REF. The proposed modification is needed to assist with construction staging and access requirements for the approved project.

This addendum REF has assessed the potential biophysical, social and economic impacts of the proposed modification. The proposed modification would result in some adverse environmental impacts to biodiversity, visual amenity, noise, traffic and air quality (dust). Most of these impacts are considered minor when compared to the approved project, and would be minimised through the implementation of mitigation measures outlined in the project REF and this addendum REF.

Overall, the proposed modification is justified as it supports the construction of the proposed bypass which would provide long-term beneficial impacts of improved traffic flow, reduced congestion and improved safety for roads users and residents within Muswellbrook, as described in the project REF.

8.1.1 Social factors

The proposed modification would improve road safety along local roads by:

- Upgrading the intersection of Sandy Creek Road and the New England Highway
- Widening Milpera Drive and installing pipe culverts units along the western edge of Milpera Drive
- Maintaining existing roadway along Muscle Creek Road, Milpera Drive and Coal Road, where required.

Potential social impacts as a result of the proposed modification may include additional temporary disruptions along local roads, amenity impacts including noise and air emissions, minor permanent and temporary modifications to the landscape and visual changes. No property acquisition is required for the proposed modification.

8.1.2 Biophysical factors

The proposed modification is mostly consistent with the biophysical factors of the project REF. The proposed modification would result in the removal of an additional 15.99 ha of native vegetation , removal of an additional 17 hollow-bearing trees and potential additional impacts to four waterways. Exclusion zones have been identified to avoid impact on around 9.42 ha of Central Hunter Eucalypt Forest TEC listed under the EPBC Act, leading to an overall reduction of the projects impact on this TEC.

The overall outcome of the assessments of significance indicates that the impacts to threatened biodiversity are unlikely to be significant under the BC Act or EPBC Act, consistent with the project REF. Transport would review the project's biodiversity offset strategy to include any additional offsetting requirements resulting from the proposed modification.

8.1.3 Economic factors

The proposed modification is consistent with the economic factors of the project as outlined in Section 8.1.3 of the project REF.

8.1.4 Public interest

Whilst the community would experience some negative impacts as a result of the proposed modification, most would be temporary and would be minimised with the safeguards provided in Section 7.

As assessed in the project REF, the overall project is considered to be in the public interest as it would improve road safety, traffic efficiency and access to the town centre of Muswellbrook, while also improving amenity such as air and noise emissions within the township. The proposed modification supports the construction of the bypass which would result in these benefits.

8.2 Objects of the EP&A Act

Object	Comment
1.3(a) To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	This addendum REF has considered relevant economic, environmental and social considerations. Potential impacts would be minimised through the implementation of mitigation measures proposed in the project REF and additional mitigation measures provided in this addendum REF (refer to Section 7).
1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	This addendum REF has considered relevant economic, environmental and social considerations. Ecologically sustainable development (ESD) is considered in Section 8.3 below. Potential impacts would be minimised through the implementation of mitigation measures proposed in the project REF and additional mitigation measures provided in this addendum REF (refer to Section 7).
1.3(c) To promote the orderly and economic use and development of land.	Not relevant to the proposed modification as most of the proposed modification areas would only be used temporarily during construction.
1.3(d) To promote the delivery and maintenance of affordable housing.	Not relevant to the proposed modification.
1.3(e) To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	The proposed modification would result in a loss of an additional 15.99 ha of native vegetation and associated habitats. Aligning with the project REF, assessments of significance have been conducted for the proposal and indicate that impacts to threatened biodiversity are unlikely to be significant under the BC Act or EPBC Act. Exclusion zones have been identified avoiding 9.46 ha of native vegetation, and reducing the project's overall impact on Central Hunter Eucalypt Forest TEC. A review of the project biodiversity offset would include any additional offsetting requirements resulting from the proposed modification.
1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	The proposed modification does not impact on additional identified Aboriginal Heritage Sites or Areas. The likely impact of the proposed modification is consistent with the project REF.
1.3(g) To promote good design and amenity of the built environment.	The proposed modification does not involve any design changes to the bypass or the urban and landscape design as assessed in the project REF. There are local road maintenance and upgrade works proposed as part of the proposed modification. This work would be designed to meet the relevant road standards identified in Section 3.2.1 in the project REF.
1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	Not relevant to the proposed modification.
1.3(i) To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	Not relevant to the proposed modification.
1.3(j) To provide increased opportunity for community participation in environmental planning and assessment.	Consultation on the project, including the proposed modification, is ongoing with private landowners and stakeholders in relation to additional properties requiring lease agreements and/or arrangements and dam relocation work (refer to Section 5).

