

Kariong Hill slope remediation

Minor works review of environmental
factors

October 2025



Acknowledgement of Country

Transport for NSW acknowledges the traditional custodians of the land on which the Kariong Hill Remediation is proposed.

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.



Report review tracking

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Approval and authorisation

Approved by	Mackenzie Pierpoint - Project Engineer
Signed	
Date	03/10/2025

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1. Introduction

The purpose of the minor works review of environmental factors (REF) is to describe the proposal, to document the likely impacts of the proposal on the environment, to detail mitigation measures to be implemented and to determine whether or not the proposal can proceed. For the purposes of this work Transport for NSW (Transport) is the proponent and determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The description of the proposed works and assessment of associated environmental impacts has been undertaken in the context of section 171 of the Environmental Planning and Assessment Regulation 2021, Guidelines for Division 5.1 Assessments (DPE, 2022), the *Biodiversity Conservation Act 2016* (BC Act), the *Fisheries Management Act 1994* (FM Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act).

In doing so the REF helps to fulfil the requirements of section 5.5 of the EP&A Act including that Transport examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning and Public Spaces 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 potential for the proposal to significantly impact a matter of national environmental significance, including nationally listed threatened biodiversity matters, or the environment of Commonwealth land. Where a significant impact is considered likely on nationally listed biodiversity matters, either the proposal must be reconsidered or a project REF must be prepared.

2. The proposal

2.1 Description

2.1.1 Proposal location

Table 2-1: Proposal location details

Location details	
Title	M1 Slope Kariong Hill Remediation MWREF
File number	fA19058158
Road name and number	Central Coast Highway HW30
Closest crossroad(s)	Pacific Motorway (M1), Brisbane Water Drive, Woy Woy Road
Chainage of works	Slope 85716 – Chainage 0-120 for soil nail section
Local government area	Central Coast Council
Transport for NSW region	Hunter

2.1.2 Proposal description

Transport proposes to carry out remediation works for a downhill slope, known as Slope 85716, located at Kariong Hill on the westbound lanes of the Central Coast Highway (HW30), west of Brisbane Water Drive at West Gosford, within the Central Coast Local Government Area (the proposal). The slope has shown signs of geotechnical displacement which was evident through the cracking and vertical displacement of the overlying road pavement and the distortion of the guardrail.

The location of the proposal is shown in Figure 2-1 and the proposal area is shown in Figure 2-2. The proposal area is shown in red and is based on the design drawings construction footprint (see Appendix E: Design Drawings) with a small buffer to allow for the installation of environmental controls. The approximate area of the construction footprint is 0.36 hectares

Proposal key features

The key features of the proposal include:

- Site compound establishment
- Combination of full time 24/7 single lane closure with concrete barriers (worst case scenario / preferred option) and temporary closure as required or warranted (if traffic impacts need to be mitigated)
- Removal of vegetation from the downhill slope
- Installation of about 335 hollow bar soil nails (six rows, two metre horizontal spacing, three metre vertical spacing along slope angle – subject to further design refinement (refer to Figure 2-4)
- Installation of single row (in between the last two rows of soil nails) of horizontal subsurface drains with a nominal length of 5 metres (refer to Figure 2-5)
- Placement of erosion control mat then high tensile steel mesh over the soil nailed slope, with hydroseed and hydromulch immediately below the mesh
- Culvert remediation works, most likely to comprise a cured-in-place-pipe fibreglass reinforced lining system which is cured using ultra-violet light. This would be supported by outlet protection measures such as scour protection (i.e. rock placement downstream of both culverts identified for rehabilitation).
- Reinstatement of safety barriers.



Figure 2-1: Proposal location – soil nailing extent

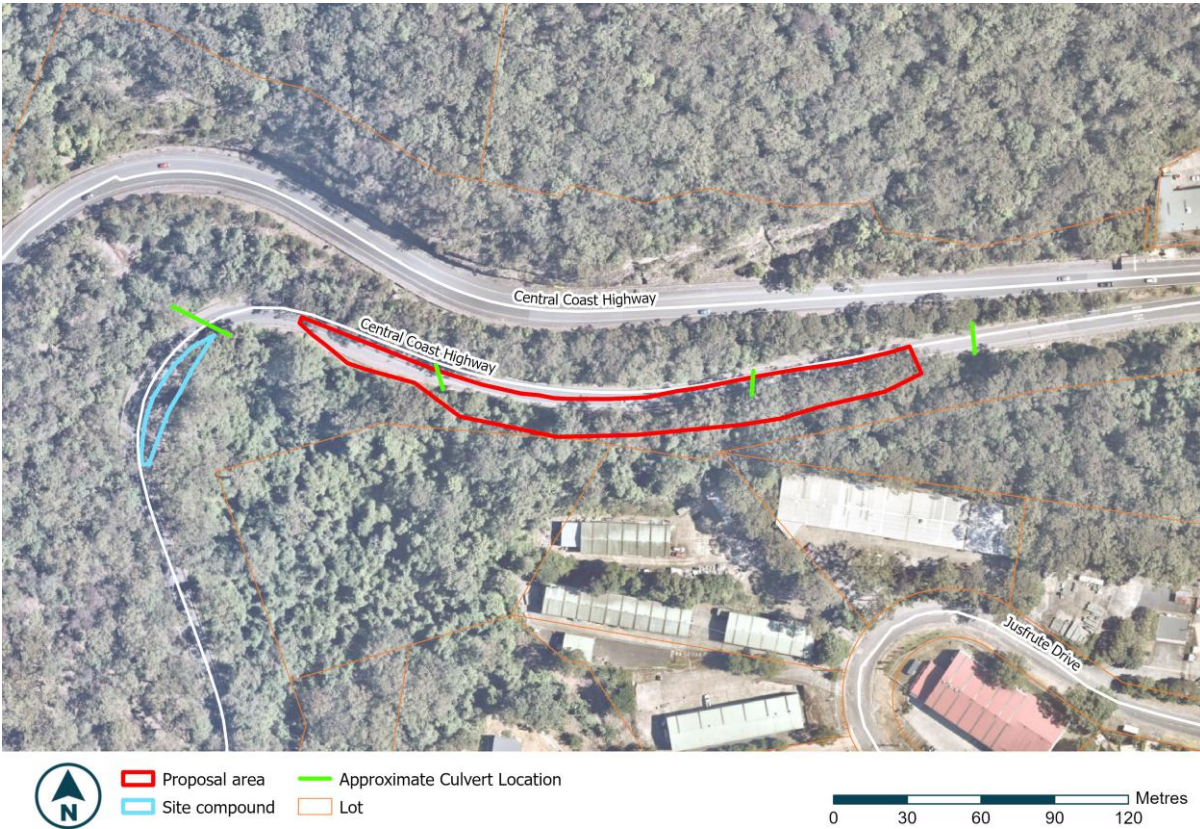


Figure 2-2: Proposal area and site compound No.1



Figure 2-3: Site compound No.2

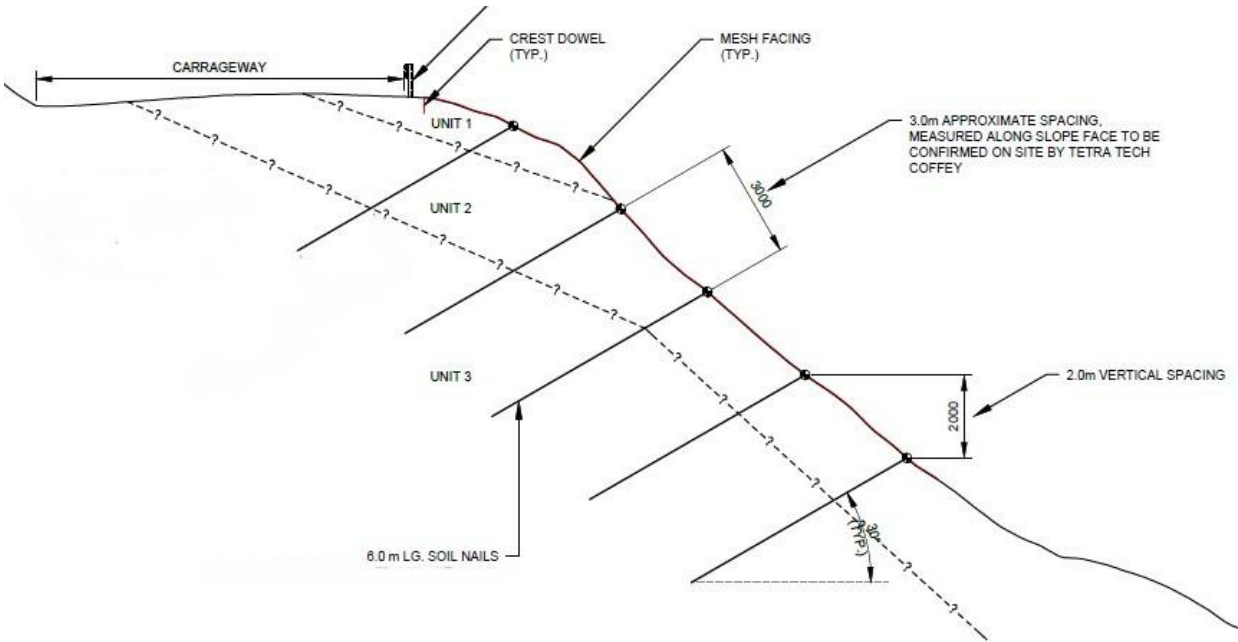


Figure 2-4: Typical soil nail arrangement

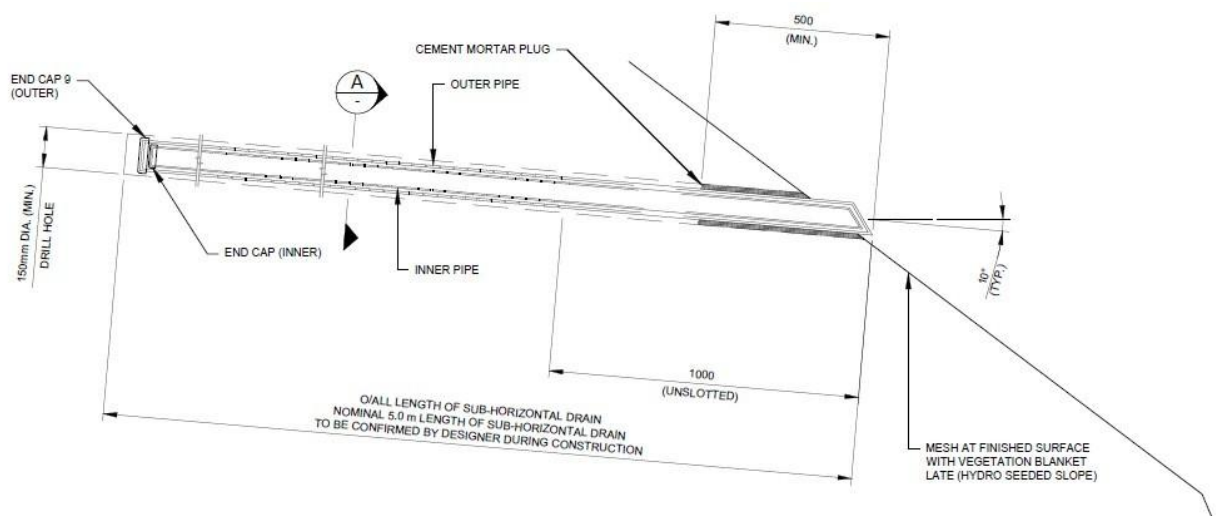


Figure 2-5: Typical slope drainage detail

Work methodology

The proposal is anticipated to involve the following work methodology:

- Establish temporary traffic control measures at the start of each shift (or as otherwise permitted by a Road Occupancy Licence (ROL)) – refer below for further details
- Establish work site, site compound, environmental controls (i.e erosion and sediment controls such as a downslope sediment fence)
- Establish environmental controls to prevent stockpile leachate or tannin impacted water discharging downslope of stockpiling locations (which may include diversion of upgradient water and bunding to capture stockpile leachate or tannin impacted water where high tannin vegetation types are stockpiled)
- Remove vegetation from the downhill slope working from the road and using elevated work platforms, long reach excavators, a mobile crane and chainsaws
- Mulch vegetation at the site using mulcher and reuse mulch in disturbed areas on site or transport off site using trucks at end of each shift to a Transport depot or licenced facility
- Use a long reach excavator to install the upper two rows of hollow bar soil nails from the road: The hollow bar soil nails have a sacrificial drill bit which enables drilling of the soil nail while progressively pumping grout through the hollow core. Grout overflow and ground impacted water is captured (using measures which may include a small dam, a mobile vacuum and or a bucket)
- Potentially install anchor nails to support manual installation of the lower one to two rows of soil nails and drainage using handheld machinery
- Install flexible mesh facing and fix using steel plates to support the batter following the installation of the soil nails
- Level of soil nail heads with shotcrete where needed and install nuts, washers and face plates
- Carry out tensioning and testing of soil nails
- Carry out culvert remediation works, which are expected to involve:
 - Repair inlets and outlet headwalls as required
 - Place outlet scour protection (i.e. rock rip rap)
 - Insert new culvert liner into the culvert via the inlet then cure in place using ultra violet light
 - Collect any fibreglass offcuts (using matting or similar)
 - Rinse the cured liner collecting rinse water and disposing of it in accordance with its waste classification

- Demobilisation, site clean-up, reinstatement of safety barriers and removal of traffic management measures.

Traffic management

An ROL for a 24-hour single lane closure is preferred to reduce setup and pack-down times which in turn would reduce the overall construction period. This option would apply to the off-peak December to January period, with an option to extend to the end of construction if traffic impacts are manageable. Once established on-site, this option would be managed by a Transport representative to assess the level of impact to the Central Coast Highway (queuing and delays) and connecting local road networks.

An alternative to the 24-hour single lane closure would be an ROL which commences after the AM peak and extends into the evening (7:00am to 11:00pm), with traffic control and barriers removed at the end of each shift. Peak AM period will be monitored and level of impact assessed by a Transport representative, if the AM peak is lower than anticipated or has passed prior to 9:30am, there is an option to set up prior to 9:30am, but not before standard set up time. This option would also apply outside the off-peak December to January period.

Vegetation removal works are expected to have a duration of three weeks and would occur prior to the main construction work, and outside the off-peak December to January period. A full carriageway closure would be required due to plant access (e.g. mobile crane). Subject to an ROL, a contraflow onto the eastbound carriageway of the Central Coast Highway would be implemented during the night period, reducing the traffic flow in both direction to single lane travel.

Equipment and materials

The following plant and equipment would be used during construction:

- | | |
|------------------------------|---------------------------------|
| • Rigid steel plate x 2 | • 12t Tipper trucks |
| • 13-16t Crane | • Mulcher |
| • 3-15t Excavator | • Marini drill rig |
| • 15-30t Excavator | • Hydraulic jack |
| • Extension on drilling rigs | • Reaction frame/support plates |
| • Telehandler 20m reach | • Anchor/grout head access |
| • Washout bins | |

The following materials would be used for the proposal:

- | | |
|---|--|
| • Shotcrete | • Fibreglass culvert treatment materials |
| • Grout | • Geotextile material |
| • Hollow bar (type of soil nails) | • Vegetation blanket |
| • Drilling muds | • Gravel or Road base |
| • High tensile steel mesh | • Rockfill |
| • Sub-soil drains (slotted polyvinyl pipes) | • No-fines concrete |

2.1.3 Proposal objectives

The objectives of the proposal are to:

- Improve safety for road users by reducing risks associated with slope instability
- Improve the ongoing structural integrity of the slope
- Achieve a cost effective strategy to managing slope stability risk
- Minimise environmental and community impacts.

2.1.4 Ancillary facilities

Table 2-2: Ancillary facilities

Ancillary facilities		
Will the proposal require the use or installation of a compound site? Site compound No.1 has an area of about 370 square metres and would be located about 80 metres to the west of the proposal area along the road in the shoulder adjacent to the downhill slope (at the location of the heritage listed "Kendalls Glen" reserve, rock and memorial). This area would be used for refuelling, parking, and storage of plant, equipment and materials. The location of site compound No.1 is identified in Figure 2-2 (refer also to Figure 2-6). This area may include placement of hardstand material and bunding where required. Site compound No.2 has an area of about 5,600 square metres and is located along a section of the former Central Coast Highway alignment located about 550 metres to the south-west (refer to Figure 2-3 and Figure 2-7). This site would be used for the temporary storage of equipment and materials. The site currently serves as lookout and would be unavailable for this purpose during the works. The community would be notified of the closure through project communications and signage. Some trimming of overhanging tree branches would be required.	Yes ☒	No ☐
Will the proposal require the use or installation of a stockpile site? The following existing Transport stockpile sites would be used for these works: • Calga transfer area • Somersby transfer area • Mt White transfer area.	Yes ☒	No ☐
Are any other ancillary facilities required (e.g. temporary plants, parking areas, access tracks)? Vehicles and plant may be temporarily parked within the road shoulder under traffic control during construction. Access tracks would not be required for the proposal.	Yes ☒	No ☐



Figure 2-6: Image of site compound No.1



Figure 2-7: Image of site compound No.2

2.1.5 Proposed date of commencement

Work is estimated to commence in November 2025 subject to both delivery resourcing and funding.

2.1.6 Estimated length of construction period

Construction work is expected to be carried out over a 6-week to 8-week period primarily during the December to January off-peak traffic period which is dependent on weather and ROL approvals.

Delivery following vegetation removal work is expected to occur from December 2025 to January 2026 (potentially going into February and March 2026).

Works, including packing up after each shift, would occur during the day and night periods subject to ROL conditions. Planned working hours are:

- Monday to Saturday – 7:00am to 10:00pm, 10:00pm to 11:00pm pack up (traffic control will remain in place for 24 hours in accordance with the approved ROL)
- Sunday – 8:00am to 10:00pm, 10:00pm to 11:00pm pack up (work on Saturday is provisional in case work is behind schedule)
- No work on public holidays.

Works outside these hours (during the 7:00pm to 5:00am night period) would be required over an approximate three week period for vegetation removal.

2.2 Need and options

2.2.1 Options considered

The options considered for the proposal included:

- Do nothing
- Carry out slope remediation works

Do nothing

Although the 'Do nothing' option would not generate any environmental impacts from vegetation removal, construction noise and traffic management during construction, this option would not meet the objective of the proposal to improve safety for road users by addressing slope instability and would not manage slope stability risks to road users. Without remediation works the risk of slope failure would remain high and slope failure would potentially have more substantial environmental (loss vegetation, sedimentation) and community impacts.

Carry out slope remediation works

The option to carry out the slope remediation works would address all objectives of the proposal to improve safety for road users by reducing risks associated with slope instability, achieve a cost-effective strategy to managing slope stability risk and would minimise environmental and community impacts through the implementation of best practice and environmental safeguards.

Therefore, the preferred option is to carry out the slope remediation works.

2.2.2 Justification for the proposal

The downhill slope adjacent to the Central Coast Highway has shown significant pavement distress with a subsequent geotechnical investigation concluding that the slope is critically unstable.

Since construction of the Central Coast Highway, natural weather events and use have degraded the slope over time. In addition, vegetation regrowth that has occurred within the slope face and at the top of the slope which has resulted in a risk of the slope failing. To prevent this, the slope requires the proposed remediation works to reduce risk of landslide and prevent the road collapse which would be catastrophic for road users.

2.3 Statutory and planning framework

2.3.1 State Environmental Planning Policy (Transport and Infrastructure) 2021

The State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP (Transport and Infrastructure)) aims to facilitate the effective delivery of infrastructure across the state. This includes roads and road infrastructure facilities, and port, wharf or boating facilities.

Section 2.109 of the 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 proposal is appropriately characterised as development for the purposes of a road or road infrastructure facilities and is to be carried out by or on behalf of Transport, 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 (Precincts – Eastern Harbour City) 2021
- State Environmental Planning Policy (Precincts – Central River City) 2021
- State Environmental Planning Policy (Precincts – Western Parkland City) 2021

- State Environmental Planning Policy (Precincts – Regional) 2021
- State Environmental Planning Policy (Planning Systems) 2021.

2.3.2 Central Coast Local Environmental Plan

The proposal (including both site compounds) is located on land which is subject to the Central Coast Local Environmental Plan 2022 (CCLEP). Table 2-3 identifies the objectives for the applicable zones under the CCLEP.

Table 2-3: Consistency of the proposal with the objectives of land use zones

Zone	Objective	Comment
SP2 Infrastructure	• To provide for infrastructure and related uses • To prevent development that is not compatible with or that may detract from the provision of infrastructure • To recognise existing railway land, major roads and utility installations and to enable their future development and expansion.	Roads are permitted with consent. The proposal would be compatible with the existing road infrastructure, as it would address safety issues which would otherwise potentially affect use of the Central Coast Highway.

Under the CCLEP roads are permitted with consent on land zoned SP2. The provisions of the SEPP (Transport and Infrastructure) override development consent requirements of the relevant LEP and development consent from Council is not required.

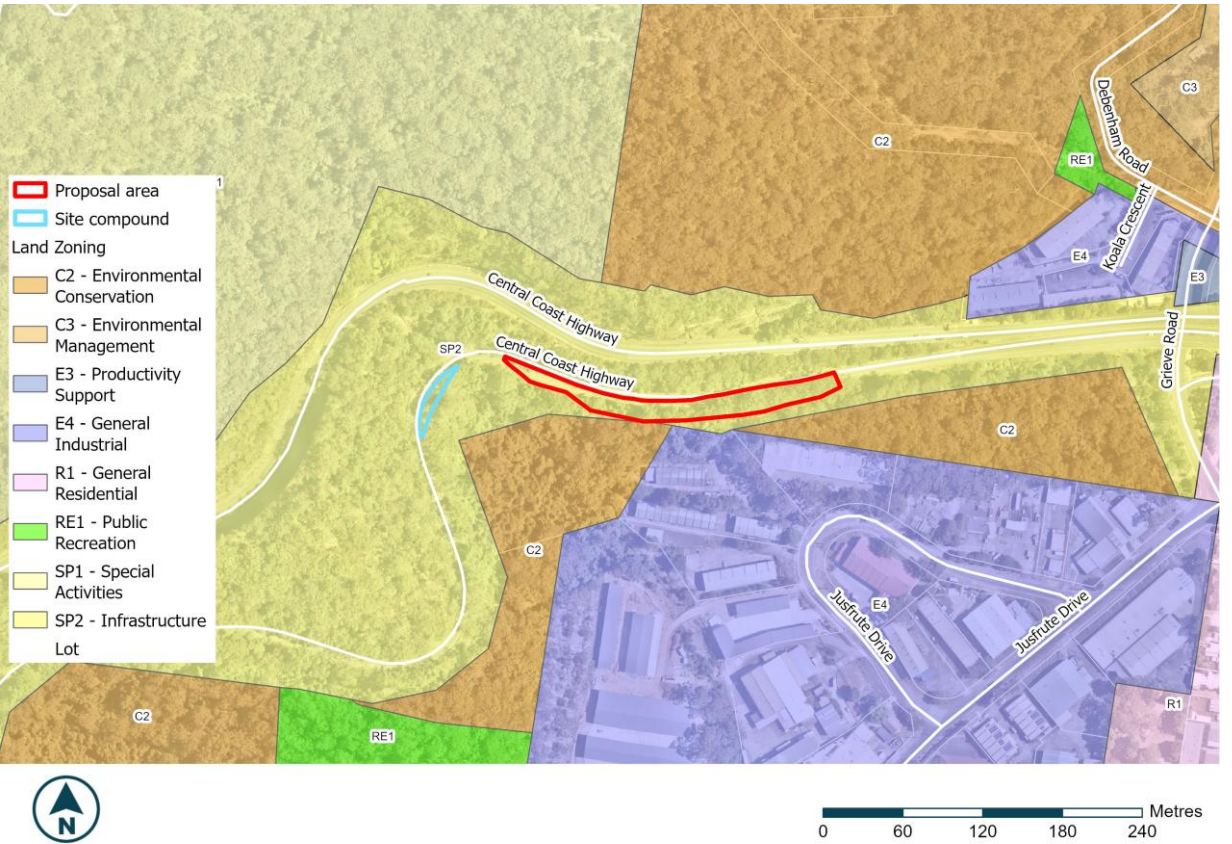


Figure 2-8: Land use zones surrounding the proposal

2.3.3 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) is administered by the NSW Environment Protection Authority (EPA). It provides an integrated system of licenses to set out protection of the environment policies and to adopt more innovative approaches to reduce pollution in the environment, having regard to the need to maintain ecologically sustainable development (ESD). Measures to address potential pollution from the proposal have been identified in this Minor Works REF and are included in Section 3.1 and Section 3.2.

The POEO Act requires an Environmental Protection Licence (EPL) for scheduled development work and the carrying out of scheduled activities. The proposal does not involve undertaking a scheduled activity and therefore an EPL is not required.