8.3 Ecologically sustainable development

ESD is development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends. ESD requires the effective integration of economic and environmental considerations in

decision-making processes. ESD was applied to the project and is outlined in the project REF. The four main principles supporting the achievement of ESD for the proposed modification is discussed below.

8.3.1 The precautionary principle

The precautionary principle deals with reconciling scientific uncertainty about environmental impacts with certainty in decision-making. It provides that where there is a threat of serious or irreversible environmental damage, the absence of full scientific certainty should not be used as a reason to postpone measures to prevent environmental degradation. The precautionary principle has guided the assessment of environmental impacts for the proposed modification and the development of additional mitigation measures for the project.

8.3.2 Intergenerational equity

Inter-generational equity focuses on minimising the distribution of costs to future generations. The proposed modification would result in minor amenity impacts for some residents of Muswellbrook and road users, however would not result in any impacts that are likely to impact on the health, diversity or productivity of the environment for future generations.

The proposed modification would benefit future generations by improving road safety along some of the local roads including:

- Upgrading the intersection of Sandy Creek Road and the New England Highway
- Widening Milpera Drive and installing pipe culverts units along the western edge of Milpera Drive
- Maintenance of existing roadway along Muscle Creek Road, Milpera Drive and Coal Road.

8.3.3 Conservation of biological diversity and ecological integrity

An addendum biodiversity assessment was prepared for the proposed modification as outlined in Section 6.1 and in Appendix B. Conservation of biological diversity and ecology integrity was applied to the proposed modification through the identification of exclusion zones preventing the removal of up to 9.46 ha of Central Hunter Eucalypt Forest TEC. This has reduced the overall project impact on this TEC. Furthermore, temporary instream structures would be built in accordance with an Environmental Work Method Statement to provide safe fish passage through aquatic habitats and minimise aquatic habitat impacts where possible.

The applications of biological diversity and ecological integrity for the project REF are consistent with the proposed modification.

8.3.4 Improved valuation, pricing and incentive mechanisms

The principle of internalising environmental costs into decision making requires consideration of all environmental resources which may be affected by the carrying out of a project, including air, water, land and living things.

The proposed modification has examined environmental impacts and benefits and identified mitigation measures to manage the potential for adverse impacts. The implementation of mitigation measures would increase both the capital and operating costs of the project. This signifies that environmental resources have been given appropriate valuation.

8.4 Conclusion

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

This has included consideration where relevant, of conservation agreements and plans of management under the NP&W Act, biodiversity stewardship sites under the BC Act, wilderness areas, areas of outstanding value, impacts on threatened species, populations and ecological communities and their habitats and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the Federal EPBC Act.

A number of potential environmental impacts from the proposed modification have been avoided or reduced. The proposed modification as described in the addendum REF best meets the project objectives but would still result in some adverse impacts. Safeguards and management measures as detailed in this addendum REF would ameliorate or minimise these expected impacts. The proposed modification supports the construction of the proposed bypass which would provide long-term beneficial impacts

of improved traffic flow, reduced congestion and improved safety for roads users and residents within Muswellbrook. On balance the proposed modification is considered justified, and the following conclusions are made.