2.3.4 Heritage Act 1977

The *Heritage Act 1977* provides for the conservation of buildings, work, relics and places that are of historic, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance to the State.

An excavation permit is required to disturb or excavate any land knowing or having reasonable cause to suspect that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed. A permit is also required to disturb or excavate any land on which the person has discovered or exposed a relic. Section 139(4) of the *Heritage Act 1977* makes provision for the issuing of an exception in certain prescribed circumstances. The proposal area does not contain any features which would indicate the likely presence of archaeological items. Therefore, an excavation permit is not required for the proposal.

2.3.5 National Parks and Wildlife Act 1974

The proposal is located on the slope adjacent to the Central Coast Highway and is approximately 800m from the Brisbane Water National Park.

The harming or desecrating of Aboriginal objects or places is an offence under section 86 of the *National Parks and Wildlife Act 1979*. Under section 90, an Aboriginal heritage impact permit may be issued in relation to a specified Aboriginal object, Aboriginal place, land, activity or person or specified types or classes of Aboriginal objects, Aboriginal places, land, activities or persons. An extensive search of the Aboriginal Heritage Information System (AHIMS) was conducted on the 20 August 2025 and which identified 43 records within 500 metres of the proposal area. No Aboriginal sites were identified within or immediately adjacent to the proposal area. The closest AHIMS record is about 28 metres from the slope. No records for potential archaeological deposits were identified.

The potential impacts and relevant safeguards in relation to Aboriginal heritage are discussed further in Section 3.5. Aboriginal objects are not likely to be impacted by the proposal and therefore an Aboriginal Heritage Impact Permit (AHIP) is not required.

2.3.6 Fisheries Management Act 1994

The *Fisheries Management Act 1994* aims to conserve, develop and share the fishery resources of the State for the benefit of present and future generations.

Section 199 of the *Fisheries Management Act 1994* provides that:

(1) A public authority (other than a local government authority) must, before it carries out or authorises the carrying out of dredging or reclamation work:

(a) give the Minister written notice of the proposed work, and

(b) consider any matters concerning the proposed work that are raised by the Minister within 21 days after the giving of the notice (or such other period as is agreed between the Minister and the public authority).

Section 219 of the *Fisheries Management Act 1994* prohibits the blocking of fish passage.

Notice under Section 199 and a permit under section 219 is typically only required in relation to mapped Key Fish Habitat (KFH) and where the exemption in Section 227 of the Fisheries Management (General) Regulation 2019 does not apply.

While the proposal is located within the Brisbane Water estuary catchment which includes KFH, there would be not direct impacts on KFH due to the location of the proposal and the implementation of environmental safeguards.

As the proposal does not involve dredging or reclamation works within the KFH, a notification to the Department of Primary Industries and Regional Development is not required. Safeguards will be implemented to ensure the proposal has a minimal impact on the KFH receiving water body. The proposal would not block fish passage.

2.3.7 Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) seeks to conserve biological diversity and promote ecologically sustainable development; to prevent extinction and promote recovery of threatened species, populations and ecological communities; and to protect areas of outstanding biodiversity value.

The BC Act provides a listing of threatened species, populations and ecological communities, areas of outstanding biodiversity value, and key threatening processes. Part 7 of the BC Act requires that the significance of the impact on threatened species, populations and endangered ecological communities listed under the BC Act or *Fisheries Management Act 1994*, are assessed using a five-part test. Where a significant impact is likely to occur, a Species Impact Statement (SIS) or Biodiversity Development Assessment Report (BDAR) must be prepared.

No threatened ecological communities have been identified within the proposal area.

Assessments of significance have been undertaken for each threatened species listed under the BC Act and EPBC Act that have a moderate likelihood of occurrence and were assumed present. The assessments concluded that the proposal would not have a significant impact on threatened species or habitat and therefore a SIS or BDAR is not required.

2.3.8 Environment Protection and Biodiversity Conservation Act 1999

Under the EPBC Act, a referral to the Australian Minister for the Environment 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: Consideration of State and Commonwealth environmental factors of this Minor Works REF.

A referral is not required for the proposal 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.

The assessment of the proposal's impact on matters of national environmental significance and the environment of Commonwealth land found that there is unlikely to be a significant impact on relevant matters of national environmental significance or on Commonwealth land. Accordingly, the proposal has not been referred to the Australian Government Department of Climate Change, Energy, the Environment and Water under the EPBC Act.

2.3.9 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 that affect 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 carried out on 20 August 2025 and identified one Native Title determination which was finalised on 3 August 2018. The applicant was Darkinjung Local Aboriginal Land Council and the determination was that native title does not exist. The land is adjacent to the proposal area and is situated on either side of the Central Coast Highway.

2.4 Community engagement and agency consultation

2.4.1 SEPP (Transport and Infrastructure) consultation

Part 2.2 of the 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. This is detailed below:

Table 2-4: Consultation required with Council

Is consultation with Council required under sections 2.10 - 2.12 and 2.14 of the SEPP (Transport and Infrastructure)?		
Are the works likely to have a substantial impact on the stormwater management services which are provided by council?	Yes ☐	No ☒
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? While the proposal would result in some delays during the construction it would not increase demand on the road system.	Yes ☐	No ☒
Will the works involve connection to a council owned sewerage system? If so, will this connection have a substantial impact on the capacity of the system?	Yes ☐	No ☒
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?	Yes ☐	No ☒
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 ☐	No ☒
Will the works involve more than a minor or inconsequential excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	Yes ☐	No ☒
Is there 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? The 'Kendalls Glen' rock and memorial heritage item is within the proposal area would be located within the site compound area. This area would be used for refuelling, parking and storage of plant, equipment and materials. The proposed safeguards (within section 3.6) (including protection measures for the memorial) and the temporary nature of the works would have negligible impact on the heritage significance of this item.	Yes ☒	No ☐
Is the proposal within the coastal vulnerability area and inconsistent with a certified coastal management program applying to that land? Note: See interactive map at 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.	Yes ☐	No ☒
Are the works located on flood liable land? If so, will the works change flooding patterns to more than a minor extent?	Yes ☐	No ☒

Table 2-5: Consultation with other public authorities

Is consultation with a public authority (other than Council) required under sections 2.13, 2.15 and 2.16 of the SEPP (Transport and Infrastructure)?		
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? 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 Floodplain Development Manual: the management of flood liable land (nsw.gov.au) .	Yes ☐	No ☒

Is consultation with a public authority (other than Council) required under sections 2.13, 2.15 and 2.16 of the SEPP (Transport and Infrastructure)?		
Are the works adjacent to a national park, nature reserve or other area reserved under the <i>National Parks and Wildlife Act 1974</i> , or on land acquired under that Act? A section of compound area 2 is adjacent to the Brisbane Waters National Park, however the section is currently paved and would only be used to exit the compound site. There would be no trimming of trees adjacent to the national park and in this context consultation is not required.	Yes ☒	No ☐
Are the works on land in Zone C1 National Parks and Nature Reserves or in a land use zone equivalent to that zone? The proposal is adjacent to land zoned as C2 Environmental Conservation. The proposed safeguards in Section 3 would address potential risks from construction and impacts to environmentally sensitive land.	Yes ☐	No ☒
Do the works include a fixed or floating structure in or over navigable waters?	Yes ☐	No ☒
Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional facility or group home in bush fire prone land?	Yes ☐	No ☒
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)	Yes ☐	No ☒
Are the works on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map referred to in clause 5.15 of Lockhart LEP 2012, Narrandera LEP 2013 and Urana LEP 2011).	Yes ☐	No ☒
Are the works on land in a mine subsidence district within the meaning of the <i>Mine Subsidence Compensation Act 1961</i> ?	Yes ☐	No ☒
Are the works on, or reasonably likely to have an impact on, a part of the Willandra Lakes Region Work Heritage Property?	Yes ☐	No ☒
Are the works within a Western City operational area specified in Schedule 2 of the <i>Western Parkland City Authority Act 2018</i> with a capital value of \$30 million or more?	Yes ☐	No ☒

Table 2-6: Notification of council and occupiers of adjoining land

Do Council and occupiers of adjoining land need to be notified under section 2.111 of the SEPP (Transport and Infrastructure)?		
Does the proposal include a car park intended for the use by commuters using regular bus services?	Yes ☐	No ☒
Does the proposal include a bus depot?	Yes ☐	No ☒
Does the proposal include a permanent road maintenance depot or associated infrastructure, such as garages, sheds, tool houses, storage yards, training facilities and workers amenities?	Yes ☐	No ☒

2.4.2 Other agency and community engagement

Transport proposes to issue a start of works notification at least five days prior to the commencement of works to adjacent property owners and suitable signage would be placed to inform road users of changes in traffic conditions during the implementation of the proposal. The project would obtain a ROL and Transport would notify the local community prior to the works commencing.

3. Environmental assessment

This chapter provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposal. All aspects of the environmental potentially impacted upon by the proposal are considered. This includes consideration of the factors specified in s171 of the Environmental Planning and Assessment Regulation 2021.

The matters of national environmental significance under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) are also considered in Appendix A. Site-specific safeguards are provided to ameliorate the identified potential impacts.

3.1 Soil

Table 3-1: Soil

Description of existing environmental and potential impacts		
Are there any known occurrences of salinity or acid sulfate soils in the area? Acid sulfate risk mapping provided by the NSW Department of Climate Change, Energy, the Environment and Water indicates that the proposal area has no known occurrence of acid sulfate soils, with the nearest risk area located about 450m to the south-east. The eSpade system indicates the proposal area (and compound locations) have a very low overall salinity risk.	Yes ☐	No ☒
Does the proposal involve the disturbance of large areas (e.g., >2ha) for earthworks? The proposal would require the disturbance of the existing roadside slope for vegetation clearing. The area of disturbance across the proposal area is approximately 0.36 hectares. The proposed earth works would likely not impact on the entire disturbance area and would be localised to where vegetation is required to be removed and where soil nails are installed.	Yes ☐	No ☒
Does the site have constraints for erosion and sedimentation controls such as steep gradients or narrow corridors? The proposal area is constrained by steep slopes and the proximity of the Central Coast Highway travel lanes. Effective water quality controls can still be implemented at the top and base of the slopes, and in any other areas as required, to avoid or minimise any potential impacts to soils.	Yes ☒	No ☐
Are there any sensitive receiving environments that are located in or nearby the likely proposal area or that would likely receive stormwater discharge from the proposal? Sensitive receiving environments include (but are not limited to) wetlands, state forests, national parks, nature reserves, rainforests, drinking water catchments). The proposal is not located within a coastal vulnerability area as it is not located on land that is subject to coastal hazards as defined by the Coastal Management Act 2016. A tributary of Coorumbine Creek runs through the proposal area and flows into an area mapped as KFH, coastal wetlands, proximity to coastal wetlands and coastal use area. The proposed safeguards in Section 3.2 would address potential risks from construction and impacts to downstream sensitive coastal environments.	Yes ☒	No ☐
Is there any evidence within or nearby the likely footprint of potential contamination? A search (21 August 2025) of the NSW EPA contaminated land record of notices for the Central Coast local government area returned no records near the proposal footprint. A search of the list of NSW contaminated sites notified to EPA (as of 21 August 2025) returned two sites within the suburb of Kariong, however these sites are not near the proposal area. The site at 6 Central Coast Highway, Kariong is about 1.5 kilometres from the proposal area, while the site at Lot 2 Langford Drive, Kariong is about 2 kilometres from the proposal area.	Yes ☐	No ☒
Is the likely proposal footprint in or nearby highly sloping landform?	Yes ☒	No ☐

Description of existing environmental and potential impacts

The proposal area comprises a steep roadside slope that requires stabilisation. Safeguards are proposed to address potential erosion and sedimentation impacts.

Is the proposal likely to result in more than 2.5ha (area) of exposed soil?

Yes ☐

No ☒

The proposal involves work to remove vegetation to ground level resulting in exposed soil. The area of disturbance across the proposal area which may result in exposed soils from the clearing would be approximately 0.36 hectares.

Safeguards have been proposed in this section, Section 3.2 and Section 3.4 have been proposed to address water and air quality risks associated with exposed soils.

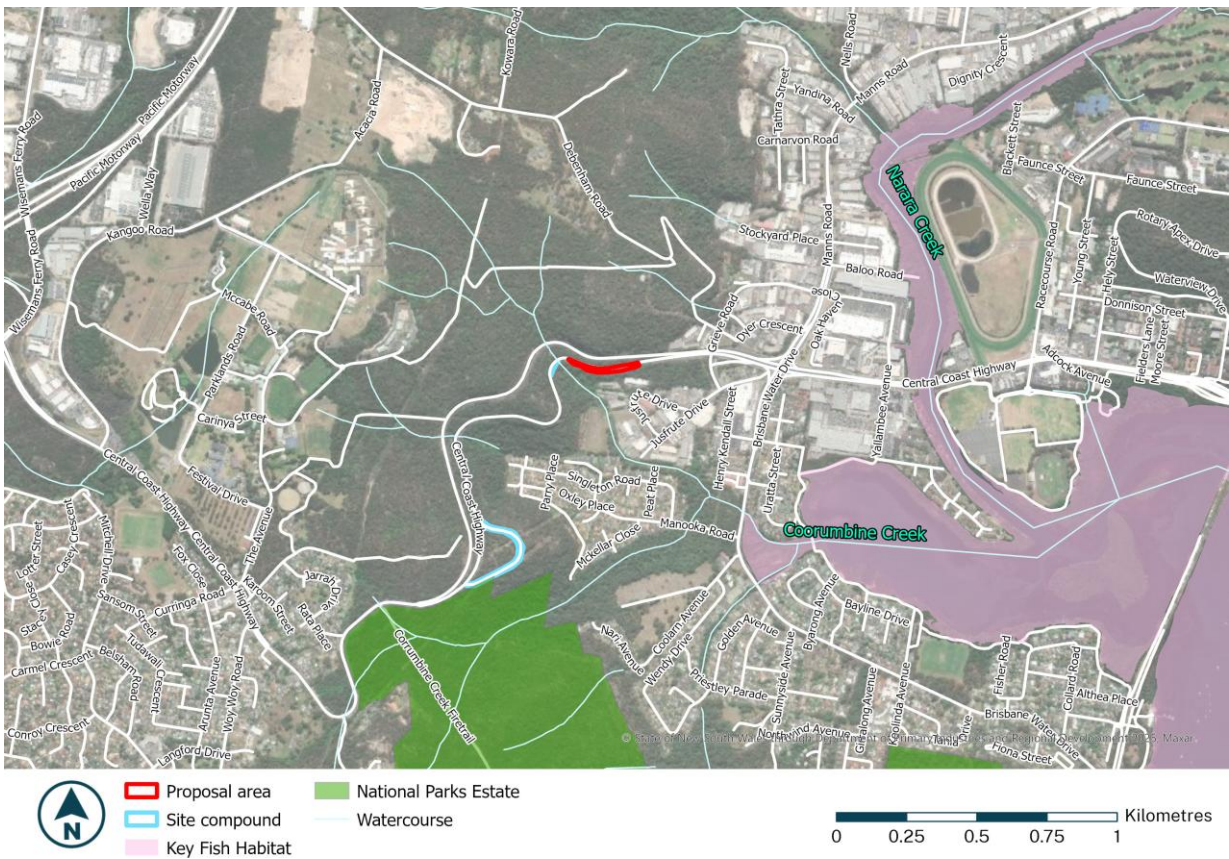


Figure 3-1: Sensitive receiving environments near the proposal

Safeguards

Safeguards to be implemented are:

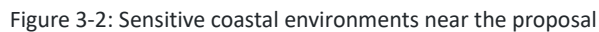
SE1	Erosion and sediment control measures are to be implemented and maintained to: - Minimise sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets - Reduce water velocity and capture sediment on site - Minimise the amount of material transported from site to surrounding pavement surfaces. (in accordance with the Managing Urban Stormwater, Soils and Construction Guidelines (the Blue Book) Landcom, 2004).
SE2	Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request.

SE3	Erosion and sediment control measures are not to be removed until the works are complete, and areas are stabilised.
SE4	A progressive erosion and sediment control plan is to be prepared for the works.
SE5	Parking of vehicles and storage of plant/equipment is to occur only within the designated proposal footprints or at nominated ancillary sites.
SE6	Area of exposed soils are to be stabilised as soon as possible.
SE7	The use of established stockpile sites is to be in accordance with the Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10).
SE8	If contaminated areas are encountered during investigations, appropriate control measures will be implemented to manage the immediate risks of contamination. 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 or further actions identified in consultation with the Transport for NSW Environment Manager and/or EPA.

3.2 Waterways and water quality

Table 3-2: Waterways and water quality

Description of existing environmental and potential impacts		
Is the proposal located within, adjacent to or near a waterway? The proposal is located within Brisbane Water estuary catchment. A tributary of Coorumbine Creek runs through the proposal area and flows about 850 metres downstream into an area mapped as KFH, coastal wetlands, proximity to coastal wetlands and coastal use area. The proposed safeguards in this section would address potential risks from construction and impacts to downstream sensitive coastal environments. Watercourses near the proposal are shown in Figure 3-1: Sensitive receiving environments near the proposal and Figure 3-2: Sensitive coastal environments near the proposal In the absence of appropriate controls, works within and adjacent to the watercourse on site have the potential to affect water quality. Potential impacts include • Discharge of sediment laden water from disturbed areas following vegetation clearing • Discharge of grout and mixed grout / water through at each drilling location or via fissures in the slope • Discharge of sediment laden water and mixed concrete water at culvert locations • Discharge of stockpile leachate or tannin impacted water from mulch stockpiles within compound locations. The proposed safeguards in this section and Section 3.1 would address water quality risks during construction.	Yes ☒	No ☐
Is the location known to flood or be prone to water logging?	Yes ☐	No ☒
Is the proposal located within a regulated catchments covered by chapter 6 of State Environmental Planning Policy (Biodiversity and Conservation) 2021 (SEPP (Biodiversity and Conservation))? The proposal is located within Brisbane Water estuary catchment. The Brisbane Water estuary catchment is not a regulated catchment covered by chapter 6 of the SEPP (Biodiversity and Conservation). The boundary of the Hawkesbury-Nepean regulated catchment is located about 800 metres to the west.	Yes ☐	No ☒
Would the proposal be undertaken on a bridge or ferry?	Yes ☐	No ☒
Is the proposal likely to require the extraction of water from a local water course (not mains)?	Yes ☐	No ☒



Safeguards to be implemented are:

WQ1	There is to be no release of dirty water into drainage lines and/or waterways.
WQ2	Water quality control measures are to be used to prevent any materials (e.g. concrete, grout, sediment etc) entering drain inlets or waterways, including measures to capture any excess grout during soil nailing.
WQ3	If refuelling of plant and equipment is required on site it will take place on flat ground only using 20 litre drums within a bunded area large enough to contain 120 per cent of the container's contents.
WQ4	If an incident (e.g. spill) occurs, the Environmental Incident Procedure (Transport for NSW, 2021) is to be followed and the Transport for NSW Contract Manager and Environment Manager notified immediately
WQ5	An emergency spill kit is to be kept on site and maintained throughout the construction work. The spill kit must be appropriately sized for the volume of substances. All staff are to be made aware of the location of the spill kit and trained in its use.
WQ6	Plant and equipment will be inspected regularly to ensure there are no leakages of fuel, oil and hydraulic fluid.
WQ7	The Bureau of Meteorology website will be checked prior to start of the workday for any severe weather, thunderstorm and/or flood warnings. Procedures will be developed for managing the worksite where there is a risk of high rainfall, including removal and storage of plant and equipment and stabilisation of the site.
WQ8	Soil nailing and shotcreting operations would not occur during periods of rainfall or where a medium or higher chance ($\geq 40\%$) of rainfall is forecast by the Bureau of Meteorology.

WQ9	Waste grout and shotcrete would be frequently removed from work areas to prevent mobilisation during a rainfall event.
WQ10	Vehicle wash down would occur in a bunded area within an existing Transport for NSW depot.
WQ11	All fuels, chemicals and liquids will be stored in an impervious bunded area within the compound site when not in use.
WQ12	Concrete is to be washed out into a contained area and disposed of appropriately.

3.3 Noise and vibration

Table 3-3: Noise and vibration

Description of existing environmental and potential impacts		
Are there any residential properties or other noise sensitive areas near the location of the proposal that may be affected by the work (i.e., church, school, hospital)? There are residential areas to the south and south-east of the proposal in the suburbs of Point Clare and West Gosford which would be affected by the proposal (the nearest being at a distance of about 290 metres to the main works area). Residential receivers are also located within about 140 metres of Site Compound No.2. Nearby non-residential noise sensitive receivers include: • Elim Christian Ministry Church (400 metres) • Kariong Mountains High School (770 metres from Site Compound No.2) • Central Coast Sports College (580 metres from Site Compound No.2) Other noise sensitive receivers near the proposal are commercial businesses which include Coastwide Child and Family Services (at a distance of about 200 metres) and West Gosford Dental Surgery (at a distance of about 380 metres). There are also nearby commercial and industrial receivers which are adjacent to the south of the proposal area. These receivers are located along Jusfrute Drive within 50 metres of the proposal area and include a mix of retailers, suppliers and manufacturers.	Yes ☒	No ☐
Is the proposal going to be undertaken only during standard working hours? Works would occur during the day and night periods subject to ROL conditions. Planned working hours are: • Monday to Saturday – 7:00am to 10:00pm, 10:00pm to 11:00pm pack up (traffic control will remain in place for 24 hours in accordance with the approved ROL) • Sunday – 8:00am to 10:00pm, 10:00pm to 11:00pm pack up (work on Saturday is provisional in case work is behind schedule) • No work on public holidays. Works outside these hours (during the 7:00pm to 5:00am night period) would be required over an approximate three week period for vegetation removal.	Yes ☐	No ☒
Is any explosive blasting required for the proposal?	Yes ☐	No ☒
Would construction noise or vibration from the proposal affect sensitive receivers? <u>Assessment approach</u> Construction noise impacts have been considered in accordance with the Construction Noise and Vibration Guideline (Transport for NSW, 2024). An assessment using Transport’s Construction Noise and Vibration Guideline (for Road and Maritime works) was undertaken to determine the distance the proposal would affect sensitive receivers. Noise management levels (NMLs) were established for the proposal using the Rating Background Level (RBL) for the R3 representative environment defined in the noise estimator. This level best	Yes ☒	No ☐

Description of existing environmental and potential impacts

reflects the high traffic volumes on the adjacent Central Coast Highway and the distance of the surrounding commercial and residential land use.

The following NMLs apply to the proposal:

Period	RBL	NML LAeq (15min) dBA
Day	50	60
Day OOHV	-	55
Evening	45	50
Night	40	45

The selected environment type used in the assessment was for 'propagation across a valley / over water' which best represents the proposals elevated position on a steep south-east facing slope which overlooks the receivers identified above. The affected receivers were identified from aerial photography.

The works would be carried out near the top of the slope so a direct line of sight between noise sources and receivers has been assumed for receivers to the south-east of the proposal. The barrier provided by upslope topography would likely mean that the receivers to the north and west of the proposal would be substantially shielded from the noise sources.

The following scenarios were assessed:

- Vegetation clearing at night – this was assessed using the 'distance-based (scenario)' worksheet with 'corridor clearing' selected.
- Soil nailing during the day and evening – this was assessed using the 'distance-based (noisiest plant)' worksheet with the 'Microdrilling Rig (Soilmec SM-5)' selected as representative of the noisiest plant.
- Compound operation during the day, evening and night – this was assessed using the 'distance-based (scenario)' worksheet with 'compound operation' selected

Assessment results – vegetation removal

The construction noise estimator results for vegetation removal are provided in Appendix C. Key assessment results for residential receivers are summarised in the table below, while impact distances are shown in Figure 3-2.

Noise impact (night)	Distance (m)	Recommended mitigation
Affected distance (>NML)	Within 1120	N
Noticeable (5-10 dBA > background)	745 to 1120	N
Clearly audible (10-20 dBA > background)	305 to 745	N, R2, DR
Moderately intrusive (20-30 dBA > background)	110 to 305	N, PC, SN, R2, DR
Highly intrusive (>30 dBA > background)	0 to 110	-
Highly noise affected (> 75dBA)	0 to 50	-
Sleep disturbance	Within 370	-

N – notification, PC – phone calls, SN – specific notification, R2 – respite period 2, DR – duration respite.

The results show that receivers could experience noticeable noise levels up to 1120 metres from the proposal (primarily impacting receivers to the south and east). Receivers within 745 metres could experience clearly audible noise, while receivers within 110 to 305 metres could experience moderately intrusive noise. No receivers are within 110 metres of proposed vegetation clearing and therefore highly intrusive or highly affected noise impacts are unlikely. Noise from the proposal may cause sleep disturbance up to a distance of 370 metres.

Not all receivers within 1120 metres of the proposal would be equally affected as the proposal area only has a clear line of sight to the east and south-east. The areas to the north and west of the proposal are shielded by the hillside of the Mount Penang in Kariong which would reduce the impact construction related noise.

Description of existing environmental and potential impacts

Assessment results – soil nailing

The construction noise estimator results for soil nailing are provided in Appendix C. Key assessment results for residential receivers are summarised in the table below, while impact distances are shown in Figure 3-4 and Figure 3-5.

Noise impact	Distance (m)	Recommended mitigation
Day		
Affected distance (>NML)	Within 175	-
Moderately intrusive (20-30 dBA > background)	40 to 65	N, PC, RO
Highly intrusive (>30 dBA > background)	0 to 40	N, PC, RO
Highly noise affected (> 75dBA)	0 to 40	-
Evening		
Affected distance (>NML)	Within 445	-
Clearly audible (10-20 dBA > background)	105 to 280	N, R1, DR
Moderately intrusive (20-30 dBA > background)	40 to 105	N, R1, DR
Highly intrusive (>30 dBA > background)	0 to 40	N, R1, DR
Highly noise affected (> 75dBA)	0 to 40	-

N – notification, PC – phone calls, SN – specific notification, R1 – respite period 1, DR – duration respite.

The results show that receivers could experience noticeable noise levels up to 175 metres from the proposal during the day and up to 445 metres during the night (primarily impacting receivers to the south and east). There are commercial receivers along Jusfrute Drive which would be affected by moderately intrusive noise and partially affected by highly intrusive noise.

Assessment results – compound operation

The construction noise estimator results for compound operation are provided in Appendix C. Key assessment results for residential receivers are summarised in the table below, while impact distances are shown in Figure 3-6 (for the worst case night scenario).

Noise impact	Distance (m)	Recommended mitigation
Day		
Affected distance	Within 155	-
Moderately intrusive (20-30 dBA > background)	25 to 50	N
Highly intrusive (>30 dBA > background)	0 to 25	N, PC, RO
Highly noise affected (> 75dBA)	0 to 25	N, PC, RO
Night		
Affected distance	Within 630	-
Noticeable (>NML)	405 to 630	N
Clearly audible (10-20 dBA > background)	155 to 405	N, R2, DR
Moderately intrusive (20-30 dBA > background)	50 to 155	N, PC, SN, R2, DR
Highly intrusive (>30 dBA > background)	0 to 50	AA, N, SN, R2, DR
Sleep disturbance	Within 110	-

AA – alternative accommodation, N – notification, PC – phone calls, SN – specific notification, R2 – respite period 2, DR – duration respite.

Description of existing environmental and potential impacts

The results show that receivers could experience noticeable noise levels up to 155 metres from the proposal during the day and up to 630 metres during the night (primarily impacting receivers to the south and east). Moderately intrusive noise could be experienced during the night within 155 metres, while there are no receivers in the area likely to be affected by highly intrusive noise (within 50 metres). The assessment for compound operation should be considered conservative as the actual use is likely to be less noise intensive than assumed by the estimator. The compounds would also only be used at night to support the vegetation clearing phase at the start of the project and would not be used for soil nailing phase of the proposal.

Construction noise mitigation

A letterbox drop would notify all affected receivers within 1120 metres of the proposal area and within 630 metres of site compound 2. Notifications would detail work activities, dates and hours, number of shifts, impacts and mitigation measures, indication of work schedule and contact telephone number. A notification would be sent a minimum of five working days prior to the start of works.

Phone calls detailing relevant information would be made to receivers who would experience moderately intrusive noise impacts, who have provided their contact details, within seven calendar days of proposed work. Phone calls provide these receivers with personalised contact and tailored advice, with the opportunity to provide comments on the proposed work and specific needs. Where the resident cannot be telephoned then an alternative form of engagement would be used. As phone calls have been proposed, specific notification is not considered necessary.

Respite period 2 is considered counterproductive as limiting the number of nights per week would extend the program of works. Respite offers would be considered in response to noise complaints and implemented where appropriate for receivers who would experience highly intrusive noise impacts in accordance with Construction Noise and Vibration Guideline (CNVG) (Transport for NSW, 2024).

Alternative accommodation does not need to be considered as there are no residential receivers within 50 metres of works or compound locations.

Non-residential receivers

Assessment results for non-residential receivers (day period) are included in the tables below. Tables are not provided for educational institutions due to distances beyond 500 metres from works. This noise assessment has selected the Microdrilling Rig (Soilmec SM-5) as a proxy for the operation of two smaller rigs operating at the same time.

Noise impact (soil nailing - places of worship – day)	Distance (m)	Recommended mitigation
Affected distance (>NML)	Within 280	N
10-20 dBA > NML	105	N
Highly affected (>75 dBA)	40	N, PC, RO

N – notification, PC – phone calls, RO – respite offer.

Noise impact (soil nailing - commercial – day)	Distance (m)	Recommended mitigation
Affected distance (>NML)	Within 65	-
Highly affected (75 dBA > NML)	40	N, PC, RO

N – notification, PC – phone calls, RO – respite offer.

Noise impact (compound operation – places of worship – day)	Distance (m)	Recommended mitigation
Affected distance (>NML)	Within 250	N
10-20 dBA > NML	75	N
Highly affected (>75 dBA)	25	N, PC, RO

N – notification, PC – phone calls, RO – respite offer.

Description of existing environmental and potential impacts

Noise impact (compound operation - commercial – day)	Distance (m)	Recommended mitigation
Affected distance (>NML)	Within 50	-
Highly affected (75 dBA > NML)	25	N, PC, RO

N – notification, PC – phone calls, RO – respite offer.

The nearest place of worship is about 400 metres from the proposal and is therefore unlikely to be affected. Adjacent commercial / industrial receivers would be notified prior to the start of works.

Would operation of the proposal alter the noise environment for sensitive receivers?

Yes ☐

No ☒

The operation of the proposal would not result in changes to the traffic mix or traffic speeds and traffic lanes would not move closer to noise sensitive receivers.

Would the proposal result in vibration being experienced by any surrounding properties or infrastructure during construction or operation?

Yes ☐

No ☒

The plant and equipment listed in Section 2.1.2 are not included in the Construction Noise and Vibration Guideline (CNVG) (Transport for NSW, 2024) list of vibration intensive plant.

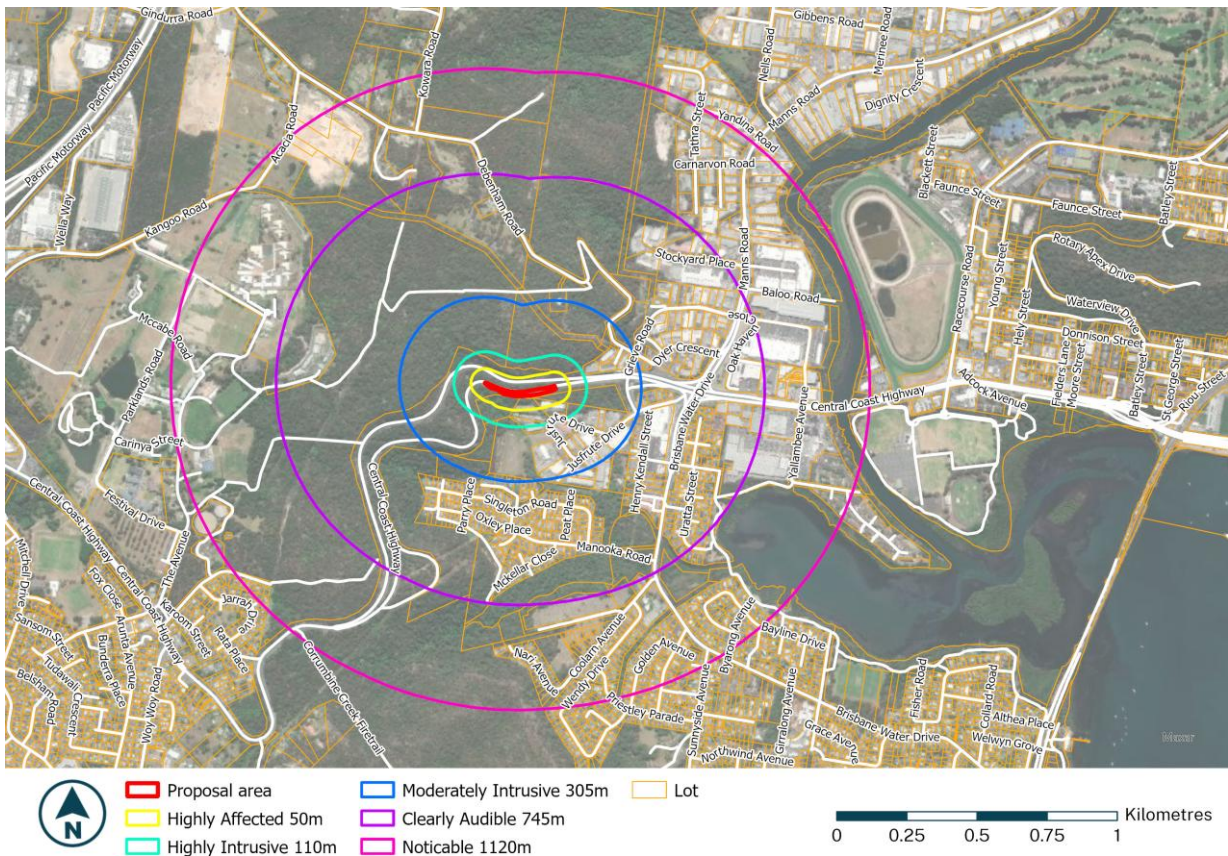


Figure 3-3: Predicted construction noise impacts – vegetation clearing (night)

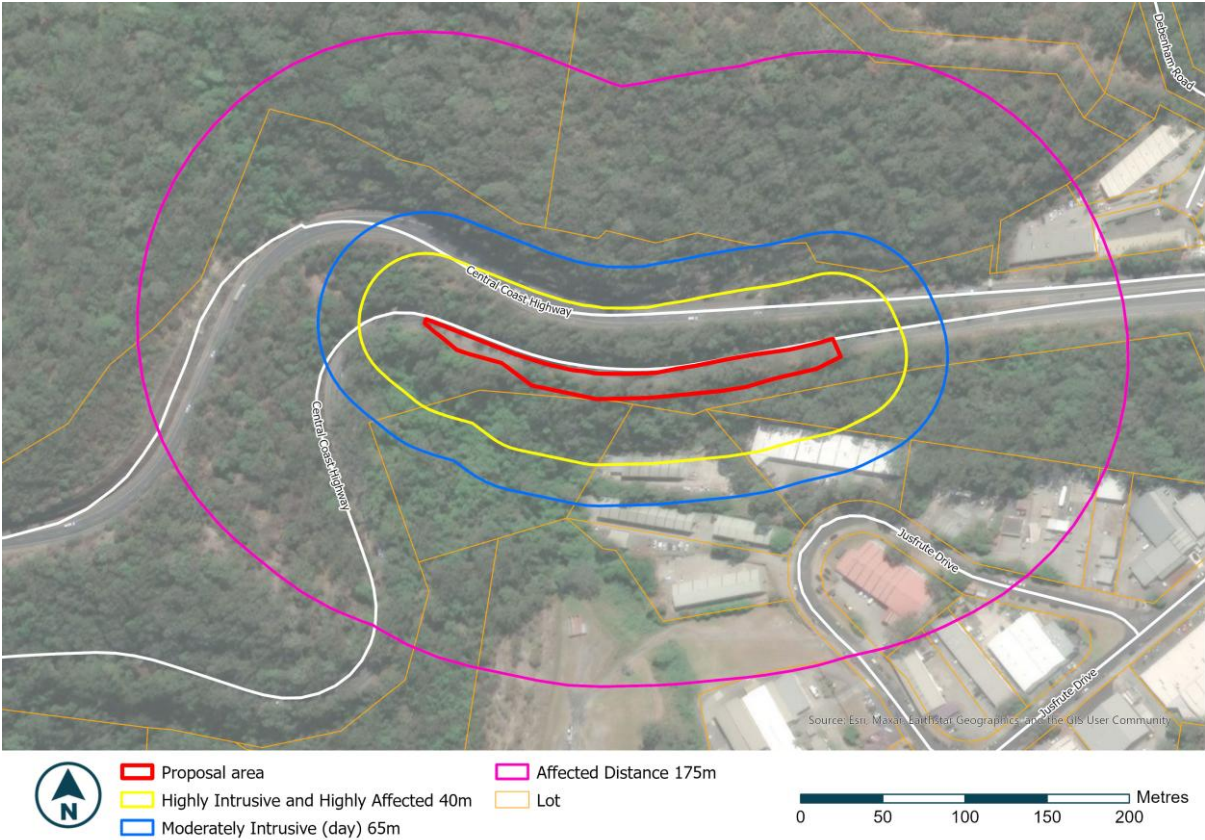


Figure 3-4: Predicted construction noise impacts – soil nailing (day)

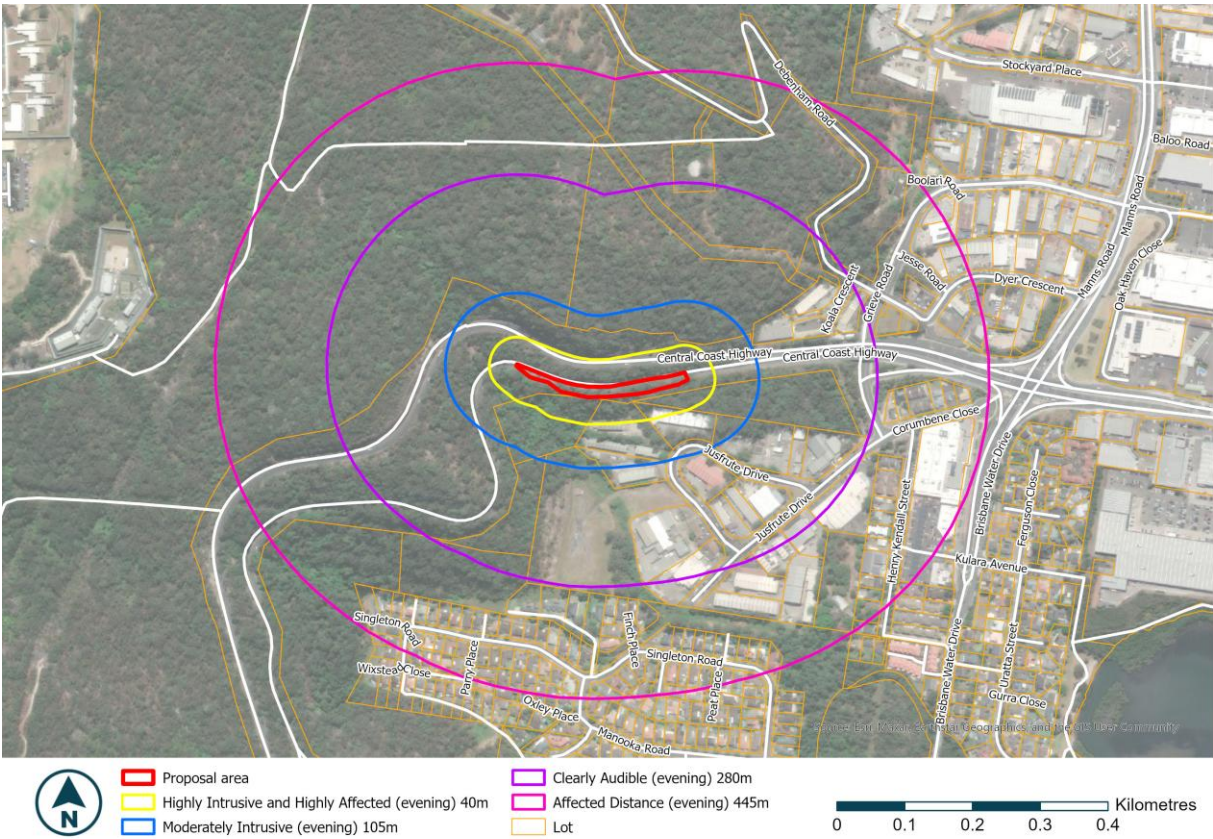


Figure 3-5: Predicted construction noise impacts – soil nailing (evening)

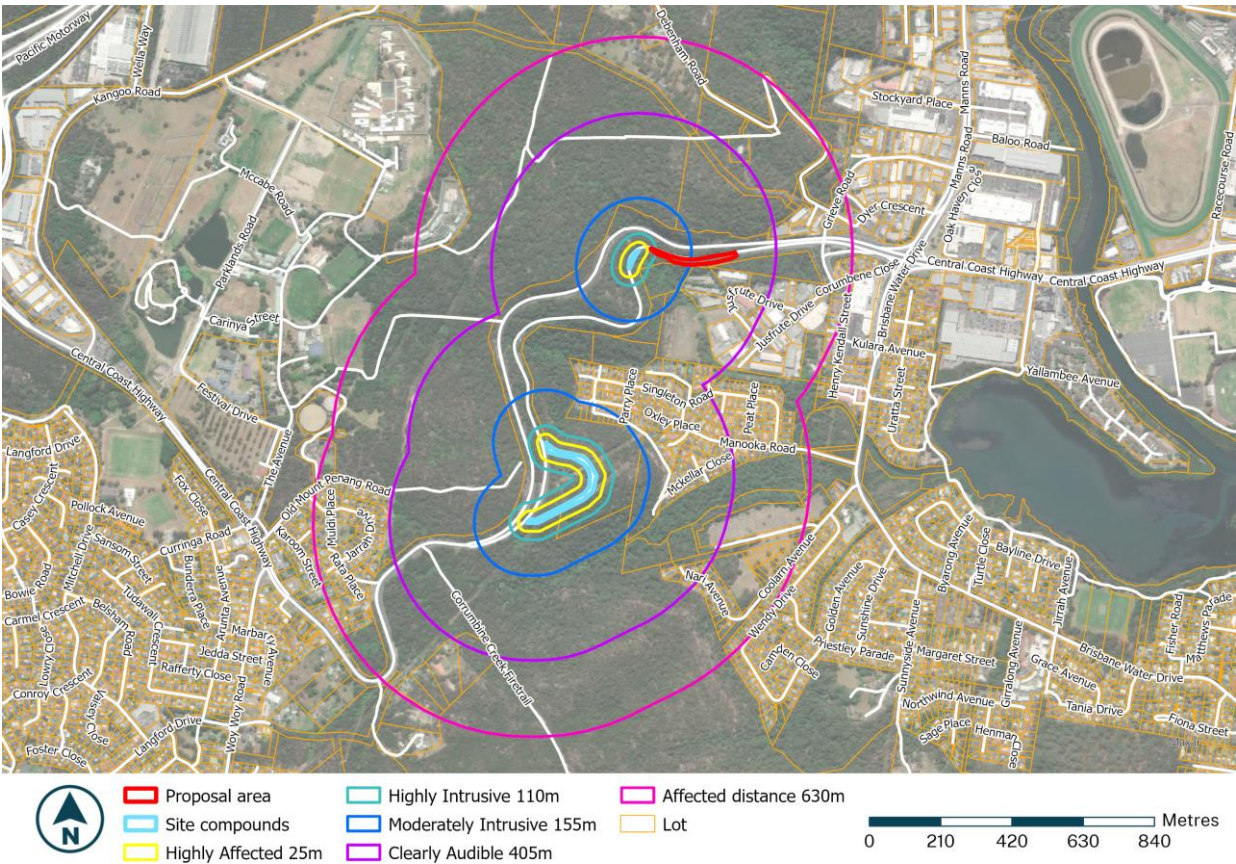


Figure 3-6: Predicted construction noise impacts – compound operation (night -worst case)

Safeguards

Safeguards to be implemented are:

NV1	The standard mitigation measures identified in Appendix C of the Construction Noise and Vibration Guideline (Transport for NSW, 2024) will be implemented.
NV2	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: • All project specific and relevant 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
NV3	Residences within 1120 metres of the proposal area and within 630 metres of site compound 2 will be notified a minimum of five working days prior to the start of works. The notification will include information about the proposed works, the hours of work and a Transport for NSW contact.
NV4	Phone calls detailing relevant information will be made to residences within 305 metres of the proposal, who have provided their contact details in response to initial communications. Where the resident cannot be telephoned then an alternative form of engagement will be considered.
NV5	Unnecessary noise will be avoided including: • No swearing or unnecessary shouting or loud stereos/radios on site • No dropping of materials from height, throwing of metal items and slamming of doors

	Plant used intermittently will be throttled down or shut down when not in use.
NV6	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.
NV7	Respite offers will be considered in response to noise complaints and implemented where appropriate for receivers who would experience highly intrusive noise impacts in accordance with Construction Noise and Vibration Guideline (CNVG) (Transport for NSW, 2024).
NV8	Vibration generating equipment must comply with the recommended minimum working distances for vibration intensive plant (CNVG). Where this is not possible an alternative methodology is to be used or vibration monitoring must be undertaken prior to commencement of works and site and machine specific safe working distance to be established.
NV9	The Kariong Slope Remediation Community and Stakeholder Engagement Plan would be followed to inform relevant stakeholders of the work.

3.4 Air quality

Table 3-4: Air quality

Description of existing environmental and potential impacts		
Is the proposal likely to result in large areas (>2ha) of exposed soils? The proposal involves work to remove vegetation to ground level resulting in exposed soil. The area of disturbance across the proposal area which may result in exposed soils from the clearing would be less than a hectare. Any dust impacts would be highly localised and can be managed with the proposed safeguards.	Yes ☐	No ☒
Are there any dust-sensitive receivers located within the vicinity of the proposal during the construction period? The nearest sensitive receiver (commercial) is located within 50 metres of the proposal area, however due to the small area of exposed soil and nature of the works, the proposed safeguards would manage potential dust impacts associated with the proposal.	Yes ☒	No ☐
Is there likely to be an emission to air during construction? The proposal would not result in a material increase in air pollution. The proposal would result in minor exhaust emissions from equipment and vehicles. Given the scale of the proposal and implementation of appropriate controls, the potential for adverse air quality impacts on receivers and the general environment is considered minor.	Yes ☒	No ☐

Safeguards

Safeguards to be implemented are:

AQ1	Work will not be carried out during strong winds or in weather conditions where high level of dust or air borne particulates are likely.
AQ2	Vehicles transporting waste or other materials that may produce odours or dust are to be covered during transportation.
AQ3	Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust.
AQ4	Stockpiles or areas that may generate dust are to be managed to suppress dust emissions in accordance with the Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10).

3.5 Aboriginal cultural heritage

Table 3-5: Aboriginal cultural heritage

Description of existing environmental and potential impacts		
Would the proposal involve disturbance in any area that has not been subject to previous ground disturbances?	Yes ☐	No ☒
Has an online Aboriginal Heritage Information Management System (AHIMS) search been completed? A search of the AHIMS was conducted on 21 August 2025. The search identified several sites in the locality, including a culturally modified tree immediately to the north of the proposal area (45-3-0307) (between the two carriageways). An axe grinding groove (45-3-0306) is located upslope of site compound No.1 and would not be impacted by the proposal.	Yes ☒	No ☐
Is there potential for the proposal to impact on any items of Aboriginal cultural heritage?	Yes ☐	No ☒
Would the proposal involve the removal of mature native trees? Tree removal is required for the proposed slope stabilisation works. No trees have been identified to have any heritage value. Safeguard AH1 would be implemented if any unexpected finds occur.	Yes ☒	No ☐
Is the proposal consistent with the requirements of Transport’s <i>Procedure for Aboriginal cultural heritage consultation and investigation</i> (PACHCI)? The PACHCI Stage 1 found that the proposal was unlikely to have an impact on Aboriginal cultural heritage objects or places. It noted that although there were seven sites within 200 to 300 metres of the study area, none of these sites were within the proposed work areas. It also noted that the cultural heritage potential for the future presence of aboriginal heritage is reduced due to past disturbance from the construction of the Central Coast Highway.	Yes ☒	No ☐

Safeguards

Safeguards to be implemented are:

AH1	If Aboriginal heritage items are uncovered during the works, all works must cease in the vicinity of the find and the Transport for NSW Aboriginal Community and Heritage Partner and the Environment Manager contacted immediately. The steps in the Unexpected Heritage Items Procedure (Transport for NSW, 2022) must be followed.
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Figure 3-7: AHIMS search results

3.6 Non-Aboriginal heritage

Table 3-6: Non-Aboriginal heritage

Description of existing environmental and potential impacts						
Have online heritage database searches been completed?					Yes ☒	No ☐
The following database searches were carried out on 12 June 2025:						
• Transport (including legacy Roads and Maritime) section 170 register • NSW Heritage database • Commonwealth Heritage List, established under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act) • Maritime heritage database • Australian Heritage Places Inventory • Local Environmental Plan(s) heritage items.						
Are there any items of non-Aboriginal heritage or heritage conservation areas listed on relevant heritage databases/registers that are located within the vicinity of the proposal?					Yes ☒	No ☐
One heritage listed item was identified within the proposal area and three heritage listed items were identified within 500 metres of the proposal, as described in the table below.						
ID	Item name	Item type	Listing	Significance	Distance from proposal	
LEPI329	‘Kendalls Glen’ Reserve, Rock and Memorial	Landscape (Rock – Natural)	Central Coast Local Environmental Plan 2022	State (NSW)	Inside and outside the proposal area.	
SHRI667	Mount Penang Parklands	Landscape (Cultural)	State Heritage Register	State (NSW)	100 metres north	

Source: Esri, Maxar, Earthstar Geographics, Bing, Google, Swire, and others

Kariong Hill slope remediation MWREF

Safeguards

Safeguards to be implemented are:

NH1	If unexpected archaeological remains are uncovered during the works, all works must cease in the vicinity of the material/find and the steps in the Unexpected heritage items procedure (Transport for NSW, 2022) must be followed. The Transport for NSW Environment Manager must be contacted immediately.
NH2	Due care must be taken in the vicinity of identified heritage items. Suitable protection measures must be implemented to ensure no heritage items are damaged during the proposed works. No construction materials are to be stockpiled or stored against heritage items or trees.
NH3	The 'Kendalls Glen' rock and memorial heritage item is to be protected from damage using effective physical barriers.
NH4	Any accidental damage caused to heritage items must be reported immediately to the Transport Environment and Sustainability Manager. Damage is to be made good in accordance with specialist heritage advice.
NH5	Any proposed changes beyond the approved scope of works may require further assessment and approval.