8.4.1 Significance of impact under NSW legislation

The proposed modification would not result in a change to the findings of the project REF and would be unlikely to cause a significant impact on the environment. Therefore, it is not necessary for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act. A Biodiversity Development Assessment Report or Species Impact Statement is not required. The proposed modification is subject to assessment under Division 5.1 of the EP&A Act. Consent from Council is not required.

8.4.2 Significance of impact under Australian legislation

The proposed modification would not likely cause a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the EPBC Act 1999. A referral to the Australian Government Department of Climate Change, Energy, the Environment and Water is not required.

9. Certification

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

Catherine Brady
Technical Director
AECOM

Date: 1 April 2024

I have examined this addendum review of environmental factors and accept it on behalf of Transport for NSW.

David Lehrbach
Senior Environment and Sustainability Officer
Transport for NSW

David Lehrbach

Date: 8 April 2024

10. EP&A Regulation publication requirement

Respondent	Yes/No
Does this REF need to be published under section 171(4) of the EP&A Regulation?	Yes

11. Terms and acronyms used in this addendum REF

Term /acronym	Description
AECOM	AECOM Australia Pty Ltd
AEP	Annual Exceedance Probability
AFT	Stone Artefact
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
AHMP	Aboriginal Heritage Management Plan
ALR Act	*Aboriginal Land Rights Act 1983* (NSW)
Approved project	Transport for NSW proposes to build a New England Highway bypass of Muswellbrook
ARI	Average Recurrence Interval
ARTC	Australian Rail Track Corporation
BAR	Biodiversity Assessment Report
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BDAR	Biodiversity Development Assessment Report
BESS	Battery Energy Storage System
Biosecurity Act	*Biosecurity Act 2015* (NSW)
CEEC	Critically endangered ecological community
CEMP	Construction / Contractor's environmental management plan
CHAR	Aboriginal Cultural Heritage Report
CLM Act	*Contaminated Lands Management Act 1997* (NSW)
CMSC Act	*Coal Mine Subsidence Compensation Act 2017* (NSW)
CoPC	Contaminant of potential concern
CP	Communication Plan
dB(A)	A weighted decibel
DMP	Dewatering Management Plan
DNG	Derived Native Grassland
DPE	NSW Department of Planning and Environment
DPI – Fisheries	Department of Primary Industries – Fisheries
DSI	Detailed Site Investigation
EEC	Endangered ecological community
EES	Environment, Energy and Science
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 Environmental Protection Authority
EPL	Environmental Protection Licence
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
ESD	Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased
FM Act	*Fisheries Management Act 1994* (NSW)
GDE	Groundwater Dependent Ecosystem
ha	Hectares
HBT	Hollow-bearing tree
Heritage Act	*Heritage Act 1977* (NSW)
Hz	Hertz
KFH	Key Fish Habitat
km	Kilometres
KNC	Kelleher Nightingale Consulting Pty Ltd
LA_{eq}	Equivalent Continuous Sound Pressure Level
Land Acquisition Act	*Land Acquisition (Just Terms Compensation) Act 1991* (NSW)
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act