3.7 Biodiversity

Table 3-7: Biodiversity

Description of existing environmental and potential impacts			
Have relevant database searches been carried out? Biodiversity Assessment Report (BAR) was prepared for this proposal and is available in Appendix B. Relevant database searches were carried out as part of the BAR and are outlined in Table 2-2 in Appendix B.		Yes ☒	No ☐
Did the database searches identify any endangered ecological communities, threatened flora and/or threatened or protected fauna, or migratory species in or within the vicinity of the proposed works? Both Commonwealth and State listed matters must be considered. <u>Vegetation</u> Vegetation at the proposal site is mapped on the NSW State Vegetation Type Map as the following plant community types (PCTs): - PCT 3150 Hunter Coast Ranges Turpentine Wet Forest - PCT 3586 Northern Sydney Scribbly Gum Woodland The proposal requires the removal of up to 0.36 hectares of native vegetation. The proposed laydown areas are not mapped as any PCT and do not contain native vegetation, however some tree trimming would be required at site compound 2 due to overhanging branches from PCT 3586.. Vegetation at the top of the slope was found in the BAR to conform to PCT 3150 Hunter Coast Ranges Turpentine Wet Forest. No TEC’s have been identified within the proposal area. Maps showing the location of PCTs within the proposal area are provided in Section 3.1 in Appendix B. The area of the PCTs within the proposal area is outlined below.		Yes ☒	No ☐
Vegetation	Associated TEC	Condition	Area (ha)
PCT 3150 Hunter Coast Ranges Turpentine Wet Forest	Not a TEC	High	3,603.7 m ² (0.36 ha)
PCT 3586 Northern Sydney Scribbly Gum Woodland	Not a TEC	Low	Tree trimming only
<u>Threatened species</u>			

Description of existing environmental and potential impacts

The proposal would remove vegetation and affect other features which may offer habitat to threatened species. The proposal requires the removal of up to 0.36 hectares of vegetation that provides foraging habitat for 28 threatened fauna species. One threatened flora was recorded within the study area and two with moderate likelihood of occurring based on their association with PCT 3150, were assumed present as surveys were conducted outside of their required survey period. A map showing the location of threatened species records near the proposal area are provided in Figure 2.5 in Appendix B. Threatened species which may be affected by the proposal are listed below:

Scientific and common name	Status *		Potential occurrence	Potential impacts
	State	Cwth		
Fauna				
Dusky Woodswallow <i>Artamus cyanopterus cyanopterus</i>	V		Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat, foraging only
Bush Stone-curlew <i>Burhinus grallarius</i>	E		Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat
Gang-gang Cockatoo <i>Callocephalon fimbriatum</i>	V		Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat
South-eastern Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i>	V		Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat
Brown Treecreeper (eastern subspecies) <i>Climacteris picumnus victoriae</i>	V		Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat
Varied Sittella <i>Daphoenositta chrysoptera</i>	V		Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat
Little Lorikeet <i>Glossopsitta pusilla</i>	V		Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat
Swift Parrot <i>Lathamus discolor</i>	E	CE	Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat, foraging only
Barking Owl <i>Ninox connivens</i>	V		Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat
Powerful Owl <i>Ninox strenua</i>	V		Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat
Masked Owl <i>Tyto novaehollandiae</i>	V		Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat
Eastern Pygmy-possum <i>Cercartetus nanus</i>	V		Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat
Large-eared Pied Bat <i>Chalinolobus dwyeri</i>	V	V	Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat, foraging only

Description of existing environmental and potential impacts

Spotted-tailed Quoll <i>Dasyurus maculatus</i>	V	E	Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat
Eastern False Pipistrelle <i>Falsistrellus tasmaniensis</i>	V		Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat
Parma Wallaby <i>Macropus parma</i>	V		Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat
Eastern Coastal Free tailed Bat <i>Micronomus norfolkensis</i>	V		Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat
Little Bentwing-bat <i>Miniopterus australis</i>	V		Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat, foraging and roosting habitat (culverts)
Large Bentwing-bat <i>Miniopterus orianae oceanensis</i>	V		Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat, foraging and roosting habitat (culverts)
Southern Greater Glider <i>Petauroides volans</i>	E	E	Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat
Yellow-bellied Glider <i>Petaurus australis</i>	V	V	Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat
Squirrel Glider <i>Petaurus norfolcensis</i>	V		Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat
Koala <i>Phascolarctos cinereus</i>	E	E	Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat
Northern long-nosed Potoroo <i>Potorous tridactylus tridactylus</i>	V	V	Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	V	V	Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat, foraging only
Yellow-bellied Sheath-tail-bat <i>Saccolaimus flaviventris</i>	V		Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat
Greater Broad-nosed Bat <i>Scoteanax rueppellii</i>	V		Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat
Eastern Cave Bat <i>Vespertilio troughtoni</i>	V		Moderate (assumed)	Clearing of up to 0.36 hectares of potential habitat, foraging only

Description of existing environmental and potential impacts					
Flora					
Scrub Turpentine <i>Rhodamnia rubescens</i>	CE	CE	Recorded	3 individuals	
Tranquility Mintbush <i>Prostanthera askania</i>	E	E	Moderate (assumed)	0.36 ha	
Magenta Lilly Pilly <i>Syzygium paniculatum</i>	E	V	Moderate (assumed)	0.36 ha	
*V= vulnerable, E = endangered					
Assessments of significance were undertaken for each threatened species listed under the BC Act and EPBC Act that have a moderate likelihood of occurrence and were assumed present. The results of the assessment of significance under the BC Act and EPBC Act are provided Table 5-5 and Table 5-6 in Appendix B. The assessments concluded that as the proposal requires only minor clearing of native vegetation (0.36 ha of PCT 3150) and it is unlikely to place a local population of any threatened species at risk of extinction. The habitat to be impacted is already along a road edge, therefore the further reduction of the wildlife corridor would not result in further fragmentation or isolation of habitat.					
The proposal does contribute to four key threatening processes including clearing native vegetation, the establishment of Myrtle Rust (fungal disease), the loss of hollow bearing trees and the spread of Lantana camara (invasive weed species). These negative impacts are unlikely to have a significant impact on the long-term survival of local threatened species due to the relatively small (0.36 ha) extent of clearing and the fact that an adjoining habitat exists next to the proposal area.					
Does the proposal involve pruning, trimming or removal of any tree/s?					Yes ☒ No ☐
115 native trees with a DBH >5cm are estimated to occur within the proposal footprint however it is likely that not all these trees would require removal. There are 20 hollow trees within the proposal area. The categories of the trees by size is provided below:					
Diameter at breast height (DBH) (cm)			Count of trees		
5-19			42		
20-49			40		
50-99			19		
>100			14		
Hollows			20 hollows		
The preliminary replacement requirements for the removal of trees are outlined below:					
Category	Count of trees/ hollows	Replacement requirement per tree/hollow removed		Estimates number to be replaced	Estimated equivalent payment to Transport conservation fund
Small tree DBH 5-19 cm	42	2 trees	\$125	84	\$5,250.00
Medium tree DBH 20-49 cm	40	4 trees	\$500	160	\$20,000.00
Large tree DBH 50-99 cm	19	8 trees	\$1,000	152	\$19,000.00

Description of existing environmental and potential impacts

Very large tree DBH >100 cm	14	16 trees	\$2,500	224	\$35,000.00
Hollow	20. Occupancy not confirmed	Provide 3 artificial hollows for every occupied hollow removed*	\$500	12	\$6,000.00
Totals	115	-	-	620	\$85,250

Is the proposal likely to impact nationally listed threatened species, ecological communities or migratory species?

Yes ☐

No ☒

The proposal is considered unlikely to have a significant impact on nationally threatened species, ecological communities or migratory species. EPBC Act assessments of significance for relevant species are included in Appendix B.

Would the proposal require the removal of any other vegetation?

Yes ☐

No ☒

Would the proposal require the removal of any tree hollows?

Yes ☒

No ☐

The proposal requires the removal of eight mature hollow bearing trees comprising 20 hollows of varying sizes. These hollows provide potential habitat for threatened species assumed to present within the proposal area. Where practical, artificial hollows would be installed adjacent to the impacted area and would provide habitat in place of the removed hollow bearing trees. There are also two culverts within the proposal area and two culverts adjacent to the proposal area which provide potential roosting habitat for threatened microbats.

Are there any known areas of outstanding biodiversity value or areas mapped as 'littoral rainforest' or 'coastal wetland' under chapter 2 of SEPP (Resilience and Hazards) in or within the vicinity of the proposed work?

Yes ☐

No ☒

The proposal footprint does not fall within the Coastal Environment Area and as such, no further assessment of the impacts of the proposal on SEPP coastal wetlands or littoral rainforest is required.

Would the proposal provide any additional barriers to the movement of wildlife?

Yes ☐

No ☒

The Central Coast Highway is an existing barrier to north-south movements of fauna. While vegetation is proposed to be removed, the proposal would not result in isolation of habitat.

Would the proposal disturb any natural waterways or aquatic habitat?

Yes ☒

No ☐

The proposed safeguards in Table 3-2: Waterways and water quality would address potential risks from construction and impacts to water quality and downstream sensitive coastal environments.

Would the proposal impact (directly or indirectly) any potential microbat roosting or breeding habitat such as on bridges and culverts?

Yes ☒

No ☐

The proposal area involves the removal of eight mature hollow bearing trees and includes two culverts which would be impacted by required construction work. Specific mitigation measures have been included by a qualified ecologist to address potential impacts.

Aquatic habitat

The proposal is located within Brisbane Water estuary catchment. A tributary of Coorumbine Creek runs through the proposal area and flows into an area mapped as KFH, coastal wetlands, proximity to coastal wetlands and coastal use area. The proposed safeguards in Table 3-2: Waterways and water quality would address potential risks from construction and impacts to downstream sensitive coastal environments.

Description of existing environmental and potential impacts

Groundwater dependant ecosystems

The proposal requires only minor clearing in this area and would not substantially alter topography. Proposed excavation is limited and not likely to result in additional groundwater drawdown. Based on the small scale of development, the proposal is considered unlikely to substantially impact groundwater dependent ecosystems.

Weeds

The proposal has the potential to spread weeds through works and the movement of vehicles and machinery into or out of the site. Safeguards have been proposed to address these potential impacts. Revegetation is proposed in areas between bushland and the edge of the work area in order to minimise the risk of weeds establishing within these areas following construction completion.

Invasion and spread of pathogens and disease

During construction, the proposal has the potential to cause both the spread of pathogens and disease. The establishment of Myrtle Rust was observed on Scrub Turpentine (*Rhodamnia rubescens*) within the proposal area. There is a risk of spreading fungus and diseases through the introduction and movement of soil. Detailed hygiene management measures during construction are proposed to minimise this risk.

Noise, light and vibration

During construction, activities associated with the proposal may cause additional noise, vibration and artificial light; however, given the presence of the existing road corridor, it is not considered that the proposal would result in adverse changes to existing levels of noise, vibration and/or light from this existing source such that there would be a significant impact to native fauna species. Additional impacts from the proposal would be short-term.

Fauna injury and mortality

Risks of fauna injury mortality would be mitigated and managed in accordance with Transport’s Biodiversity Management Guideline (Transport for NSW, 2024) and by implementing the safeguards outlined below.

Biodiversity offsets

The proposal does not trigger the biodiversity offset scheme or Transport’s Biodiversity Policy as clearing of threatened fauna habitat is less than one hectare, there a less than 10 threatened plants removed, no threatened ecological communities are cleared, and no threatened species would be significantly impacted. The loss of trees will be offset in accordance with Transport’s Tree and hollow replacement guidelines.

Safeguards

Safeguards to be implemented are:

BD1	Native vegetation removal and threatened fauna habitat removal will be minimised through pre-construction planning and the retention of trees where possible.
BD2	Pre-clearing surveys and final pre-clearing checks will be undertaken in accordance with Guide 1: Pre-clearing process of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW 2024). This includes counts of trees and hollows to be removed to provide accurate offsetting requirements.
BD3	Vegetation removal would be carried out in accordance with Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Management Guideline (Transport for NSW, 2024). Disturbed areas that are not stabilised using shotcrete are to be stabilised using mesh and hydroseed, and mulch from trees cleared from the proposal footprint and/or vegetation (native ground cover) following completion of works.
BD4	Native vegetation will be re-established in areas adjacent to retained bushland in accordance with Guide 3: Re-establishment of native vegetation of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024).
BD5	An unexpected threatened species finds procedure is to be developed as part of the CEMP using the template in Guide 1: Pre-clearing process of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024). The procedure is to be followed if threatened ecological communities (TEC), either new TECs or new occurrences of known TECs, not assessed in the biodiversity assessment, are identified in the proposal footprint.

BD6	The three Scrub Turpentine (<i>Rhodamnia rubescens</i>) identified within the proposal footprint occur along the southern boundary. If these three individuals can be avoided, tree protection zones (including fencing) will be established prior to construction works.
BD7	Threatened fauna habitat removal will be minimised through detailed design.
BD8	Habitat removal will be undertaken by staged clearing in accordance with Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024). Non hollow bearing trees and understory vegetation is to be cleared first, to allow fauna to relocate. Hollow bearing trees that require removal are to be inspected by an ecologist or contractors engaged to clear trees (under the supervision of an ecologist) immediately prior to felling, using a burrow scope or the like. Alternatively, the hollow is to be plugged with a towel, and the hollow section cut and lowered to the ground for inspection. It is preferable to undertake clearing of hollow bearing trees at night, when threatened nocturnal fauna are less likely to be occupying the hollows.
BD9	Koala feed trees (Grey Gum, <i>Eucalyptus punctata</i>) located at the proposed site compound No.2, are to be inspected by an ecologist during pre-clearing surveys, prior to any tree trimming to ensure no occupation by koalas.
BD10	The presence of microbats is to be confirmed prior to work on the culverts. If microbats are present, prior to culvert work, a Microbat Management Plan is to be developed and implemented as per Transports Microbat Management Guidelines (2023) to manage impacts to microbats.
BD11	Habitat will be replaced or re-instated in accordance with Guide 5: Re-use of woody debris and bushrock and Guide 8: Artificial hollows of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024). Where practical, a total of 12 artificial hollows will be installed in nearby habitat and include 15 - 20 cm diameter entrances.
BD12	Felled trees will be cut at ground level, retaining the stump/root system in the ground; maintaining soil stabilisation. The root structure of removed trees must be left undisturbed where they do not pose a risk to the stability of the slope.
BD13	Exclusion zones will be set up at the limit of clearing in accordance with Guide 2: Exclusion zones of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024).
BD14	Fauna that may be present on site during works will be managed in accordance with Guide 9: Fauna handling of the Biodiversity Management Guideline (Transport for NSW, 2024).
BD15	Inspections for the presence of any sheltering native species would be carried out under vehicles and machinery prior to their use.
BD16	Weed species would be managed in accordance with Guide 6: Weed management of the Biodiversity Management Guideline (Transport for NSW, 2024) and the Biosecurity Act 2015 (general duty to prevent, eliminate or minimise any biosecurity risk). Lantana (<i>Lantana camera</i>) and other exotics are to be cleared and mulched separately from native vegetation and are not to be re-used for mulching on site. This is to occur as per NSW Weedwise removal guidelines with disposal at a licenced facility.
BD17	Pathogens will be managed in accordance with Guide 7: Pathogen management of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024). The following controls are required to prevent the spread of Myrtle Rust identified in Scrub Turpentine (<i>Rhodamnia rubescens</i>) within the proposal footprint:

	• Before beginning the project: – Ensure vehicles, plant and machinery are clean prior to accepting on site. Machinery including vehicles should not park in known infested areas. – Program works to move from uninfected areas to infected areas. – Set up exclusion zones with fencing and signage to restrict access into contaminated areas. – Include all personnel (including visitors) to be inducted on Myrtle rust management measures for the site. • Where contact with biosecurity matter is unavoidable, the following processes are to be implemented: – Disinfect vehicle and machinery using one of the disinfectant options in Table 7 of DPIE Hygiene Guidelines. – Personnel working in an infected site to remove any seed and plant material from clothing, shower and launder clothes (especially hats) before moving to another bushland site. – Provide boot wash-down facility. – Disinfect footwear and equipment using one of the disinfectant options in Table 7 of DPIE Hygiene Guidelines – Use a designated clean bay – Clean all soil and plant material from vehicle (inside and out), equipment and clothing. – Brush off/vacuum/use a blower to clean inside of vehicle and under the hood. – Clean from top of the vehicle down. – Use a pressure washer, where available, to remove debris from vehicle, paying particular attention to high-risk areas that have been in contact with weeds such as tyres. – If adequate cleaning facilities are unavailable onsite, clean the vehicle at a suitable wash-down facility before proceeding to another site. – Bury infected plant material on site if possible.
BD18	Shading and artificial light impacts will be minimised during pre-construction planning.
BD19	Transport's Tree and hollow replacement guidelines apply to this proposal and the removal of approximately 115 trees, and 20 hollows require offsetting. Accurate counts of trees and hollows removed during construction will be undertaken during pre-clearing surveys. Where possible, revegetation will be undertaken in the retained strip of bushland to reduce the spread of exotics downslope, where there are BioNet records of Scrub Turpentine <i>Rhodamnia rubescens</i> . Artificial tree hollows would also be installed close to the disturbed area. If tree planting is proposed, a Tree Replacement Plan is to be prepared.

3.8 Traffic and transport

Table 3-8: Traffic and transport

Description of existing environmental and potential impacts		
Is the proposal likely to result in detours or disruptions to traffic flow (vehicular, cycle and pedestrian) or access during construction?	Yes ☒	No ☐
No detours are required for the proposal but a contraflow onto the eastbound carriageway of the Central Coast Highway would be implemented during the night period vegetation removal.		
The proposal requires an ROL as it would be undertaken in the closed slow lane of the roadway which would reduce the capacity of the road temporarily from two lanes to one during		

construction. This would also require reduced speed limits, resulting in some disruptions and delays to traffic flow. A 24-hour ROL has been approved for this proposal and would include 24-hour closure of the westbound slow lane of the Central Coast Highway using concrete barriers for separation. This option would apply to the off-peak December to January period, with an option to extend to the end of construction if traffic impacts are manageable. Once established on-site, this option would be managed by a Transport representative to assess the level of impact to the Central Coast Highway (queuing and delays) and connecting local road networks. The most recent traffic count by Transport identifies that about 17,500 vehicles use the two westbound lanes of the Central Coast Highway on a weekly basis (Station ID 05786). This data shows that the AM peak (7:00am to 8:00am) and PM peak (3:00pm to 4:00pm) Monday to Friday would be when more vehicles are using the westbound lane of the Central Coast Highway. A substantial portion of the peak traffic volume would be commuter traffic and would be expected to be lower during the December to January periods which is when the construction work has been scheduled. Traffic queuing would be likely to occur because of the construction work and would result in delays for commuters. Potential delays for the PM peak period could be between 5 to 10 minutes. No data currently exists for the AM peak period. Emergency services would be notified of the lane closure and potential delays in advance of construction. No allowance would be made for cyclists during lane closures due to the insufficient width of the roadway. No allowance would be made for oversize and/or overmass (OSOM) vehicles if concrete barriers are in place for the 24-hour closure. Transport will investigate opportunities to facilitate OSOM and freight movements as the design and construction staging is finalised. Vehicle movements generated by construction works would be small and unlikely to impact network performance. As noted in Section 2.1.2, a 24-hour single lane closure is proposed to reduce setup and pack-down times which in turn would reduce the overall construction period. This would apply to the off-peak December to January period and once established on-site, would be reassessed based on the level of impact to the Central Coast Highway (queuing and delays) and connecting local road networks. This adaptive approach would minimise potential impacts. Vegetation removal works are expected to have a duration of three weeks and would occur prior to the main construction work, and outside the off-peak December to January period. A full carriageway closure would be required due to plant access (e.g. mobile crane). Subject to an ROL, a contraflow onto the eastbound carriageway of the Central Coast Highway would be implemented during the night period, reducing the traffic flow in both direction to single lane travel.		
Is the proposal likely to result in detours or disruptions to traffic flow (vehicular, cycle and pedestrian) or access during operation? The proposal would not involve any permanent changes to traffic flow along the Central Coast Highway. There are no off road pedestrian or bicycle facilities that would be affected by the proposal.	Yes ☐	No ☒
Is the proposal likely to affect any other transport nodes or transport infrastructure (e.g., bus stops, bus routes) in the surrounding area? Or result in detours or disruptions to traffic flow (vehicular, cycle and pedestrian) or access during operation?	Yes ☐	No ☒

Safeguards

Safeguards to be implemented are:

TT1	During construction traffic and/or pedestrian movements would be managed in accordance with Traffic control at work sites – Technical manual (version 6.1, 2022) as necessary.
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3.9 Socio-economic

Table 3-9: Socio-economic

Description of existing environmental and potential impacts		
Is the proposal likely to impact on local business?	Yes ☐	No ☒
Is the proposal likely to require any property acquisition?	Yes ☐	No ☒
Is the proposal likely to alter any access for properties (either temporarily or permanently)?	Yes ☐	No ☒
Is the proposal likely to alter any on-street parking arrangements (either temporarily or permanently)? While designated on-street parking would not be affected, areas nominated for parking / stockpiling (refer to Section 2.1.4) would be unavailable for other vehicles to use as pull over areas for the duration of construction. No school bus pick up / drop off areas would be affected.	Yes ☐	No ☒
Is the proposal likely to change pedestrian movements or pedestrian access (either temporarily or permanently)?	Yes ☐	No ☒
Is the proposal likely to impact on any items or places of social value to the community (either temporarily or permanently)? Site compound No.1 would be located in the road shoulder where a monument to Henry Kendall titled 'To Kendall's Rock' is located. This would be temporarily unavailable for access during the construction period. Similarly the lookout at the site compound No.2 location would not be accessible to the public during the construction period.	Yes ☒	No ☐
Is the proposal likely to reduce or change visibility of any businesses, farms, tourist attractions or the like (either temporarily or permanently)?	Yes ☐	No ☒
Is the proposal likely to impact trees planted by a community group, Landcare group or by council or a tree that is a memorial or part of a memorial group e.g., has a plaque?	Yes ☐	No ☒
Is the proposal likely to impact trees that form part of a streetscape, an avenue or roadside planting?	Yes ☐	No ☒

Safeguards

Safeguards to be implemented are:

SO1	Any complaints received during the undertaking of the works are to be addressed in accordance with the project communications and stakeholder engagement plan (CSEP) or equivalent.
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3.10 Landscape character and visual amenity

Table 3-10: Landscape character and visual amenity

Description of existing environmental and potential impacts		
Is the proposed work over or near an important physical or cultural element or landscape? (For example, heritage items and areas, distinctive or historic built form, National Parks, conservation areas, scenic highways etc.) The proposal is adjacent to land zoned as C2 Environmental Conservation which is designed to preserve environmental value. The proposal would involve the removal of vegetation along the slope next to the road. The vegetation which would be removed largely comprises of regrowth vegetation on the face and at the top of the slopes. The vegetation removal would only be visible from the travel lanes of the Central Coast Highway and from commercial businesses near the proposal area.	Yes ☒	No ☐
Would the proposal obstruct or intrude upon the character or views of a valued landscape or urban area? (For example, locally significant topography, a rural landscape or a park, a river, lake or the ocean or a historic or distinctive townscape or landmark) The proposal would involve vegetation removal works adjacent to the road. The scenic views of the lush vegetation which are normally available to road users, would be impacted for the duration of construction and during the period of vegetation regrowth post construction. The vegetation removal would also be visible from parts of West Gosford (looking west), although this would be a substantial distance and not likely to be considered visually prominent.	Yes ☒	No ☐
Would the proposal require the removal of mature trees or stands of vegetation, either native or introduced? As described above, the proposal would involve the removal of vegetation down to ground level on the slope.	Yes ☒	No ☒
Would the proposal result in large areas of shotcrete visible from the road or adjacent properties?	Yes ☐	No ☒
Would the proposal involve new noise walls or visible changes to existing noise walls?	Yes ☐	No ☒
Would the proposal involve the removal or reuse of large areas of road corridor, landscape, either verges or medians? The proposal would utilise small areas of the existing road corridor along the shoulder to carry out the remediation works and as site compound and temporary laydown areas.	Yes ☐	No ☒
Would the proposal involve substantial changes to the appearance of a bridge (including piers, girders, abutments and parapets) that are visible from the road or residential areas?	Yes ☐	No ☒
If involving lighting, would the proposal create unwanted light spillage on residential properties at night (in construction or operation)? Temporary lighting would be directed away from surrounding residential properties so that no unwanted light spillage is created during construction. At times when temporary lighting would be used, no commercial businesses would be operational.	Yes ☐	No ☒
Would any new structures or features to be constructed, result in over shadowing to adjoining properties or areas?	Yes ☐	No ☒

Safeguards

Safeguards to be implemented are:

LV1	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.
LV2	All construction related material and equipment will be removed from the proposal footprint at the completion of work and disturbed areas restored.

LV3	Site lighting will be positioned to minimise light spill impacts on adjacent properties.
LV4	Restore or enhance any previously treated areas within the slope faces.

3.11 Waste

Table 3-11: Waste

Description of existing environmental and potential impacts		
Is the proposal likely to generate >200 tonnes of waste material (contaminated and /or non-contaminated material)?	Yes ☐	No ☒
Waste materials which would be generated during construction would include organic material, soil, other excavated material. This material would be reviewed for its suitability for reuse on site or on other nearby sites in accordance with the relevant resource recovery guidelines. If material is deemed to be unsuitable for reuse it may be temporarily stored in the site compound or established stockpile sites before being disposed of at a licensed waste facility.		
Is the proposal likely to require a licence from EPA?	Yes ☐	No ☒
Is the proposal likely to require the removal of asbestos?	Yes ☐	No ☒

Safeguards

Safeguards to be implemented are:

WS1	Resource management hierarchy principles are to be followed: - Avoid unnecessary resource consumption as a priority - Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery) - Disposal is undertaken as a last resort (in accordance with the Waste Avoidance & Resource Recovery Act 2001)
WS2	Waste material is to be reused in accordance with any waste exemptions or disposed of legally in accordance with its waste classification.
WS3	Where mulch is to be reused away at another location, a Mulch Management Plan will be prepared. Residual mulch would be removed from the site by the contractor and taken to a licensed waste facility.

3.12 Climate change and greenhouse gas emissions

Table 3-12: Climate change and greenhouse gas emissions

Description of existing environmental and potential impacts		
Is the proposal located in an area likely to be permanently or tidally inundated in the future or subject to increased duration and intensity of flooding?	Yes ☐	No ☒
Have opportunities for reduced energy consumption during construction and operation been considered?	Yes ☒	No ☐
No opportunities have arisen for reduced energy consumption during construction. There would be no energy consumption during operation.		
Greenhouse gas emissions sources during construction are likely to be largest from:		

- Transporting materials to site
- Operation of plant and equipment.

There would be no greenhouse gas emission sources during operation.

Safeguards

No additional safeguards have been proposed in relation to climate change and greenhouse gas emissions.

3.13 Cumulative impact

Table 3-13: Cumulative impact

Description of existing environmental and potential impacts		
Are there other projects and developments in the study area which could add to potential impacts in both construction and operation?	Yes ☐	No ☒
The slope remediation would be the only works occurring along the Central Coast Highway in the immediate locality during the construction period.		

Safeguards

No additional safeguards have been proposed in relation to cumulative impacts.

4. Summary of safeguards and environmental management measures

4.1 Safeguards and environmental management measures

This section provides a summary of the site-specific environmental safeguards and management measures identified in described in chapter 3 of this minor works REF. These safeguards will be implemented to reduce potential environmental impacts throughout construction and operation. A framework for managing the potential impacts is provided with reference to environmental management plans and relevant Transport QA specifications. Any potential licence and/or approval requirements required prior to construction are also listed.

Table 4-1: Summary of site-specific safeguards for proposed work

Factor	ID	Safeguards
Soil	SE1	Erosion and sediment control measures are to be implemented and maintained to: - Minimise sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets - Reduce water velocity and capture sediment on site - Minimise the amount of material transported from site to surrounding pavement surfaces. (in accordance with the Managing Urban Stormwater, Soils and Construction Guidelines (the Blue Book) Landcom, 2004).
	SE2	Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request.
	SE3	Erosion and sediment control measures are not to be removed until the works are complete, and areas are stabilised.
	SE4	A progressive erosion and sediment control plan is to be prepared for the works.
	SE5	Parking of vehicles and storage of plant/equipment is to occur only within the designated proposal footprints or at nominated ancillary sites.
	SE6	Area of exposed soils are to be stabilised as soon as possible.
	SE7	The use of established stockpile sites is to be in accordance with the Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10).
	SE8	If contaminated areas are encountered during investigations, appropriate control measures will be implemented to manage the immediate risks of contamination. 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 or further actions identified in consultation with the Transport for NSW Environment Manager and/or EPA.
Waterways and water quality	WQ1	There is to be no release of dirty water into drainage lines and/or waterways.
	WQ2	Water quality control measures are to be used to prevent any materials (e.g. concrete, grout, sediment etc) entering drain inlets or waterways, including measures to capture any excess grout during soil nailing.
	WQ3	If refuelling of plant and equipment is required on site it will take place on flat ground only using 20 litre drums within a bunded area large enough to contain 120 per cent of the container's contents.

	WQ4	If an incident (e.g. spill) occurs, the Environmental Incident Procedure (Transport for NSW, 2021) is to be followed and the Transport for NSW Contract Manager and Environment Manager notified immediately
	WQ5	An emergency spill kit is to be kept on site and maintained throughout the construction work. The spill kit must be appropriately sized for the volume of substances. All staff are to be made aware of the location of the spill kit and trained in its use.
	WQ6	Plant and equipment will be inspected regularly to ensure there are no leakages of fuel, oil and hydraulic fluid.
	WQ7	The Bureau of Meteorology website will be checked prior to start of the workday for any severe weather, thunderstorm and/or flood warnings. Procedures will be developed for managing the worksite where there is a risk of high rainfall, including removal and storage of plant and equipment and stabilisation of the site.
	WQ8	Soil nailing and shotcreting operations would not occur during periods of rainfall or where a medium or higher chance ($\geq 40\%$) of rainfall is forecast by the Bureau of Meteorology.
	WQ9	Waste grout and shotcrete would be frequently removed from the road pavement and other areas to prevent mobilisation during a rainfall event.
	WQ10	Vehicle wash down would occur in a bunded area within an existing Transport for NSW depot.
	WQ11	All fuels, chemicals and liquids will be stored in an impervious bunded area within the compound site when not in use.
	WQ12	Concrete is to be washed out into a contained area and disposed of appropriately.
Noise and vibration	NV1	The standard mitigation measures identified in Appendix C of the Construction Noise and Vibration Guideline (Transport for NSW, 2023) will be implemented.
	NV2	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: • All project specific and relevant 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.
	NV3	Residences within 1120 metres of the proposal area and within 630 metres of site compound 2 will be notified a minimum of five working days prior to the start of works. The notification will include information about the proposed works, the hours of work and a Transport for NSW contact.
	NV4	Phone calls detailing relevant information will be made to residences within 305 metres of the proposal, who have provided their contact details in response to initial communications. Where the resident cannot be telephoned then an alternative form of engagement will be considered.
	NV5	Unnecessary noise will be avoided including: • No swearing or unnecessary shouting or loud stereos/radios on site • No dropping of materials from height, throwing of metal items and slamming of doors • Plant used intermittently will be throttled down or shut down when not in use.

	NV6	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.
	NV7	Respite offers will be considered in response to noise complaints and implemented where appropriate for receivers who would experience highly intrusive noise impacts in accordance with Construction Noise and Vibration Guideline (CNVG) (Transport for NSW, 2024).
	NV8	Vibration generating equipment must comply with the recommended minimum working distances for vibration intensive plant (CNVG). Where this is not possible an alternative methodology is to be used or vibration monitoring must be undertaken prior to commencement of works and site and machine specific safe working distance to be established.
	NV9	The Kariong Slope Remediation Community and Stakeholder Engagement Plan would be followed to inform relevant stakeholders of the work.
Air quality	AQ1	Work will not be carried out during strong winds or in weather conditions where high level of dust or air borne particulates are likely.
	AQ2	Vehicles transporting waste or other materials that may produce odours or dust are to be covered during transportation.
	AQ3	Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust.
	AQ4	Stockpiles or areas that may generate dust are to be managed to suppress dust emissions in accordance with the Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10).
Aboriginal cultural heritage	AH1	If Aboriginal heritage items are uncovered during the works, all works must cease in the vicinity of the find and the Transport for NSW Aboriginal Community and Heritage Partner and the Environment Manager contacted immediately. The steps in the Unexpected Heritage Items Procedure (Transport for NSW, 2022) must be followed.
Non-Aboriginal heritage	NH1	If unexpected archaeological remains are uncovered during the works, all works must cease in the vicinity of the material/find and the steps in the Unexpected heritage items procedure (Transport for NSW, 2022) must be followed. The Transport for NSW Environment Manager must be contacted immediately.
	NH2	Due care must be taken in the vicinity of identified heritage items. Suitable protection measures must be implemented to ensure no heritage items are damaged during the proposed works. No construction materials are to be stockpiled or stored against heritage items or trees.
	NH3	The 'Kendalls Glen' rock and memorial heritage item is to be protected from damage using effective physical barriers.
	NH4	Any accidental damage caused to heritage items must be reported immediately to the Transport Environment and Sustainability Manager. Damage is to be made good in accordance with specialist heritage advice.
	NH5	Any proposed changes beyond the approved scope of works may require further assessment and approval.
Biodiversity	BD1	Native vegetation removal and threatened fauna habitat removal will be minimised through pre-construction planning and the retention of trees where possible.
	BD2	Pre-clearing surveys and final pre-clearing checks will be undertaken in accordance with Guide 1: Pre-clearing process of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW 2024). This

		includes counts of trees and hollows to be removed to provide accurate offsetting requirements.
	BD3	Vegetation removal would be carried out in accordance with Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Management Guideline (Transport for NSW, 2024). Disturbed areas that are not stabilised using shotcrete are to be stabilised using mesh and hydroseed, and mulch from trees cleared from the proposal footprint and/or vegetation (native ground cover) following completion of works.
	BD4	Native vegetation will be re-established in areas adjacent to retained bushland in accordance with Guide 3: Re-establishment of native vegetation of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024).
	BD5	An unexpected threatened species finds procedure is to be developed as part of the CEMP using the template in Guide 1: Pre-clearing process of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024). The procedure is to be followed if threatened ecological communities (TEC), either new TECs or new occurrences of known TECs, not assessed in the biodiversity assessment, are identified in the proposal footprint.
	BD6	The three Scrub Turpentine (<i>Rhodamnia rubescens</i>) identified within the proposal footprint occur along the southern boundary. If these three individuals can be avoided, tree protection zones (including fencing) will be established prior to construction works.
	BD7	Threatened fauna habitat removal will be minimised through detailed design.
	BD8	Habitat removal will be undertaken by staged clearing in accordance with Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024). Non hollow bearing trees and understory vegetation is to be cleared first, to allow fauna to relocate. Hollow bearing trees that require removal are to be inspected by an ecologist or contractors engaged to clear trees (under the supervision of an ecologist) immediately prior to felling, using a burrow scope or the like. Alternatively, the hollow is to be plugged with a towel, and the hollow section cut and lowered to the ground for inspection. It is preferable to undertake clearing of hollow bearing trees at night, when threatened nocturnal fauna are less likely to be occupying the hollows.
	BD9	Koala feed trees (Grey Gum, <i>Eucalyptus punctata</i>) located at the proposed site compound No.2, are to be inspected by an ecologist during pre-clearing surveys, prior to any tree trimming to ensure no occupation by koalas.
	BD10	The presence of microbats is to be confirmed prior to work on the culverts. If microbats are present, prior to culvert work, a Microbat Management Plan is to be developed and implemented as per Transport's Microbat Management Guidelines (2023) to manage impacts to microbats.
	BD11	Habitat will be replaced or re-instated in accordance with Guide 5: Re-use of woody debris and bushrock and Guide 8: Artificial hollows of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024). Where practical, a total of 12 artificial hollows will be installed in nearby habitat and include 15 - 20 cm diameter entrances.
	BD12	Felled trees will be cut at ground level, retaining the stump/root system in the ground; maintaining soil stabilisation. The root structure of removed trees must be left undisturbed where they do not pose a risk to the stability of the slope.

BD13	Exclusion zones will be set up at the limit of clearing in accordance with Guide 2: Exclusion zones of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024).
BD14	Fauna that may be present on site during works will be managed in accordance with Guide 9: Fauna handling of the Biodiversity Management Guideline (Transport for NSW, 2024).
BD15	Inspections for the presence of any sheltering native species would be carried out under vehicles and machinery prior to their use.
BD16	Weed species would be managed in accordance with Guide 6: Weed management of the Biodiversity Management Guideline (Transport for NSW, 2024) and the <i>Biosecurity Act 2015</i> (general duty to prevent, eliminate or minimise any biosecurity risk). Lantana (<i>Lantana camera</i>) and other exotics are to be cleared and mulched separately from native vegetation and are not to be re-used for mulching on site. This is to occur as per NSW Weedwise removal guidelines with disposal at a licenced facility.
BD17	Pathogens will be managed in accordance with Guide 7: Pathogen management of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024). The following controls are required to prevent the spread of Myrtle Rust identified in Scrub Turpentine (<i>Rhodamnia rubescens</i>) within the proposal footprint: • Before beginning the project: – Ensure vehicles, plant and machinery are clean prior to accepting on site. Machinery including vehicles should not park in known infested areas. – Program works to move from uninfected areas to infected areas. – Set up exclusion zones with fencing and signage to restrict access into contaminated areas. – Include all personnel (including visitors) to be inducted on Myrtle rust management measures for the site. • Where contact with biosecurity matter is unavoidable, the following processes are to be implemented: – Disinfect vehicle and machinery using one of the disinfectant options in Table 7 of DPIE Hygiene Guidelines. – Personnel working in an infected site to remove any seed and plant material from clothing, shower and launder clothes (especially hats) before moving to another bushland site. – Provide boot wash-down facility. – Disinfect footwear and equipment using one of the disinfectant options in Table 7 of DPIE Hygiene Guidelines – Use a designated clean bay – Clean all soil and plant material from vehicle (inside and out), equipment and clothing. – Brush off/vacuum/use a blower to clean inside of vehicle and under the hood. – Clean from top of the vehicle down. – Use a pressure washer, where available, to remove debris from vehicle, paying particular attention to high-risk areas that have been in contact with weeds such as tyres. – If adequate cleaning facilities are unavailable onsite, clean the vehicle at a suitable wash-down facility before proceeding to another site. – Bury infected plant material on site if possible.
BD18	Shading and artificial light impacts will be minimised during pre-construction planning.
BD19	Transport's Tree and hollow replacement guidelines apply to this proposal and the removal of approximately 115 trees, and 20 hollows require offsetting. Accurate counts of trees and hollows removed during construction will be undertaken during pre-clearing surveys. Where possible, revegetation will be undertaken in the retained strip of bushland to reduce the spread of exotics downslope, where there are BioNet records of Scrub Turpentine <i>Rhodamnia rubescens</i> . Artificial tree hollows would also be installed close to the disturbed area. If tree planting is proposed, a Tree Replacement Plan is to be prepared.

Traffic and transport	TT1	During construction traffic and/or pedestrian movements would be managed in accordance with Traffic control at work sites – Technical manual (version 6.1, 2022) as necessary.
Socio-economic	SO1	Any complaints received during the undertaking of the works are to be addressed in accordance with the project communications and stakeholder engagement plan (CSEP) or equivalent.
Landscape character and visual amenity	LV1	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.
	LV2	All construction related material and equipment will be removed from the proposal footprint at the completion of work and disturbed areas restored.
	LV3	Site lighting will be positioned to minimise light spill impacts on adjacent properties.
	LV4	Restore or enhance any previously treated areas within the slope faces.
Waste	WS1	Resource management hierarchy principles are to be followed: - Avoid unnecessary resource consumption as a priority - Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery) - Disposal is undertaken as a last resort. (in accordance with the Waste Avoidance & Resource Recovery Act 2001)
	WS2	Waste material is to be reused in accordance with any waste exemptions or disposed of legally in accordance with its waste classification.
	WS3	Where mulch is to be reused away at another location, a Mulch Management Plan will be prepared. Residual mulch would be removed from the site by the contractor and taken to a licensed waste facility.
Climate change and greenhouse gas emissions	N/A	No additional safeguards have been proposed in relation to climate change and greenhouse gas emissions.
Cumulative impacts	N/A	No additional safeguards have been proposed in relation to climate change and greenhouse gas emissions.

4.2 Licensing and approvals

Table 4-2: Summary of licensing and approvals required

Instrument	Requirement	Timing
<i>Roads Act 1993</i>	Road occupancy licence	Prior to the start of the activity

4.3 Other requirements

Table 4-3: Other requirements

Requirement		
Environmental management plan sent to SMES or their delegate (ESL) for review.	Yes ☒	No ☐

5. Certification, review and determination

5.1 Certification

This minor works REF provides a true and fair review of the proposal in relation to its potential effects on the environment. It addresses, to the fullest extent possible, all matters affecting or likely to affect the environment as a result of the proposal.

Prepared by:

Signature



Name: Stephen Hanna
Position: Consultant – Environment
Company name: bd infrastructure
Date: 3 October 2025

Minor works REF reviewed by:

Signature



Name: Stuart Hill
Position: Principal – environment
Company name: bd infrastructure
Date: 3 October 2025

5.2 Environment and sustainability staff review

The minor works REF has been reviewed and considered against the requirements of sections 5.5 and 5.7 of the EP&A Act.

In considering the proposal this assessment has examined and taken into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of that activity as addressed in the minor works REF and associated information. This assessment is considered to be in accordance with the factors required to be considered under section 171 of the Environmental Planning and Assessment Regulation 2021.

The proposal described in this minor works REF will have some environmental impacts which can be ameliorated satisfactorily. Having regard to the safeguards and management measures proposed, this assessment has considered that these impacts are unlikely to be significant and therefore an approval for the proposal does not need to be sought under Division 5.2 of the EP&A Act.

The assessment has considered the potential impacts of the activity on areas of outstanding value and on threatened species, ecological communities or their habitats for both terrestrial and aquatic species as defined by the *Biodiversity Conservation Act 2016* and the *Fisheries Management Act 1994*.

The proposal described in the minor works REF will not affect areas of outstanding value. The activity described in the minor works REF will not significantly affect threatened species ecological communities or their habitats. Therefore, a species impact statement is not required.

The assessment has also addressed the potential impacts of the activity on matters of national environmental significance and any impacts on the environment of Commonwealth land and concluded that there will be no significant impacts. Therefore, there is no need for a referral to be made to the Australian Government Department of Climate Change, Energy, the Environment and Water for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the *Environment Protection and Biodiversity Conservation Act 1999*.

The minor works REF is considered to meet all relevant requirements.

5.3 Environment and Sustainability staff recommendation

It is recommended that the proposal to carry out slope remediation works of Slope 85716, located along the Central Coast Highway (HW30), west of Brisbane Water Drive at West Gosford as described in this minor works REF proceed subject to the implementation of all safeguards identified in the minor works REF and compliance with all other relevant statutory approvals, licences, permits and authorisations.

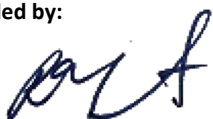
The minor works REF has examined and taken into account to the fullest extent possible all matters likely to affect the environment by reason of the activity in accordance with the EP&A Act, EP&A Regulation and the Guidelines approved under clause 170 of the EP&A Regulation. The minor works REF has established that the activity is not likely to significantly affect the environment or threatened species, ecological communities or their habitats.

The minor works REF has concluded that there will be no significant impacts on matters of national environmental significance or any impacts on the environment of Commonwealth land.

If the proposal has not commenced within two years of the determination date the SMES must be consulted to identify any new or updated assessment or approval requirements.

Recommended by:

Signature



Name: Renae Martin

Position: Environment & Sustainability Manager

Date: 8/10/2025

Noted by:

Signature



Name: David Crowley

Position: A/ Senior Project Manager

Date: 08/10/2025

5.4 Decision statement

In accordance with the above recommendation, I certify that I have reviewed and endorsed the contents of this minor works REF, and to the best of my knowledge, it is in accordance with the EP&A Act, the EP&A Regulation and the Guidelines approved under Section 170 of the EP&A Regulation, and the information is neither false nor misleading.

I determine that Transport for NSW may proceed with the activity.

Signature



Name: David Macgregor

Position: A / Senior Manager Project Services North

Date:

08/10/2025

5.5 EP&A Regulation publication requirement

Table 5-1: EP&A Regulation publication requirement

Requirement		
Does this minor works REF need to be published under section 171(4) of the EP&A Regulation?	Yes ☐	No ☒

6. Definitions

Table 6-1: Definitions

Term	Definition
AHIMS	Aboriginal Heritage Information Management System
BC Act	Biodiversity Conservation Act 2016 (NSW) (BC Act)
dBa	A-weighted decibels
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DPE	Department of Planning and Environment
EPA	Environmental Protection Agency
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)
EPL	Environmental Protection Licence
EP&A Act	Environmental Planning and Assessment Act 1979
ESD	Ecologically Sustainable Development
FM Act	Fisheries Management Act 1994
KFH	Key Fish Habitat
LEP	Local Environmental Plan
NML	Noise Management Level
NPW Act	National Parks and Wildlife Act 1974
OOHW	Out of hours works
PACHCI	Roads and Maritime Procedure for Aboriginal cultural heritage consultation and investigation
POEO Act	Protection of the Environment Operations Act 1997
REF	Review of environmental factors
ROL	Road Occupancy Licence
SEPP	State Environmental Planning Policy
TISEPP	State Environmental Planning Policy (Transport and Infrastructure) 2021
Transport	Transport for NSW

Appendix A: Consideration of State and Commonwealth environmental factors

Environmental Planning and Assessment Regulation 2021 section 171(2) factors

The following factors, listed in section 171(2) of the Environmental Planning and Assessment Regulation 2021, have been considered to assess the likely impacts of the proposal on the natural and built environment. This consideration is required to comply with sections 5.5 and 5.7 of the EP&A Act.