Term /acronym	Description
LGA	Local Government Area
LoS	Level of Service. A qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers
m	Metres
MCC	Muswellbrook Coal Company
MNES	Matters of national environmental significance under the Commonwealth EPBC Act
Muswellbrook LEP	*Muswellbrook Local Environmental Plan 2009*
NCA	Noise catchment area
NEPM	National Environmental Protection Measure
NML	Noise management level
NP&W Act	*National Parks and Wildlife Act 1974* (NSW)
NRAR	Natural Resources Access Regulator
PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation (NSW Roads and Maritime Services, 2011)
PAD	Potential archeological deposit
PCT	Protected Ecological Community
PFAS	Per- and Poly-Fluoroalkyl Substances
PFOS	Perfluorooctane sulfonic acid
PMF	Probable Maximum Flood
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)
Project REF	A review of environmental factors was prepared for the New England Highway bypass of Muswellbrook in October 2021
Proposed modification	Transport for NSW proposes to modify the New England Highway bypass of Muswellbrook by amending the construction footprint in certain areas to assist with construction staging and access requirements
QA Specifications	Specifications developed by Roads and Maritime Services for use with road work and bridge work contracts let by Transport for NSW
RAP	Registered Aboriginal Party
REF	Review of Environmental Factors
RTA	Roads and Traffic Authority
Roads Act	*Roads Act 1993* (NSW)
Roads and Maritime	NSW Roads and Maritime was dissolved by the Transport Administration Amendment Bill in August 2019, all function are now managed by Transport for NSW
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act
SEPP (Transport and Infrastructure)	State Environmental Planning Policy (Transport and Infrastructure) 2021
SES	NSW State Emergency Services
SIS	Species Impact Statement
Submissions report	The project REF was placed on public display between Monday 8 November 2021 and Friday 17 December 2021 for community and stakeholder comment. A submissions report dated June 2022 was prepared to respond to issues raised
TEC	Threatened Ecological community
TMP	Traffic Management Plan
TSR	Travelling Stock Route
UXO	Unexploded Ordnance
WAL	Water Access Licence
WM Act	*Water Management Act 2000* (NSW)
WONS	Weeds of National Significance

12. References

AECOM Australia Pty Ltd 2021, New England Highway bypass of Muswellbrook, Review of Environmental Factors, October 2021.

AECOM Australia Pty Ltd 2022, New England Highway bypass of Muswellbrook, Response to Submissions, June 2022.

Department of Environment and Climate Change 2009, Interim Construction Noise Guideline, Sydney, NSW Government.

Department of Environment Climate Change & Water 2010, Aboriginal Cultural Heritage Consultation Requirements for Proponents, NSW Government.

Department of Urban Affairs and Planning 1995, Is an EIS Required? Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979.

Department of Urban Affairs and Planning 1996, Roads and Related Facilities EIS Guideline.

OEH, 2011. Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW. Office of Environment and Heritage, Department of Premier and Cabinet, Sydney.

Roads and Maritime 2011, Roads and Maritime Procedure for Aboriginal cultural heritage consultation and investigation. November 2011.

Appendix A

Consideration of section 171(2) factors and matters of National Environmental Significance and Commonwealth land

Section 171(2) checklist

In addition to the requirements of the Is an EIS required? (1995/1996) guideline and the *Roads and Related Facilities EIS Guideline* (DUAP, 1996) as detailed in the addendum REF, the following factors, listed in section 171(2) of the Environmental Planning and Assessment Regulation 2021, have also been considered to assess the likely impacts of the proposed modification on the natural and built environment.

Factor	Impact
Any environmental impact on a community?	
The proposed modification would have some temporary impacts during construction associated with visual amenity, traffic and noise. These impacts would be temporary and managed with the mitigation measures outlined in the project REF.	Short-term negative
The proposed modification would remove up to 15.99 ha of additional native vegetation (3.99 ha of remnant vegetation and 12 ha of DNG). The total cumulative Project impact would be 113.73 ha. The proposed modification has been designed to reduce impacts to these aspects as far as practical. Exclusion zones have been identified to avoid 9.46 ha of Central Hunter Eucalypt Forest TEC, reducing the overall project impact on this TEC. These impacts would be managed with the mitigation measures outlined in the addendum REF and project REF.	Long-term negative
Any transformation of a locality?	
The proposed modification would have some temporary impacts during construction associated with visual amenity, traffic and noise. However, land used for the purposes of construction would be restored following the construction phase and would be available for future agriculture or other use.	Short-term negative
Any environmental impact on the ecosystems of the locality?	
The proposed modification would result in the additional removal of 15.99 ha from the project REF. The proposed modification has been designed to reduce impacts to these aspects as far as practical with the identification of exclusion zones. These impacts would be managed with the mitigation measures outlined in the addendum REF and project REF.	Long-term negative
The proposed modification could result in impacts from contaminated and/or low quality water being released during dam dewatering. There may also be further water quality impacts from dam construction work. These impacts would be temporary and managed through the implementation of the safeguards provided in this addendum REF.	Short-term negative
Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?	
The proposed modification would have some temporary impacts during construction associated with visual amenity, traffic and noise. These impacts would be short-term and managed through the implementation of the safeguards provided in the project REF.	Short-term negative
Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?	
Aboriginal and non-Aboriginal heritage sites would be impacted by the proposed modification, consistent with the project REF. Modification Area 10 was adjusted by Transport to avoid the potential for additional impact on Aboriginal Heritage. These	Nil

Factor	Impact
impacts would be managed with the mitigation measures outlined in the addendum REF and project REF.	
Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act 1974*)?	
The proposed modification would result in an additional 15.99 ha of native vegetation. Of this, 3.99 ha is remnant vegetation and 12 ha is comprised of modified DNG. The cumulative total Project impact is 113.73 ha. A substantial effort was made to avoid higher quality vegetation where possible, resulting in the reduction of impact to 9.46 ha of on Central Hunter Eucalypt Forest TEC through the establishment of exclusion zones. The proposed modification would result in the loss of a further 17 hollow-bearing trees and impacts to streams with the installation of temporary instream structures. Additional mitigation measures and safeguards and a review of the biodiversity offsetting strategy have been recommended to mitigate additional impacts to threatened fauna.	Long-term negative
Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?	
The proposed modification would have potential indirect effects related to the temporary instream structure along Muscle Creek affecting the Endangered Population of *Eucalyptus camaldulensis*. However, impacts would be short-term and temporary during construction. The proposed modification has avoided all direct impact to threatened fauna.	Short-term negative
The assessment of significance have identified no threatened fauna or flora species, populations or ecological communities known or predicted to occur are likely to be significantly impacted by the proposed modification. This is consistent with the project REF.	Neutral
Any long-term effects on the environment?	
The proposed modification would improve road safety by maintaining and upgrading local roads, including Milpera Drive, Coal Road and Muscle Creek Road as well as improve the safety profile of the intersection of Sandy Creek Road and the New England Highway.	Long-term positive
Any degradation of the quality of the environment?	
The proposed modification would have some temporary impacts during construction associated with visual amenity, traffic and noise. These impacts would be short-term and managed through the implementation of the safeguards provided in the project REF.	Short-term negative
The proposed modification could result in impacts from contaminated and/or low quality water being released during dam dewatering. There may also be further water quality impacts from dam construction work. These impacts would be temporary and managed through the implementation of the safeguards provided in this addendum REF.	Short-term negative
Any risk to the safety of the environment?	
The proposed modification would not change the number of construction vehicles required for the overall project. However, as part of the proposed modification the use of new access tracks and construction compounds may increase the level of	Short-term negative