Table A1: Consideration of section 171 of the EP&A Regulation factors

Environmental factor	Impact
a) Any environmental impact on a community? The proposal would have a minor and short-term impact on the community, which is attributable to construction noise, lane closures, delays and construction related visual impacts. Safeguards have been proposed to address identified potential impacts. Over the long-term, the community would benefit from improved safety.	Negative (minor and short-term) Positive (long-term)
b) Any transformation of a locality? The proposal would result in some transformation of the locality in the short-term due to visual impacts associated with construction works. Over the longer term the proposal is unlikely to be noticeable in the broader motorway landscape.	Negative (minor and short-term)
c) Any environmental impact on the ecosystems of a locality? The proposal would have limited impact on ecosystems. Impacts on threatened species, communities and/or their habitats are discussed in Section 3.7. Significant impacts are not expected.	Negative (minor and short-term)
d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? The proposal would result in a minor reduction in the aesthetic value of the locality as a result of construction related activities.	Negative (minor and short-term)
e) Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations? Impacts on Aboriginal cultural heritage are not expected (refer to Section 3.5). The proposal would occur adjacent to two locally listed non-Aboriginal heritage items. Protection measures will be implemented to ensure these items are not impacted. There would be a short-term impact on the setting of Kendalls Glen' rock and memorial	Negative (minor and short-term)
f) Any impact on habitat of any protected animals (within the meaning of the <i>Biodiversity Conservation Act 2016</i>)? The proposal would result in the removal of hollow bearing trees. The proposed safeguards (including tree and hollow replacement) are considered adequate to minimise impacts on protected animals.	Negative (minor and short-term)
g) Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? The proposal would not endanger any species of animal, plant or other form of life. The proposal was assessed as not likely to have a significant impact on threatened species and communities. Refer to Section 3.7.	Nil
h) Any long-term effects on the environment? Over the longer term the proposal would improve safety for road users.	Positive (long-term)

Environmental factor	Impact
i) Any degradation of the quality of the environment? There would be potential for minor, short-term impacts on the quality of the environment including amenity (air quality and noise), visual and potential water quality impacts. Safeguards have been proposed to address the potential impacts.	Negative (minor short-term)
j) Any risk to the safety of the environment? The proposal would not result in a risk to the safety of the environment. Over the longer term the proposal would improve safety for road users.	Nil (short-term) Positive (long-term)
k) Any reduction in the range of beneficial uses of the environment? The proposal would not reduce the range of beneficial uses of the environment.	Nil
l) Any pollution of the environment? Minor, short-term risks to water quality would be present in the event of a spill or release of material from the work site during construction. Safeguards have been proposed to address the risk of water pollution. Any dust impacts would be highly localised and can be managed with the proposed safeguards.	Negative (minor short-term)
m) Any environmental problems associated with the disposal of waste? The proposal would result in some waste as noted in Section 3.11. Waste generated would be transported from the proposal footprint, tracked and disposed of at a licensed waste facility.	Nil
n) Any increased demands on resources, natural or otherwise which are, or are likely to become, in short supply? The proposal would not increase demand for resources which are likely to become in short supply.	Nil
o) Any cumulative environmental effect with other existing or likely future activities? Noting the relatively limited scale of the proposal and the absence of other nearby projects, no cumulative environmental effects as a result of existing or likely future activities have been identified.	Nil
p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions? The proposal would not influence coastal processes and/or coastal hazards.	Nil
q) Any impact on applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1? The nominated regional strategic plan is the Central Coast Regional Plan 2041. As the proposal is for the repair of an existing road, it does not directly align (but is not inconsistent with) with many of the directions in the Hunter Regional Plan. The proposal is however consistent with Direction 26: Deliver infrastructure to support growth and communities. The Central Coast Council Local Strategic Planning Statement (CCLSPS) identifies the key outcomes Council aims to achieve in relation to land uses, activities, land forms and built forms. The proposal supports the planning priorities identified in the CCLSPS for climate resilience.	Positive (short-term and long-term)
r) Any impact on other relevant environmental factors? In considering the potential impacts of this proposal all relevant environmental factors have been considered, refer to Chapter 3 of this assessment.	Nil

Matters of National Environmental Significance

Table A2: Matters of national environmental significance

Environmental factor	Impact
a) Any impact on a World Heritage property?	Nil
b) Any impact on a National Heritage place?	Nil
c) Any impact on a wetland of international importance (often called 'Ramsar' wetlands)?	Nil
d) Any impact on nationally threatened species, ecological communities or migratory species?	Not significant (See Section 3.7)
e) Any impact on a Commonwealth marine area?	Nil
f) Does the proposal involve a nuclear action (including uranium mining)?	Nil
Additionally, any impact (direct or indirect) on the environment of Commonwealth land?	Nil

Appendix B: Biodiversity assessment report

Kariong Hill Slope Stabilisation – HW30 Slope 85716

Biodiversity assessment report for
review of environmental factors (REF)
September 2025



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Executive summary

Introduction

BD Infrastructure, on behalf of Transport for New South Wales (TfNSW) engaged Coast Ecology to prepare a Biodiversity Assessment Report (BAR) for proposed slope remediation works at Kariong Hill HW30 (Slope 85716). The slope has shown signs of geotechnical displacement which was evident through the cracking and vertical displacement of the overlying road pavement and the distortion of the guardrail.

The proposal includes temporary closure of the westbound slow lane, removal of safety barriers, removal of vegetation and the installation of soil nails, subsurface drains and high tensile steel mesh followed by hydro mulching. Culvert remediation works are also proposed.

The proposal footprint occurs within the Sydney Basin IBRA region and both the Pittwater and Wyong sub-regions. The proposal footprint adjoins native bushland which is connected to Brisbane Water National Park to the south and west. The Mitchell Landscapes of the proposal footprint is Gosford - Cooranbong Coastal Slopes.

Survey effort for targeted threatened species potentially utilising the proposal footprint were restricted due to:

- Project timing constraints which limited seasonal and/or repeat surveys
- The requirement for traffic control and lane closures to access to proposal footprint
- Safety aspects associated with the steepness and general inaccessibility of the proposal footprint
- Heavy rainfall experienced during the first site visit.

Due to these restrictions, most of the threatened flora and fauna species with moderate likelihood of occurring, were assumed to be present as surveys could not determine presence or absence of a species.

Native vegetation

Two plant community types (PCTs) were identified within the proposal footprint which were equivalent to two vegetation zones:

- Vegetation zone 1 - PCT 3150 Hunter Coast Ranges Turpentine Wet Forest (0.36 ha)
- Vegetation zone 2 - PCT 3586 Northern Sydney Scribbly Gum Woodland (tree trimming only)

The vegetation integrity score for zone 1 was 67.3 (high condition) and for zone 2 was 49.1 (high condition).

Threatened species

Following habitat assessment and survey, the following 31 species listed under the *Biodiversity Conservation Act 2016* (BC Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) were either recorded or assumed present:

1. **Scrub Turpentine *Rhodamnia rubescens* CE (BC Act), CE (EPBC Act) - recorded**
2. Tranquility Mintbush *Prostanthera askania* E (BC Act), E (EPBC Act) – assumed present
3. Magenta Lilly Pilly *Syzygium paniculatum* E (BC Act), V (EPBC Act) – assumed present
4. Dusky Woodswallow *Artamus cyanopterus cyanopterus* V (BC Act) – assumed present
5. Bush Stone-curlew *Burhinus grallarius* E (BC Act) – assumed present
6. Gang-gang Cockatoo *Callocephalon fimbriatum* V (BC Act) – assumed present
7. South-eastern Glossy Black-Cockatoo *Calyptorhynchus lathami* V (BC Act) – assumed present
8. Brown Treecreeper (eastern subspecies) *Climacteris picumnus victoriae* V (BC Act) – assumed present
9. Varied Sittella *Daphoenositta chrysoptera* V (BC Act) – assumed present
10. Little Lorikeet *Glossopsitta pusilla* V (BC Act) – assumed present
11. Swift Parrot *Lathamus discolor* E (BC Act), CE (EPBC Act) – assumed present
12. Barking Owl *Ninox connivens* V (BC Act) – assumed present
13. Powerful Owl *Ninox strenua* V (BC Act) – assumed present

14. Masked Owl *Tyto novaehollandiae* V (BC Act) – assumed present
15. Eastern Pygmy-possum *Cercartetus nanus* V (BC Act) – assumed present
16. Large-eared Pied Bat *Chalinolobus dwyeri* V (BC Act), V (EPBC Act) – assumed present
17. Spotted-tailed Quoll *Dasyurus maculatus* V (BC Act), E (EPBC Act) – assumed present
18. Eastern False Pipistrelle *Falsistrellus tasmaniensis* V (BC Act) – assumed present
19. Parma Wallaby *Macropus parma* V (BC Act) – assumed present
20. Eastern Coastal Free tailed Bat *Micronomus norfolkensis* V (BC Act) – assumed present
21. Little Bentwing-bat *Miniopterus australis* V (BC Act) – assumed present
22. Large Bentwing-bat *Miniopterus orianae oceanensis* V (BC Act) – assumed present
23. Southern Greater Glider *Petauroides volans* E (BC Act), E (EPBC Act) – assumed present
24. Yellow-bellied Glider *Petaurus australis* V (BC Act), V (EPBC Act) – assumed present
25. Squirrel Glider *Petaurus norfolcensis* V (BC Act) – assumed present
26. Koala *Phascolarctos cinereus* (E BC Act, E EPBC Act) – assumed present
27. Northern long-nosed Potoroo *Potorous tridactylus tridactylus* V (BC Act), V (EPBC Act) – assumed present
28. Grey-headed Flying-fox *Pteropus poliocephalus* (V BC Act, V EPBC Act) – assumed foraging habitat
29. Yellow-bellied Sheath-tail-bat *Saccolaimus flaviventris* V (BC Act) – assumed present
30. Greater Broad-nosed Bat *Scoteanax rueppellii* V (BC Act) – assumed present
31. Eastern Cave Bat *Vespadelus troughtoni* V (BC Act) – assumed present

These 31 threatened species were assessed in accordance with the [Threatened Species Test of Significance Guidelines](#) and [EPBC Act Significant Impact Guidelines 1.1](#). The results of these assessments are summarised below.

Impact assessment

The assessment under the BC Act concluded that the proposal would impact 0.36 ha of potential habitat for 31 threatened flora and fauna species. The proposal would result in removal of three individual Scrub Turpentine *Rhodamnia rubescens* recorded in the proposal footprint. The proposal would reduce the existing thin strip of wildlife corridor from 34 m to 16 m however it would not result in fragmentation or isolation of habitat. The proposal requires removal of 115 trees, including numerous mature trees along the top of the slope and eight hollow bearing trees with approximately 20 hollows of varying size. These hollows provide potential habitat for 15 threatened species assumed to be present in the proposal footprint (i.e. Gang-gang Cockatoo, South-eastern Glossy Black-Cockatoo, Little Lorikeet, Barking Owl, Powerful Owl, Masked Owl, Eastern Pygmy-possum, Spotted-tailed Quoll, Eastern False Pipistrelle, Eastern Coastal Free tailed Bat, Southern Greater Glider, Yellow-bellied Glider, Squirrel Glider, Yellow-bellied Sheath-tail-bat and Greater Broad-nosed Bat). While the hollows are of suitable diameter for these hollow dependant species, it is noted that the proximity of the adjoining Central Coast Highway may reduce the utilisation rate of these hollows. There are also two culverts in the proposal footprint which provide potential roosting habitat for threatened microbats (i.e. Little Bentwing-bat and Large Bentwing-bat). These culverts may require works, and as such, it has been assumed that there would be impacts to microbat roosting habitat within the culverts.

There is potential for harm to hollow dependent fauna occupying a hollow at the time of clearing, and potential for harm to microbats utilising the culverts during culvert remediation works.

In addition, the proposal would contribute to two key threatening (KTPs) processes (clearing of native vegetation and the loss of hollow bearing trees) and potentially contribute to another two KTPs (the establishment of Myrtle Rust (which was observed on Scrub Turpentine *Rhodamnia rubescens* within the proposal footprint) and the spread of *Lantana camara*).

Despite the many negative environmental outcomes of the proposal, it is considered unlikely to have a significant impact on the long-term survival of a local population of a threatened species as the extent of clearing is relatively small (0.36 ha) and there is similar adjoining habitat, including hollow bearing trees and culverts, that would not be impacted and would continue to provide habitat for these threatened species. Mitigation measures have been provided to minimise direct impacts of the proposal on any threatened species considered likely to occur within the proposal footprint.

The assessment under the EPBC Act concluded that in regard to Tranquility Mintbush *Prostanthera askania*, Swift Parrot *Lathamus discolor*, Koala *Phascolarctos cinereus* and Southern Greater Glider *Petauroides volans*, the assumed populations

within the proposal footprint do not constitute a 'population' of these species as there have been no records of these species on or near to the proposal footprint and therefore it is unlikely to support a geographically distinct regional population or a population that occurs within a bioregion. No further assessment of impact to these endangered and critically endangered species is required.

In relation to Magenta Lilly Pilly *Syzygium paniculatum*, Large-eared Pied Bat *Chalinolobus dwyeri*, Grey-headed Flying-fox *Pteropus poliocephalus*, Yellow-bellied Glider *Petaurus australis* and Northern long-nosed Potoroo *Potorous tridactylus*, the proposal footprint does not support an 'important population' of these species as it does not constitute a key source population for breeding or dispersal, is not a population necessary for maintaining genetic diversity, and is not a population that is near the limit of the species range. As such, no further assessment of impact to these vulnerably listed threatened species is required.

The proposal footprint may support a 'population of a species' of the endangered Spotted-tailed Quoll *Dasyurus maculatus* and is known to provide habitat to the critically endangered Scrub Turpentine *Rhodamnia rubescens*, however assessment of impact determined that the proposal was unlikely to have a significant impact on these species as the proposal would not lead to a long term decrease in the size of the population, significantly reduce the area of occupancy, fragment an existing population, affect habitat critical to their survival, disrupt the breeding cycle or interfere with the recovery of these species. The proposal would impact 0.36 ha of potential habitat, including nesting and denning habitat for the Spotted-tailed Quoll, however this is a relatively small area, and large areas of suitable nearby habitat would remain as habitat for this species. It may also result increased impacts to *Rhodamnia rubescens* from invasive species such as *Lantana camera* and potentially facilitate the further spread of Myrtle Rust into nearby *Rhodamnia rubescens* populations that are recorded on BioNet as occurring downslope of the proposal footprint. Mitigation measures have been included to minimise any direct impacts on these species.

The proposal does not require referral to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) for impacts on MNES.

Impact avoidance and minimisation

In addition to standard Transport mitigation measures are the following recommendations:

Native vegetation - Disturbed areas that are not stabilised using shotcrete are to be stabilised using mulch from trees cleared from the proposal footprint and/or vegetation (native ground cover) following completion of works.

Threatened flora – The three Scrub Turpentine *Rhodamnia rubescens* identified in the proposal footprint are located near the lower boundary of the proposal footprint. If detailed design determines that these three individuals can be avoided, they are to be fenced *in-situ*. They are currently marked with pink flagging tape.

Fauna habitat - Hollow bearing trees identified within the proposal footprint are located on the edge of the Central Coast Highway, and on the top of a steep slope. As such, direct inspection prior to clearing may not be possible due to safety issues. Hollow bearing trees that require removal are to be felled at night (to avoid direct impacts to nocturnal hollow dependent fauna potentially utilising the hollows) and inspected by the tree lopper using a burrow scope, under the supervision of an ecologist. Alternatively, the hollow can be plugged (using a towel) and the hollow section can be cut and lowered to the ground for inspection. Works on the culverts are to be undertaken at night to avoid direct impacts on microbats potentially utilising the culverts for roosting. Alternatively, bat exclusion covers are to be placed over the culvert inlet and outlet after dark and prior to the commencement of works. Once the works have been completed for the day, the bat exclusion covers are to be re-installed to ensure the bats are unable to enter the culverts outside of works being undertaken.

Koala feed trees (Grey Gum *Eucalyptus punctata*) located at the proposed site compound option 2, are to be inspected by an ecologist during pre-clearing surveys, prior to any tree trimming to ensure no occupation by koalas.

Any injured fauna is to be taken to the nearest vet or wildlife carer.

Pests and pathogens – Hygiene protocols detailed in the mitigation measures are to be implemented to reduce the spread of Myrtle Rust. In addition, it is recommended that revegetation be undertaken in the retained strip of bushland to reduce the spread of exotics downslope where there are BioNet records of Scrub Turpentine *Rhodamnia rubescens*.

Offsetting

The proposal does not trigger the biodiversity offset scheme as no threatened species would be significantly impacted, nor does it trigger Transport's Biodiversity Policy as no TEC would be cleared, clearing of threatened fauna habitat is < 1 ha and there are < 10 threatened plants being impacted by the proposal.

Tree and hollow replacement guidelines apply to this proposal and the removal of approximately 115 trees and twenty hollows require offsetting. The clearing limit may vary from the proposal footprint assessed. As such, accurate counts of trees and hollows to be removed should be undertaken during pre-clearing surveys.

1. Introduction

1.1 Proposal background

BD Infrastructure, on behalf of Transport for New South Wales (TfNSW) engaged Coast Ecology to prepare a Biodiversity Assessment Report (BAR) for proposed slope remediation works at Kariong Hill HW30 (Slope 85716) on the westbound carriageway of the Central Coast Highway before it joins the M1 Motorway.

The proposal footprint is within the Central Coast Council local government area (LGA), in the Sydney Basin Interim Biogeographic Regionalisation for Australia (IBRA) region and both the Pittwater and Wyong sub-region. The proposal footprint adjoins native bushland which is connected to Brisbane Water National Park to the south and west. The Mitchell Landscapes of the proposal footprint is Gosford Cooranbong Coastal Slopes (Figure 1-1).

1.2 The proposal

Transport proposes to carry out remediation works for a downhill slope, known as Slope 85716, located at Kariong Hill on the westbound Central Coast Highway (HW30), west of Brisbane Water Drive at West Gosford (the proposal). The slope has shown signs of geotechnical displacement which was evident through the cracking and vertical displacement of the overlying road pavement and the distortion of the guardrail.

The proposal footprint is shown in Figure 1-2.

The key features of the proposal include:

- Site compound establishment
- Combination of full time 24/7 lane closure with concrete barriers (worst case scenario) and temporary closure as required or warranted (if traffic impacts need to be mitigated)
- Removal of vegetation from the downhill slope
- Installation of hollow bar soil nails (six rows, two metre horizontal spacing, three metre vertical spacing along slope angle – subject to further design refinement)
- Installation of single row (in between the last two rows of soil nail) of horizontal subsurface drains with a nominal length of 5 metres)
- Placement of erosion control mat then high tensile steel mesh over the soil nailed slope, with hydroseed and hydromulch immediately below the mesh
- Culvert remediation works, most likely to comprise a cured-in-place-pipe fibreglass reinforced lining system which is cured using ultra-violet light. This would be supported by outlet protection measures such as scour protection i.e. rock placement downstream of both culverts identified for rehabilitation
- Reinstatement of safety barriers.

1.2.1 Assessment areas

The **proposal footprint** includes all areas impacted by construction works, including all vegetation from the slope face, and up to 3 metres from the top of the crest, along with two laydown areas (Figure 1-2).

The **landscape area** is a 500 m buffer around the proposal footprint and is used in the calculation of native vegetation cover required by the BAM calculator (BAM-C).

The **locality** includes a 10 km radius centred on the middle proposal footprint and was used for threatened species database searches (Figure 1-1).

The proposal locality is shown on Figure 1-1 and the proposal footprint is shown in Figure 1-2.

1.3 Legislative context

A Review of Environmental Factors (REF) is prepared to satisfy Transport for NSW (Transport) duties under s.5.5 of the EP&A Act to “*examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity*” and s.5.5 in making decisions on the likely significance of any environmental impacts. This biodiversity impact assessment forms part of the REF being prepared for the proposed slope remediation and assesses the biodiversity impacts of the proposal to meet the requirements of the EP&A Act.

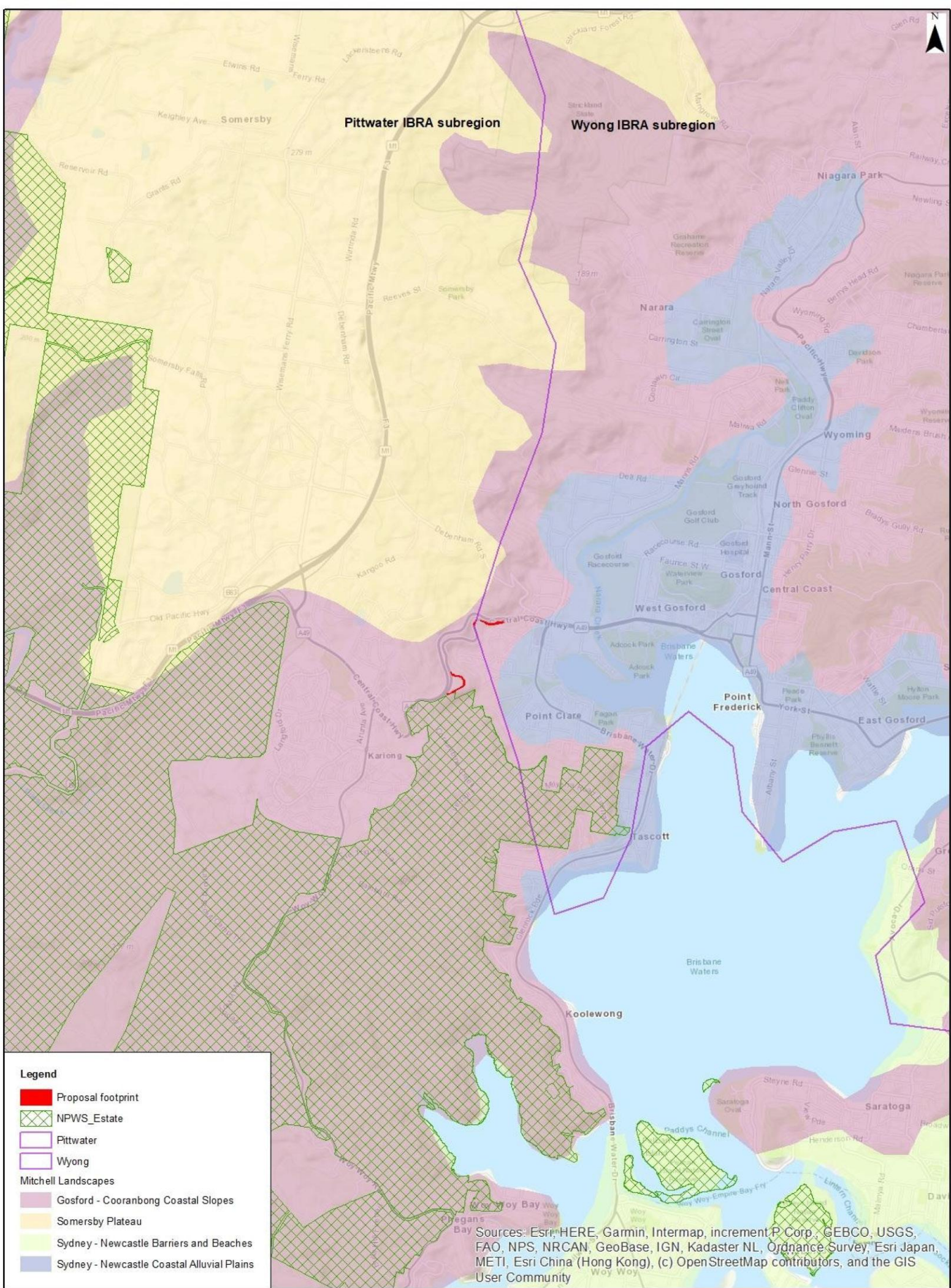
The *Biodiversity Conservation Act 2016* (BC Act) requires that the significance of the impact on threatened species, populations and threatened ecological communities is assessed using the test listed in Section 7.3 of the BC Act. Similarly, Part 7A of the *Fisheries Management Act 1994* (FM Act) requires that significance assessments are undertaken in accordance with Division 12 of the FM Act. Where a significant impact is likely to occur, a species impact statement (SIS) must be prepared in accordance with the Environment Agency Head’s requirements, or a biodiversity development assessment report (BDAR) must be prepared by an accredited assessor in accordance with the biodiversity assessment method (BAM) (DPIE 2020a).

In September 2015, a ‘strategic assessment’ approval was granted by the Federal Minister in accordance with the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The approval applies to TfNSW road activities being assessed under Division 5.1 (formerly Part 5) of the EP&A Act with respect to potential impacts on nationally listed threatened species, ecological communities and migratory species.

As a result, TfNSW road proposals assessed via an REF:

- Must address and consider potential impacts on EPBC Act listed threatened species, populations, ecological communities and migratory species, including application of the “avoid, minimise, mitigate and offset” hierarchy
- Do not require referral to the Commonwealth Department of Climate Change, Energy, the Environment and Water (Cth DCCEEW) for these matters, even if the activity is likely to have a significant impact
- Must use the Biodiversity Assessment Method (BAM) to calculate credits that would offset significant impacts on EPBC Act listed threatened species, populations, ecological communities and migratory species.

Assessments of impact significance are required for all relevant biodiversity values in accordance with the *Matters of National Environmental Significance: Significant impact guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999* (DoE 2013).





- Legend**
- Proposal footprint
 - Culvert inlets
 - Site compound option 1
 - Site compound option 2

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

2. Methods

2.1 Personnel

The contributor to the preparation of this report, their qualifications and roles are provided in Table 2-1.

Table 2-1: Personnel

Name	Role	Qualifications
Dr Kristy McQueen	Principal Ecologist – Field survey, report preparation, data management, map preparation, data entry and interpretation of the BAM C.	– Doctor of Philosophy (PhD), University of Newcastle – Bachelor of Science and Mathematics – biological oceanography (1st class hon), University of NSW – Accredited BAM assessor BAAS 18068 – Advanced Plant Identification, University of NSW and Australian Museum – Australian River Assessment System (AusRivAS) Accreditation, University of Canberra – Native Plant Identification, Ryde TAFE

2.2 Background research

The aim of the background research is to review information on the presence or likelihood of occurrence of:

- Threatened terrestrial and aquatic species and their habitat
- Threatened ecological communities
- Important habitat for migratory species
- Areas of outstanding biodiversity value.

These results informed the identification of appropriate field survey effort and the groups likely to occur.

Records of threatened species, populations and ecological communities known or predicted to occur in the locality of the proposal were obtained from a range of databases as detailed in Table 2-2.

A 10 km radius search area was used for database searches (locality) and preliminary listings under the BC Act and the EPBC Act were considered. Threatened flora and fauna records from the locality Bionet Atlas database search are shown on Figure 2-4 and Figure 2-5.