Factor	Impact
construction vehicles in the proximity of these areas which may decrease road safety in those areas. Traffic impacts would be managed through a project TMP.	
Some of the modification areas are located within areas which are known to be inundated during flood events. Flood behaviour within and surrounding the proposed modification is well understood, with adequate advance flood warning available to evacuate equipment and protect work prior to inundation.	Short-term negative
The proposed modification would improve road safety by maintaining and upgrading local roads, including Milpera Drive, Coal Road and Muscle Creek Road as well as improve the safety profile of the intersection of Sandy Creek Road and the New England Highway.	Long-term positive
Any reduction in the range of beneficial uses of the environment?	
No property acquisition is required for the proposed modification, and any land used for the purposes of construction would be restored following the construction phase and would be available for future agriculture or other use.	Nil
Any pollution of the environment?	
The proposed modification would have some temporary impacts during construction associated with visual amenity, traffic and noise. These impacts would be short-term and managed through the implementation of the safeguards provided in the project REF.	Short-term negative
The proposed modification could result in impacts from contaminated and/or low quality water being released during dam dewatering. There may also be further water quality impacts from dam construction work. These impacts would be temporary and managed through the implementation of the safeguards provided in this addendum REF.	Short-term negative
Any environmental problems associated with the disposal of waste?	
Waste generation of the proposed modification is likely to be minor and therefore no problems with disposal of waste are expected.	Nil
Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply?	
The proposed modification is unlikely to affect any resources that are or are likely to become in short supply.	Nil
Any cumulative environmental effect with other existing or likely future activities?	
There is potential for cumulative impacts to occur as a result of the proposed modification occurring simultaneously with other projects, including traffic, noise, and visual impacts (discussed in Section 6.9). The impacts would be temporary and would be managed through the implementation of mitigation measures provided in the project REF as well as ongoing consultation with stakeholders.	Short-term negative
Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?	

Factor	Impact
The proposed modification is located about 130 kilometres from the coast. The proposed modification would not impact coastal processes or hazards including those predicted under climate change conditions.	Nil

Matters of National Environmental Significance and Commonwealth land

Under the environmental assessment provisions of the EPBC Act, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposed modification should be referred to the Australian Government Department of Climate Change, Energy, the Environment and Water.

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

Factor	Impact
Any impact on a World Heritage property?	Nil
Any impact on a National Heritage place?	Nil
Any impact on a wetland of international importance? Database searches revealed the Hunter Estuary Wetlands located about 50–100 km upstream from the study area. The study area does not contain waterways that are connected to the above wetlands of international importance and therefore is considered unlikely to impact upon these wetlands. This is consistent with the project REF.	Nil
Any impact on a listed threatened species or communities? The proposed modification would result in an increase in impact to two EPBC Act listed threatened ecological communities identified within the study area. These included: • Central Hunter Valley eucalypt forest and woodland (Critically Endangered under EPBC Act) • White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grasslands (Critically Endangered under EPBC Act). Tests of significance (see Appendix B) indicate that the impacts to threatened biodiversity are unlikely to be significant.	Minor
Any impacts on listed migratory species? Six migratory species were listed under the EPBC Act with a moderate likelihood of occurring within the study area. One EPBC Act migratory species, the White-throated Needletail (*Hirundapus caudacutus*) was recorded within the study area. These findings are consistent with the project REF. An Assessment of Significance under the EPBC Act was undertaken for these migratory species. The assessment concluded that the proposed modification is unlikely to substantially impact on this species.	Minor
Any impact on a Commonwealth marine area?	Nil
Does the proposed modification involve a nuclear action (including uranium mining)?	Nil
Additionally, any impact (direct or indirect) on Commonwealth land?	Nil

Appendix B

Biodiversity Assessment Report - Addendum

Appendix C

Statutory consultation checklist

Matters of National Environmental Significance and Commonwealth land

Certain development types

Development type	Description	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) section
Car park	Does the project include a car park intended for the use by commuters using regular bus services?	No	Muswellbrook Shire Council	Section 2.110
Bus depots	Does the project propose a bus depot?	No	Muswellbrook Shire Council	Section 2.110
Permanent road maintenance depot and associated infrastructure	Does the project propose a permanent road maintenance depot or associated infrastructure such as garages, sheds, tool houses, storage yards, training facilities and workers' amenities?	No	Muswellbrook Shire Council	Section 2.110

Development within the Coastal Zone

Issue	Description	Yes / No / N/A	If 'yes' consult with	SEPP (Transport and Infrastructure) section
Development with impacts on certain land within the coastal zone	Is the proposal within a coastal vulnerability area and is inconsistent with a certified coastal management program applying to that land?	N/A	Muswellbrook Shire Council	Section 2.14

Note: See interactive map Coastal management - (nsw.gov.au). Note the coastal vulnerability area has not yet been mapped.