Table 2-2: Database searches undertaken

Database	Search date	Area searched	Reference
Bionet Atlas of NSW Wildlife	16/08/25	10 km x 10 km (North: -33.34 West: 151.20 East: 151.42 South: -33.52) Records < 10 years for fauna, all years for flora	NSW Department of Planning and Environment, https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-bionet
BioNet Vegetation Classification database	16/08/25	Landscape assessment area	NSW Department of Planning and Environment, https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-bionet

Database	Search date	Area searched	Reference
BAM calculator (BAM-C)	16/08/25	Locality	Biodiversity Accredited Assessor System (BAAS) https://customer.lmbc.nsw.gov.au/assessment/s/userlogin?startURL=%2Fassessment%2Fs%2F
Protected Matters Search Tool – searched	19/08/25	10 km radius Filtered Presence - known	Department of Climate Change, Energy, the Environment and Water (DCCEEW) https://www.dcceew.gov.au/environment/epbc/protected-matters-search-tool
SEED Intersection Tool	16/08/25	Landscape assessment area	The Central Resource for Sharing and Enabling Environmental Data in NSW https://geo.seed.nsw.gov.au/Public_Viewer/index.html?viewer=Public_Viewer&locale=en-AU
Fisheries Spatial Data Portal for: - Key Fish Habitat - Threatened aquatic species distributions - Coastal management areas identified by the Resilience and Hazards SEPP 2022	16/08/25	Locality	NSW DPI https://webmap.industry.nsw.gov.au/Html5Viewer/index.html?viewer=Fishes_Data_Portal
State Vegetation Type Map	16/08/25	Revised Plant Community type (PCT) classifications for eastern NSW (coast and tablelands bioregions)	NSW DPE Current Release C1.1.M1.1 (December 2022) https://datasets.seed.nsw.gov.au/dataset/nsw-state-vegetation-type-map
Commonwealth Atlas of Groundwater Dependent Ecosystems (GDE)	16/08/25	Locality	Bureau of Meteorology GDE Atlas Map: Water Information: Bureau of Meteorology (bom.gov.au)
National Flying-fox monitoring viewer	16/08/25	Locality	Department of Agriculture, Water and the Environment https://www.environment.gov.au/web-gis-framework/apps/ffc-wide/ffc-wide.jsf

2.3 Vegetation assessment

Vegetation survey and assessment was completed in accordance with the BAM (DIPIE 2020a), including the calculation of vegetation integrity (VI) score.

Revised Plant Community type (PCT) classifications for eastern NSW (coast and tablelands bioregions) have been used.

2.3.1 Vegetation mapping

Native vegetation is defined as follows (section 1.6 of the BC Act and Part 5A 60B of the LLS Act):

- (1) For the purposes of this Part, **native vegetation** means any of the following types of plants native to New South Wales—
- (a) trees (including any sapling or shrub or any scrub),
 - (b) understorey plants,

(c) *groundcover (being any type of herbaceous vegetation),*

(d) *plants occurring in a wetland.*

(2) *A plant is native to New South Wales if it was established in New South Wales before European settlement. The regulations may authorise conclusive presumptions to be made of the species of plants native to New South Wales by adopting any relevant classification in an official database of plants that is publicly accessible.*

(3) *For the purposes of this Part, native vegetation extends to a plant that is dead or that is not native to New South Wales if—*

(a) *the plant is situated on land that is shown on the native vegetation regulatory map as category 2-vulnerable regulated land, and*

(b) *it would be native vegetation for the purposes of this Part if it were native to New South Wales.*

Vegetation that does not meet this definition is defined as disturbed.

The NSW State Vegetation Type Map was used to inform the plot-based survey effort prior to field surveys and inform the habitat assessment by identifying threatened species associated with mapped PCTs (Figure 2-1). The State Vegetation Mapping (Figure 2-1) defined the proposal footprint as:

- PCT 3150 Hunter Coast Ranges Turpentine Wet Forest
- PCT 3621 Sydney Hinterland Turpentine-Apple Gully Forest.



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend				
	Proposal footprint	 3029, Lower North Wet Gully Palm Rainforest	 3238, Hunter Range Colluvial Apple-Gum Forest	 3621, Sydney Hinterland Turpentine-Apple Gully Forest
	Landscape Assessment Area	 3150, Hunter Coast Ranges Turpentine Wet Forest	 3586, Northern Sydney Scribbly Gum Woodland	 4020, Coastal Creekflat Layered Grass-Sedge Swamp Forest
		 3230, Central Coast Escarpment Moist Forest	 3593, Sydney Coastal Sandstone Bloodwood Shrub Forest	

2.3.2 Vegetation survey and classification

This section provides detail on the method of vegetation identification (i.e., PCTs and TECs), assessment of vegetation zones and plot-based survey undertaken in accordance with the BAM (DPIE 2020a).

Field surveys were undertaken within the study area on 22/08/25 and 26/08/25, using the following techniques:

Parallel field traverses/Random meander

The parallel field traverse is the preferred method for detecting threatened plant species (DPIE, 2020c). This technique involves searching along a grid of parallel traverses a set distance apart across areas of suitable habitat for each target threatened plant species. The study area was narrow and difficult to access and as such, a random meander approach was more suited for surveys. Random meander surveys are a variation of the transect type survey and were completed in accordance with the technique described by (Cropper, 1993), whereby the recorder walks in a random meander throughout the study area recording dominant and key plant species (e.g. flora species list, threatened species, priority weeds), boundaries between various vegetation communities and condition of vegetation.

Vegetation zones

Two PCTs were recorded within the proposal footprint, each having a consistent condition across the PCT, therefore two vegetation zones were identified.

Field Verification of Vegetation Mapping

Field validation (ground-truthing) of the existing vegetation classifications was completed based on random meander surveys and BAM vegetation integrity plots. Field verification was undertaken to confirm the vegetation structure, dominant canopy species, native diversity, condition and presence of threatened ecological communities. Field verification of the vegetation type, class and formation were used to identify vegetation zones and conditions in accordance with the BAM and NSW BioNet Vegetation Classification Database (DPE, 2020a).

Plot based vegetation survey

Plot-based full floristic surveys were completed within the proposal footprint in accordance with subsection 4.3.4 of the BAM as described below and illustrated in Figure 2-2. Each of the vegetation zones were less than 2 ha in size, therefore the minimum number of plots required is two plots (Figure 2-3).

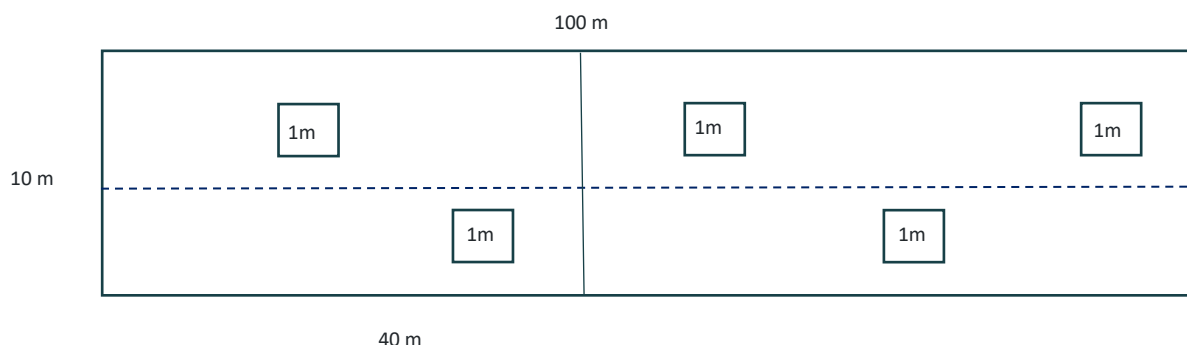


Figure 2-2: Schematic diagram illustrating the layout of quadrates used for the assessment of condition attributes.

The following site attributes were recorded at each site:

- **Location:** (easting – northing grid type MGA 94, Zone 56),
- **Native and exotic species richness:** (within a 400 m² quadrat): This consisted of recording all species by systematically walking through each 20 x 20 m quadrat. The cover and abundance (percentage of area of quadrat covered) of each species was estimated. The growth form, stratum/layer and whether each species was native/exotic/high threat weed was also recorded,
- **Number of trees with hollows:** (1,000 m² quadrat): This was the frequency of hollows within living and dead trees within each 50 x 20 m quadrat. A hollow was only recorded if (a) the entrance could be seen: (b) the estimated entrance width was at least 5 cm across: (c) the hollow appeared to have depth: (d) the hollow was at least 1 m above the ground and (e) the centre of the tree was located within the sampled quadrat,
- **Number of large trees and stem size diversity:** (1,000 m² quadrat): tree stem size diversity was recorded by measuring the diameter at breast height (DBH) (i.e.1.3 m from the ground) of living trees (>5 cm DBH) within each 50 x 20 m quadrat. For multi-stemmed living trees, only the largest stem was included in the count. Number of large trees was determined by counting all trees with DBH greater than the DBH large trees for each vegetation formation,
- **Evaluation of regeneration:** This was estimated as the presence/absence of overstorey species present at the site that was regenerating (i.e. saplings with a diameter at breast height ≤5 cm),
- **Total length of fallen logs:** (1,000 m² quadrat): This was the cumulative total of logs within each 50 x 20 m quadrat with a diameter of at least 10 cm and a length of at least 0.5 m, and
- **Litter cover:** This comprised estimating the average percentage groundcover of litter (i.e. leaves, seeds, twigs, branchlets and branches with a diameter <10 cm which is detached from a living plant) from within five 1 x 1 m sub-plots spaced evenly either side of the 100 m central transect.

Table 2-3: Minimum number of plots completed per vegetation zone

Veg zone	PCT	Condition	Area (ha)	No. plots required	No. plots completed (plot IDs)
1	PCT 3150	High	0.36	1	1
2	PCT 3621	High	0.1	1	1

Patch size

Patch size was calculated in ArcGIS using NSW State Vegetation Type mapping in accordance with the BAM. The patch size is the area of native vegetation that occurs in the proposal footprint and includes adjoining native vegetation that has a gap of less than 100 m from the next area of native vegetation (the patch may extend onto land adjoining the proposal footprint). The patch included native vegetation within the 500 m buffer landscape area, which was not separated by more than 100 m. It was calculated as 66 ha.

Native vegetation cover

Native vegetation cover was calculated in ArcGIS using NSW State Vegetation Type mapping in accordance with the BAM. The area of all native vegetation polygons within the 500 m buffer landscape area were combined to determine the total area of native vegetation cover (Table 2-4).

Table 2-4: Native vegetation cover in the assessment area

Assessment area (ha)	99 ha
Total area of native vegetation cover (ha)	66.7 ha
Percentage of native vegetation cover (%)	67%
Class (0-10, >10-30, >30-70 or >70%)	>30-70 %

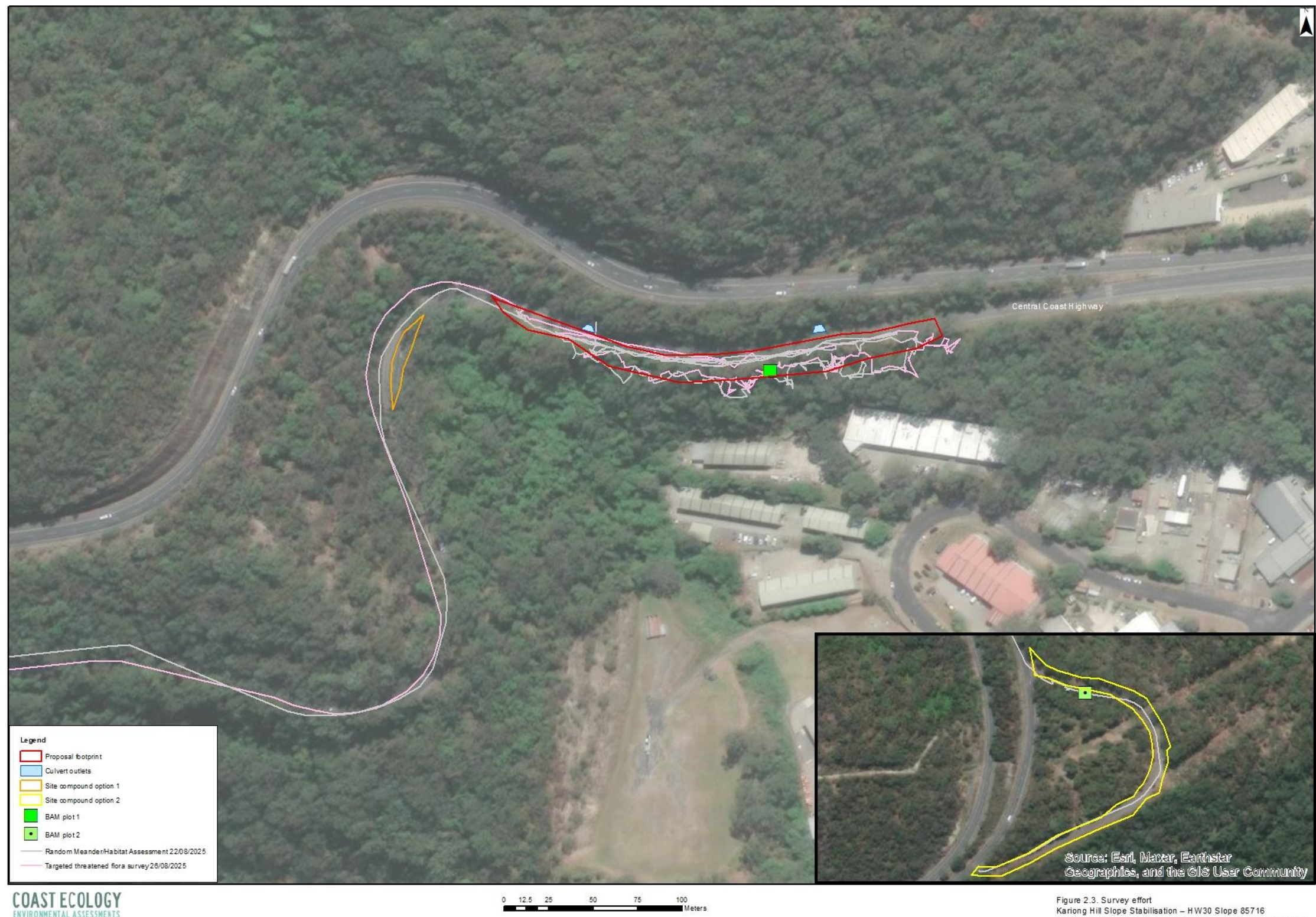


Figure 2.3. Survey effort
 Kariong Hill Slope Stabilisation – HW30 Slope 85716
 BD Infrastructure (for TfNSW) Job No. 241028 Date. 26/09/25

2.4 Threatened species assessment

Threatened species assessment has been undertaken in accordance with Chapter 5 of the BAM. Targeted surveys for species-credit species were conducted in accordance with the relevant BAM guidelines and/or information provided in the threatened biodiversity data collection (TBDC) for each species (i.e., the 'threatened biodiversity' tab of [NSW BioNet | NSW Environment and Heritage](#) and [Threatened biodiversity profile search | NSW Environment, Energy and Science](#)). Where targeted surveys for species credit species were not undertaken, the species was assumed present and assessed accordingly (i.e., using the [Threatened Species Test of Significance Guidelines](#) and [EPBC Act Significant Impact Guidelines 1.1 \(where applicable\)](#)). Targeted surveys were not undertaken for ecosystem-credits species (unless they were dual-credit species where breeding habitat was identified). However, the impacts of the proposal on non-breeding habitat is considered using the [Threatened Species Test of Significance Guidelines](#). For ecosystem credit species listed under the EPBC Act, the [EPBC Act Significant Impact Guidelines 1.1](#) were used to assess impact on non-breeding habitat.

2.4.1 Habitat suitability assessment

A habitat suitability assessment was undertaken for each threatened and/or migratory species identified from the background searches, to assess the likelihood that they occur in the proposal footprint (Appendix B). This required identifying the likely occurrence of threatened biodiversity based on the presence, condition and type of habitat and previous records, using the likelihood of occurrence criteria provided in Appendix B. It also included consideration of age, currency and location of nearby records, presence of key habitat features/constraints and information about species populations in the area. A species was considered likely to occur where:

- The geographic distribution of the species is known or predicted to include the IBRA subregion in which the proposal footprint is located; and
- The proposal footprint contains habitat features associated with the species; or
- Past surveys undertaken at the proposal footprint indicate that the species is present.

The habitat suitability assessment was undertaken following an initial survey of the proposal footprint to identify habitat features of the site and was used to determine if targeted surveys were required for species-credit species. Habitat assessment surveys targeted the identification of any 'habitat constraints' for each candidate species as defined by the BAM-C and TBDC (e.g., specific sized hollow-bearing trees, large stick nests, caves, tunnels, culverts etc.). Threatened species with moderate or higher likelihood of occurrence were subject to further assessment.

2.4.2 Targeted flora surveys

Desktop assessment identified 22 threatened flora species (Appendix B; Figure 2-4), of which seven were considered to have moderate to high likelihood of occurrence in the proposal footprint. This section of the report details the surveys undertaken for these seven threatened flora species. The survey effort and timing are provided in Table 2-5. The weather at the time of surveys was overcast with some showers on the 22/08/25 and mostly fine with mild temperatures and moderate winds on the 26/08/25. Surveys were undertaken at the end of a third consecutive La Niña, following above average rainfall in eastern NSW, and as such was not in a state of drought.

Surveys were undertaken in accordance with recommended survey guides including:

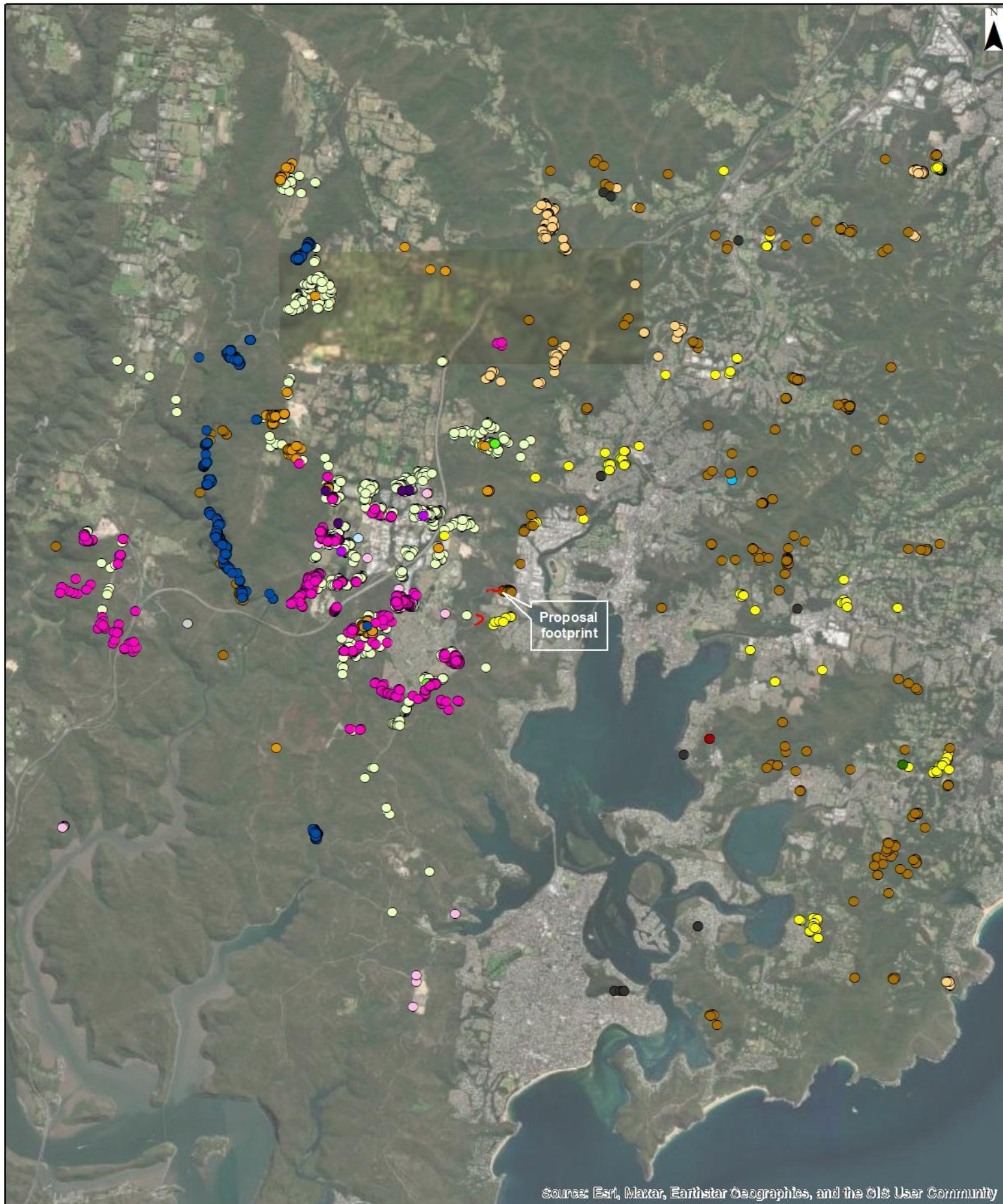
- DPIE (2020c), [Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method](#).

Table 2-5: Targeted threatened flora survey details

Scientific Name	State status	Comm status	Survey period	Minimum survey requirement	Associated PCT	Survey completed?
<i>Epacris purpurascens</i> var. <i>purpurascens</i>	V		Sept-Oct	Use flowers to identify, as easily confused with <i>E. pulchella</i> and <i>Woollsia</i> . Flowering peak Sep - Oct, but flowers sporadically throughout the year. Requires a voucher specimen RBG. Parallel field traverses (20 metres apart in open vegetation, 10 m apart in dense vegetation; DPIE, 2020c).	PCT 3150 PCT 3586	No Survey conducted 22/08/25 & 26/08/25 which is outside of the required period.
<i>Grammitis stenophylla</i> Narrow-leaf Finger Fern	E		All year	Survey after significant rainfall event. Species is difficult to detect after long dry periods. Parallel field traverses (10 metres apart in open vegetation, 5 m apart in dense vegetation; DPIE, 2020c).	PCT 3150 PCT 3586	Yes Surveys were conducted following prolonged, heavy rainfall.
<i>Melaleuca biconvexa</i> Biconvex Paperbark	V,P	V	All year	Parallel field traverses (20 metres apart in open vegetation, 10 m apart in dense vegetation; DPIE, 2020c).	PCT 3150	Yes
<i>Prostanthera askania</i> Tranquillity Mintbush	E	E	Sep-Nov	Use flowers to locate. Identify species by leaf traits to distinguish from most other co-occurring species. <i>P. incisa</i> is similar in appearance, but can be separated by leaf size and indumentum. Parallel field traverses (15 metres apart in open vegetation, 10 m apart in dense vegetation; DPIE, 2020c).	PCT 3150	No Survey conducted 22/08/25 & 26/08/25 which is outside of the required period.
<i>Rhodamnia rubescens</i> Scrub Turpentine	CE	CE	All year	Parallel field traverses (15 metres apart in open vegetation, 10 m apart in dense vegetation; DPIE, 2020c).	PCT 3150	Yes
<i>Rhodomyrtus psidioides</i> Native Guava	CE	CE	All year	Parallel field traverses (15 metres apart in open vegetation, 10 m apart in dense vegetation; DPIE, 2020c).	PCT 3150 PCT 3586	Yes
<i>Syzygium paniculatum</i> Magenta Lilly Pilly	E	V	Apr-Jun	Use fruit to identify. Samples need to be verified by RBG to detect hybridisation. Parallel field traverses (20 metres apart in open vegetation, 10 m apart in	PCT 3150	No Survey conducted 22/08/25 & 26/08/25 which is outside of the required period to

Scientific Name	State status	Comm status	Survey period	Minimum survey requirement	Associated PCT	Survey completed?
				dense vegetation; DPIE, 2020c).		distinguish species based on fruit. <i>Acmena smithii</i> was recorded which can be difficult to distinguish from the threatened <i>S. paniculatum</i> .
<i>Tetratheca glandulosa</i>	V		Aug-Nov	Use flowers to locate. Occasionally flowers in Jul. Survey Aug - Nov. Parallel field traverses (10 metres apart in open vegetation, 5 m apart in dense vegetation; DPIE, 2020c).	PCT 3586	Yes Survey conducted 22/08/25 & 26/08/25.

V = Vulnerable, E = Endangered



Legend

■ Proposal footprint

Threatened flora

● Callistemon linearifolius

● Darwinia glaucophylla

● Epacris purpurascens var. purpurascens

● Eucalyptus camfieldii

● Eucalyptus nicholii

● Grammitis stenophylla

● Grevillea shiressii

● Hibbertia procumbens

● Hibbertia puberula

● Macadamia tetraphylla

● Melaleuca biconvexa

● Prostanthera askania

● Prostanthera junonis

● Rhodamnia rubescens

● Rhodomyrtus psidioides

● Syzygium paniculatum

● Tetratheca glandulosa

2.4.3 Targeted fauna surveys

Fauna Habitat Assessment

Fauna habitat assessments were undertaken to assess the likelihood of threatened fauna occurring within the proposal footprint. Desktop assessment identified 74 threatened fauna species and 15 migratory species (Appendix B; Figure 2-5), of which 39 (18 birds, 18 mammals and 3 amphibians) were considered to have moderate to high likelihood of occurrence in the proposal footprint based on fauna habitat assessments. The survey effort and timing for these 39 species are provided in Table 2-6.