Note: a certified coastal zone management plan is taken to be a certified coastal management program.

Council related infrastructure or services

Development type	Potential impact	Yes / No	If 'yes' consult with the relevant local council(s).	SEPP (Transport and Infrastructure) section
Stormwater	Are the works likely to have a substantial impact on the stormwater management services which are provided by council?	No	Muswellbrook Shire Council	Section 2.10
Traffic	Are the works likely to generate traffic to an extent that will strain the capacity of the existing road system in a local government area?	No	Muswellbrook Shire Council	Section 2.10
Sewerage system	Will the works involve connection to a council owned sewerage system? If so, will this connection have a substantial impact on the capacity of any part of the system?	No	Muswellbrook Shire Council	Section 2.10
Water usage	Will the works involve connection to a council owned water supply system? If so, will this require the use of a substantial volume of water?	No	Muswellbrook Shire Council	Section 2.10
Temporary structures	Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a minor or inconsequential disruption to pedestrian or vehicular flow?	Yes	Muswellbrook Shire Council	Section 2.10
Road and footpath excavation	Will the works involve more than minor or inconsequential excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	Yes	Muswellbrook Shire Council	Section 2.10

Local heritage items

Development type	Potential impact	Yes / No	If 'yes' consult with the relevant local council(s).	SEPP (Transport and Infrastructure) section
Local heritage	Is there is a local heritage item (that is not also a State heritage item) or a heritage conservation area in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the heritage significance of the item/area are more than minor or inconsequential?	No	Muswellbrook Shire Council	Section 2.11

Flood liable land

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) section
Flood liable land	Are the works located on flood liable land? If so, will the works change flood patterns to more than a minor extent?	No	Muswellbrook Shire Council	Section 2.12

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) section
Flood liable land	Are the works located on flood liable land? (to any extent). If so, do the works comprise more than minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance	No	State Emergency Services Email: erm@ses.nsw.gov.au	Section 2.13

Note: Flood liable land means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the manual entitled Floodplain Development Manual: the management of flood liable land published by the New South Wales Government.

Public authorities other than councils

Development type	Potential impact	Yes / No	If 'yes' consult with the relevant local council(s).	SEPP (Transport and Infrastructure) section
National parks and reserves	Are the works adjacent to a national park or nature reserve, or other area reserved under the *National Parks and Wildlife Act 1974*, or on land acquired under that Act?	No	DPE	Section 2.15
National parks and reserves	Are the works on land in Zone E1 National Parks and Nature Reserves or in a land use zone equivalent to that zone?	No	DPE	Section 2.15
Aquatic reserves and marine parks	Are the works adjacent to an aquatic reserve or a marine park declared under the *Marine Estate Management Act 2014*?	No	Department of Industry	Section 2.15
Sydney Harbour foreshore	Are the works in the Sydney Harbour Foreshore Area as defined by the *Sydney Harbour Foreshore Authority Act 1998*?	No	Sydney Harbour Foreshore Authority	Section 2.15
Bush fire prone land	Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional centre or group home in bush fire prone land?	No	Rural Fire Service	Section 2.15
Artificial light	Would the works increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map? (Note: the dark sky region is within 200 kilometres of the Siding Spring Observatory)	No	Director of the Siding Spring Observatory	Section 2.15
Defence communications buffer land	Are the works on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map referred to in section 5.15 of Lockhart LEP 2012, Narrandera LEP 2013 and Urana LEP 2011).	No	Secretary of the Commonwealth Department of Defence	Section 2.15
Mine subsidence land	Are the works on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961*?	Yes	Mine Subsidence Advisory NSW	Section 2.15

Appendix D

Consultation Letters

Appendix E

Noise and Vibration – Technical Report Addendum

Appendix F

Aboriginal Cultural Heritage Assessment Report

Appendix G

Detailed Site Investigation

NSW GOVERNMENT