Fauna habitat characteristics assessed included:

- Structure and floristics of the canopy, understorey and ground vegetation, including the presence of flowering and fruiting trees providing potential foraging resources
- Presence of hollow-bearing trees providing roosting and breeding habitat for arboreal mammals, birds and reptiles
- Presence of old growth trees and or live or dead emergent trees suitable for bird (raptor) nesting
- Presence of large stick nests
- Presence of Allocasuarina or casuarina species or occupied nests (Gang gang cockatoo and Glossy black cockatoo)
- Presence of Flying Fox roost/breeding camps
- Presence of the ground cover vegetation, leaf litter, caves, rock outcrops and fallen timber and potential to provide protection for ground-dwelling mammals, reptiles, microbats and amphibians
- Presence of waterways (ephemeral or permanent) and water bodies
- Presence of caves, cliffs, crevices, culverts, tunnels and/or mines for microbat roosting.

A hand-held Garmin GPS was used to record locations of habitat features.

The following criteria were used to evaluate the condition of habitat values:

Good: A full range of fauna habitat components are usually present (for example, old-growth trees, fallen timber, feeding and roosting resources) and habitat linkages to other remnant ecosystems in the landscape are intact;

Moderate: Some fauna habitat components are missing or greatly reduced (for example, old-growth trees and fallen timber), although linkages with other remnant habitats in the landscape are usually intact, but sometimes degraded; and

Low: Many fauna habitat elements in low quality remnants have been lost, including old growth trees (for example, due to past timber harvesting or land clearing) and fallen timber, and tree canopies are often highly fragmented. Habitat linkages with other remnant ecosystems in the landscape have usually been severely compromised by extensive clearing.

The following survey guidelines were adhered to:

NSW survey guidelines:

- Department of Environment and Climate Change (2009) Threatened species survey and assessment guidelines: field survey methods for fauna. Amphibians. (nsw.gov.au).
- OEH (2018), 'Species credit' threatened bats and their habitats: NSW survey guide for the Biodiversity Assessment Method.
- DPIE (2020b), NSW Survey Guide for Threatened Frogs - A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method.
- DPE (2022b), Koala (Phascolarctos cinereus): Biodiversity Assessment Method Survey Guide | NSW Environment and Heritage
- Department of Environment and Conservation Threatened biodiversity survey and assessment - Guidelines for developments and activities (2004 working draft).

Commonwealth survey guidelines (on the DCCEEW website):

- Commonwealth of Australia (2010a), Survey Guidelines for Australia's Threatened Bats.

- [Commonwealth of Australia \(2010b\), Survey Guidelines for Australia's Threatened Birds.](#)
- [Commonwealth of Australia \(2011b\), Survey Guidelines for Australia's Threatened Mammals.](#)

Opportunistic Sightings

Opportunistic sightings of animals were recorded including diurnal birds. Evidence of animal activity such as scats, diggings, scratch marks, nests / dreys, burrows etc., was also noted where present. This provided indirect information on animal presence and activity.

No targeted surveys were undertaken for birds as most bird surveys are best undertaken at dawn or dusk however there was no access to the proposal footprint at these times.

Microbat surveys were not undertaken as surveys were conducted outside of the required survey period of these threatened species. CCTV footage of the culvert recorded on 22/08/25 by interflow was reviewed.

Mammal surveys using trapping techniques and repeat amphibian surveys were not conducted as access to the site was limited and repeat surveys was not practical due to lane closure requirements.

Habitat assessments were however undertaken for all threatened species with habitat constraints or specific habitat requirements.

Table 2-6: Targeted threatened fauna survey details

Scientific Name	State status	Comm status	Survey period	Minimum survey requirement	Associated PCT	Survey completed?
<i>Birds</i>						
<i>Artamus cyanopterus cyanopterus</i> Dusky Woodswallow	V,P		All year	Area search < 1 ha = 20 minutes at dawn or dusk	PCT 3150 PCT 3586	No Survey conducted 22/08/25 & 26/08/25 however they were not conducted at dawn or dusk.
<i>Burhinus grallarius</i> Bush Stone-curlew	E1,P		All year	Fallen/standing dead timber logs required habitat.	PCT 3150 PCT 3586	No Survey conducted 22/08/25 & 26/08/25 however they were not conducted at dawn or dusk.
<i>Callocephalon fimbriatum</i> Gang-gang Cockatoo	V,P,3		Oct - Jan	Habitat assessment to determine hollow bearing trees at least 3 m above the ground and with hollow diameter of 7 cm or larger.	PCT 3150 PCT 3586	No Suitable habitat present however survey was conducted 22/08/25 & 26/08/25 which is outside of the required survey period.
<i>Calyptorhynchus lathamii</i> South-eastern Glossy Black-Cockatoo	V,P,2		Jan - Sept	Habitat assessment to determine presence of Allocasuarina and casuarina species and hollow bearing trees > 15cm diameter and > than 8m above ground Area search < 1 ha = 20 minutes at dawn or dusk	PCT 3150 PCT 3586	No Suitable habitat present however surveys were not conducted at dawn or dusk.
<i>Climacteris picumnus victoriae</i> Brown Treecreeper (eastern subspecies)	V,P		All year	Area search < 1 ha = 20 minutes at dawn or dusk	PCT 3150 PCT 3586	No Survey conducted 22/08/25 & 26/08/25 however they were not conducted at dawn or dusk.
<i>Daphoenositta chrysoptera</i> Varied Sittella	V,P		All year	Area search < 1 ha = 20 minutes at dawn or dusk	PCT 3150 PCT 3586	No Survey conducted 22/08/25 & 26/08/25 however they were not conducted at dawn or dusk.
<i>Glossopsitta pusilla</i> Little Lorikeet	V,P		All year	Area search < 1 ha = 20 minutes at dawn or dusk	PCT 3150 PCT 3586	No Survey conducted 22/08/25 & 26/08/25 however they were not conducted at dawn or dusk.
<i>Haliaeetus leucogaster</i>	V, P	C	July - Dec	Habitat assessment to detect large stick nests	PCT 3150	Yes

Scientific Name	State status	Comm status	Survey period	Minimum survey requirement	Associated PCT	Survey completed?
White-bellied Sea-Eagle				within 1 km of waterbodies. Area search < 1 ha = 20 minutes	PCT 3586	Habitat assessment to detect stick nests.
<i>Hieraaetus morphnoides</i> Little Eagle	V,P		Aug - Oct	Habitat assessment to detect nest trees in live or large old tress and presence of a male and female with nesting material. Area search < 1 ha = 20 minutes	PCT 3150 PCT 3586	Yes Habitat assessment to detect stick nests.
<i>Hirundapus caudacutus</i> White-throated Needle-tail	P	C,J,K	All year	Area search < 1 ha = 20 minutes at dawn or dusk. EPBC listed species	PCT 3150 PCT 3586	No Survey conducted 22/08/25 & 26/08/25 however they were not conducted at dawn or dusk.
<i>Ixobrychus flavicollis</i> Black Bittern	V,P		All year	Habitat assessment for freshwater and/or estuarine wetlands with permanent water and dens vegetation within 40m.	PCT 3150 PCT 3586	Yes Habitat assessment to determine suitable habitat.
<i>Lathamus discolor</i> Swift Parrot	E	CE	Winter	Check important habitat map for this species. Habitat assessment to detect preferred feed trees. Area search < 1 ha = 20 minutes at dawn or dusk	Important habitat map (Figure 2-6)	No Survey conducted 22/08/25 & 26/08/25 however they were not conducted at dawn or dusk.
<i>Lophoictinia isura</i> Square-tailed Kite	V,P		Sept - Jan	Habitat assessment to detect breeding site/nest tree Area search < 1 ha = 20 minutes	PCT 3150 PCT 3586	Yes Habitat assessment to detect stick nests.
<i>Ninox connivens</i> Barking Owl	V,P,3		May - Dec	Habitat assessment to detect suitable hollow bearing trees >20 cm diameter and > 4m above the ground.	PCT 3150 PCT 3586	Yes Habitat assessment to detect suitable hollows.
<i>Ninox strenua</i> Powerful Owl	V,P		May - Aug	Habitat assessment to detect suitable hollow bearing trees >20 cm diameter and > 4m above the ground.	PCT 3150 PCT 3586	Yes Habitat assessment to detect suitable hollows.
<i>Pandion cristatus</i> Eastern Osprey	V,P,3	M	April - Nov	Habitat assessment to detect stick nests in trees > 15 m or artificial structures within 100	PCT 3150 PCT 3586	Yes Habitat assessment to detect stick nests.

Scientific Name	State status	Comm status	Survey period	Minimum survey requirement	Associated PCT	Survey completed?
				m of a floodplain for nesting. Area search < 1 ha = 20 minutes		
<i>Tyto novaehollandiae</i> Masked Owl	V,P		May - Aug	Habitat assessment to detect suitable hollow bearing trees >20 cm diameter and > 4m above the ground.	PCT 3150 PCT 3586	Yes Habitat assessment to detect suitable hollows.
<i>Mammal</i>						
<i>Cercartetus nanus</i> Eastern Pygmy-possum	V,P		Oct - March	Species is very difficult to detect, especially via spotlighting. Baited camera traps (minimum 14 nights)	PCT 3150 PCT 3586	No Survey conducted 22/08/25 & 26/08/25 which were outside of the required survey period.
<i>Chalinolobus dwyeri</i> Large-eared Pied Bat	V,P	V	Nov - Jan	Habitat assessment to determine presence of roosting habitat (i.e. cliffs, rocky areas containing caves, overhangs or crevices, mines or tunnels). Survey techniques: • Har trap or mist net (4 nights x 4 hours/night) • Acoustic detection (4 nights x 4 hours/night) • Radio tracking/roost search	PCT 3150 PCT 3586	Yes Habitat assessment conducted to determine suitable roost habitat.
<i>Dasyurus maculatus</i> Spotted-tailed Quoll	V,P	E	All year	Baited camera traps (minimum 14 nights) Cage trapping should be limited to Dec to Oct. Post breeding months (Sept to Nov) where females have dependent young should be avoided.	PCT 3150 PCT 3586	No Repeat site visits were not practical due to lane closure requirements.
<i>Falsistrellus tasmaniensis</i> Eastern False Pipistrelle	V,P		Oct-mar	Acoustic detection (4 nights x 4 hours/night)	PCT 3150 PCT 3586	No Survey conducted 22/08/25 & 26/08/25 which were outside of the required survey period.
<i>Macropus parma</i> Parma Wallaby	V		All year	Diurnal surveys 10 baited cage traps for four consecutive nights	PCT 3150 PCT 3586	No Repeat site visits were not practical due to lane closure requirements.

Scientific Name	State status	Comm status	Survey period	Minimum survey requirement	Associated PCT	Survey completed?
<i>Micronomus norfolkensis</i> Eastern Coastal Free tailed Bat	V,P		Oct-Mar	Acoustic detection (4 nights x 4 hours/night)	PCT 3150 PCT 3586	No Survey conducted 22/08/25 & 26/08/25 which were outside of the required survey period.
<i>Miniopterus australis</i> Little Bentwing-bat	V,P		Dec - Feb	Habitat assessment for suitable roosting habitat (cave/mine/tunnel etc) One harp trap per cave/mine/tunnel (4 nights x 4 hours/night)	PCT 3150 PCT 3586	No Survey conducted 22/08/25 & 26/08/25 which were outside of the required survey period. CCTV footage of cracks and crevices was inconclusive.
<i>Miniopterus orianae oceanensis</i> Large Bentwing-bat	V,P		Dec - Feb	Habitat assessment for suitable roosting habitat (cave/mine/tunnel etc) One harp trap per cave/mine/tunnel (4 nights x 4 hours/night)	PCT 3150 PCT 3586	No Survey conducted 22/08/25 & 26/08/25 which were outside of the required survey period. CCTV footage of cracks and crevices was inconclusive.
<i>Myotis Macropus</i> Southern Myotis	V		Oct - March	Habitat assessment to identify habitat constraints (Waterbodies with permanent pools/stretches 3m or wider, including rivers, large creeks, billabongs, lagoons, estuaries, dams and other waterbodies, on or within 200m of the site). Survey techniques: • Harp trap or mist net (4 nights x 4 hours/night) • Acoustic detection (4 nights x 4 hours/night) • • Roost search (30 min per structure)	PCT 3150 PCT 3586	Yes Habitat assessment conducted to determine suitable roost habitat.
<i>Petauroides volans</i> Southern Greater Glider	E	E	All year	Active searches for tracks, scats and scratches Spotlighting	PCT 3150 PCT 3586	No Repeat site visits were not practical due to lane closure requirements.

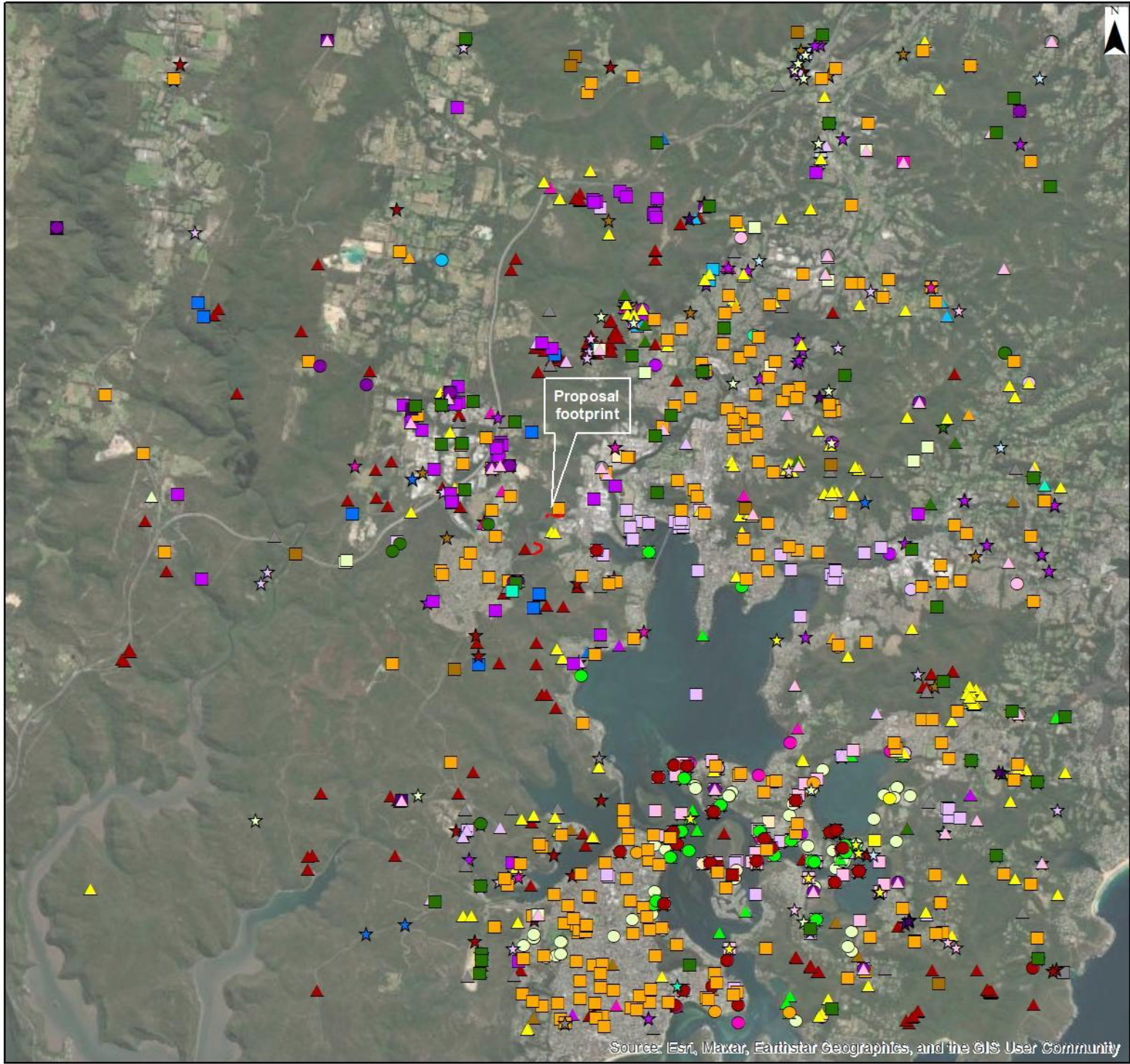
Scientific Name	State status	Comm status	Survey period	Minimum survey requirement	Associated PCT	Survey completed?
				Baited camera traps (minimum 14 nights) or Elliot traps (max 4 nights)		
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	V	V	Oct-Dec	Habitat assessment for breeding camps (3 days (one per month), 2 hours / day.	PCT 3150 PCT 3586	Partial Habitat assessment over two days.
<i>Petaurus australis</i> Yellow-bellied Glider	V	V	All year	Active searches for tracks, scats and scratches Spotlighting Baited camera traps (minimum 14 nights) or Elliot traps (max 4 nights)	PCT 3150 PCT 3586	No Repeat site visits were not practical due to lane closure requirements.
<i>Petaurus norfolcensis</i> Squirrel Glider	V,P		All year Mar-Aug	Active searches for tracks, scats and scratches Spotlighting Baited camera traps (minimum 14 nights) or Elliot traps (max 4 nights)	PCT 3150 PCT 3586	No Repeat site visits were not practical due to lane closure requirements.
<i>Phascolarctos cinereus</i> Koala	E	E	All year	Presence of one koala use feed tree (Parallel field traverses: 40 metres apart in open vegetation, 20 m apart in dense vegetation) Survey techniques: - Spot assessment: no rain, 3 SAT sites - Spotlighting: no rain, 1 x 200 m transect, 2 nights - Passive acoustic (Sep-Dec) 1 recording unit/5 ha for 7 nights.	PCT 3150 PCT 3586	Yes Vegetation surveys to detect if preferred feed trees are present. No targeted surveys.
<i>Potorous tridactylus tridactylus</i> Northern long-nosed Potoroo	V,P	V	All year (easier in spring)	Habitat assessment to detect dense shrub layer or alternatively high canopy cover exceeding 70% Baited camera traps (minimum 14 nights)	PCT 3150 PCT 3586	No Repeat site visits were not practical due to lane closure requirements.

Scientific Name	State status	Comm status	Survey period	Minimum survey requirement	Associated PCT	Survey completed?
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	V,P	V	Oct - Dec	Habitat assessment for breeding camps (3 days (one per month), 2 hours / day.	PCT 3150 PCT 3586	Yes Habitat assessment to detect roost camps.
<i>Saccolaimus flaviventris</i> Yellow-bellied Sheath-tail-bat	V,P		Oct-Mar	Acoustic detection (4 nights x 4 hours/night)	PCT 3150 PCT 3586	No Survey conducted 22/08/25 & 26/08/25 which were outside of the required survey period.
<i>Scoteanax rueppellii</i> Greater Broad-nosed Bat	V,P		Oct-Mar	Acoustic detection (4 nights x 4 hours/night)	PCT 3150 PCT 3586	No Survey conducted 22/08/25 & 26/08/25 which were outside of the required survey period.
<i>Vespadelus troughtoni</i> Eastern Cave Bat	V,P		Nov - Jan	Habitat assessment to determine presence of roosting habitat (i.e. cliffs, rocky areas containing caves, overhangs or crevices, mines or tunnels) within 2 km. Survey techniques within 100m of breeding habitat: • Har trap or mist net (4 nights x 4 hours/night) • Roost search • Acoustic detection (4 nights x 4 hours/night) • Radio tracking/roost search	PCT 3150 PCT 3586	Yes Habitat assessment conducted to determine suitable roost habitat.
<i>Amphibians</i>						
<i>Heleioporus australiacus</i> Giant Burrowing Frog	V	V	Sept - May	Aural-visual surveys - 960 minutes/500 m transect repeated over 8 surveys. in areas of native vegetation located within 300 metres of suitable breeding habitat within a week of heavy rainfall >50 mm in 24 hrs, >100 mm over 3 days) Or Tadpole searches Feb to May for 10 minutes /50m ² of water surface area repeated over 8	PCT 3150 PCT 3586	Yes Habitat assessment to determine if there is suitable habitat. Targeted surveys were not undertaken.

Scientific Name	State status	Comm status	Survey period	Minimum survey requirement	Associated PCT	Survey completed?
				surveys, conducted at night. Suitable breeding habitat consists of ephemeral flowing streams that have permanent pools, or in upland swamps, and are located within native vegetation. Non-breeding habitat is native vegetation within 300 m from breeding sites.		
<i>Litoria aurea</i> Green and Golden Bell Frog	E1,P	V	Nov - March	Survey techniques: • Aural-visual surveys (500 m transection, 480 mins over 4 days) • Acoustic recorder 14 days • Tadpole search (10 mins/50m² of surface area) Breeding/ non-breeding shelter habitat consists of any waterbody with emergent aquatic vegetation and without the plague minnow (<i>Gambusia holbrooki</i>), Foraging habitat and migratory habitat are areas of native and non-native vegetation.	PCT 3150 PCT 3586	Yes Habitat assessment to determine if there is suitable habitat. Targeted surveys were not undertaken.
<i>Pseudophryne australis</i> Red-crowned Toadlet	V		All year	Aural - visual surveys 480 minutes/500 m transect, repeated 4 times in suitable breeding habitat. Surveys should not be conducted if three significant rain events (>50 millimetres of rain in 24 hours) have occurred in the previous two months, not during periods of heavy rainfall. Call playback involving loud sounds to which the male responds can be undertaken any time of the year, Suitable breeding habitat consists of	PCT 3586	Yes Habitat assessment to determine if there is suitable habitat. Targeted surveys were not undertaken.

Scientific Name	State status	Comm status	Survey period	Minimum survey requirement	Associated PCT	Survey completed?
				ephemeral streams or pools located within areas of native vegetation on Triassic sandstones. Non-breeding habitat is native vegetation within 100 metres of suitable breeding habitat.		

P = Protected, M = Migratory, V = Vulnerable, E = Endangered, CE = Critically Endangered



Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

■ Proposal footprint

Threatened fauna

- | | | | | |
|--|---|--|--|---|
| ● Australasian Bittern | ● Crested Tern | ■ Green and Golden Bell Frog | ▲ Oriental Cuckoo | ☆ Squirrel Glider |
| ● Bar-tailed Godwit | ● Curlew Sandpiper | ■ Grey Plover | ▲ Pama Wallaby | ★ Superb Fruit-Dove |
| ● Barking Owl | ● Dusky Woodswallow | ■ Grey-headed Flying-fox | ▲ Pied Oystercatcher | ★ Swift Parrot |
| ● Black Bittern | ● Eastern Cave Bat | ■ Grey-tailed Tattler | ▲ Powerful Owl | ★ Turquoise Parrot |
| ● Black Falcon | ● Eastern Coastal Free-tailed Bat | ■ Koala | ▲ Red-backed Button-quail | ☆ Varied Sittella |
| ● Black-chinned Honeyeater | ■ Eastern Curlew | ■ Large Bent-winged Bat | ▲ Red-crowned Toadlet | ★ Wedge-tailed Shearwater |
| ● Black-tailed Godwit | ■ Eastern False Pipistrelle | ■ Large-eared Pied Bat | ▲ Regent Honeyeater | ★ Whimbrel |
| ● Brown Treecreeper | ■ Eastern Osprey | ■ Leatherback Turtle | ▲ Short-tailed Shearwater | ★ White-bellied Sea-Eagle |
| ● Bush Stone-curlew | ■ Eastern Pygmy-possum | ■ Little Bent-winged Bat | ▲ Sooty Owl | ★ White-throated Needletail |
| ● Caspian Tern | ■ Fork-tailed Swift | ▲ Little Eagle | ▲ Sooty Oystercatcher | ★ Wompoo Fruit-Dove |
| ● Comb-crested Jacana | ■ Gang-gang Cockatoo | ▲ Little Lorikeet | ▲ SE Glossy Black-Cockatoo | ★ Yellow-bellied Glider |
| ● Common Sandpiper | ■ Giant Burrowing Frog | ▲ Loggerhead Turtle | ☆ Southern Greater Glider | ★ Yellow-bellied Sheathtail-bat |
| ● Common Tern | ■ Giant Dragonfly | ▲ Marsh Sandpiper | ☆ Spotted-tailed Quoll | |
| | ■ Greater Broad-nosed Bat | ▲ Masked Owl | ☆ Square-tailed Kite | |
| | ■ Greater Sand-plover | ▲ Northern long-nosed potoroo | | |

The important habitat map (accessed via the Biodiversity Accredited Assessor System (BAAS)) identifies the proposal footprint as important habitat for the Swift Parrot (Figure 2-6). It is not identified as important habitat for other threatened migratory birds or migratory shorebirds.

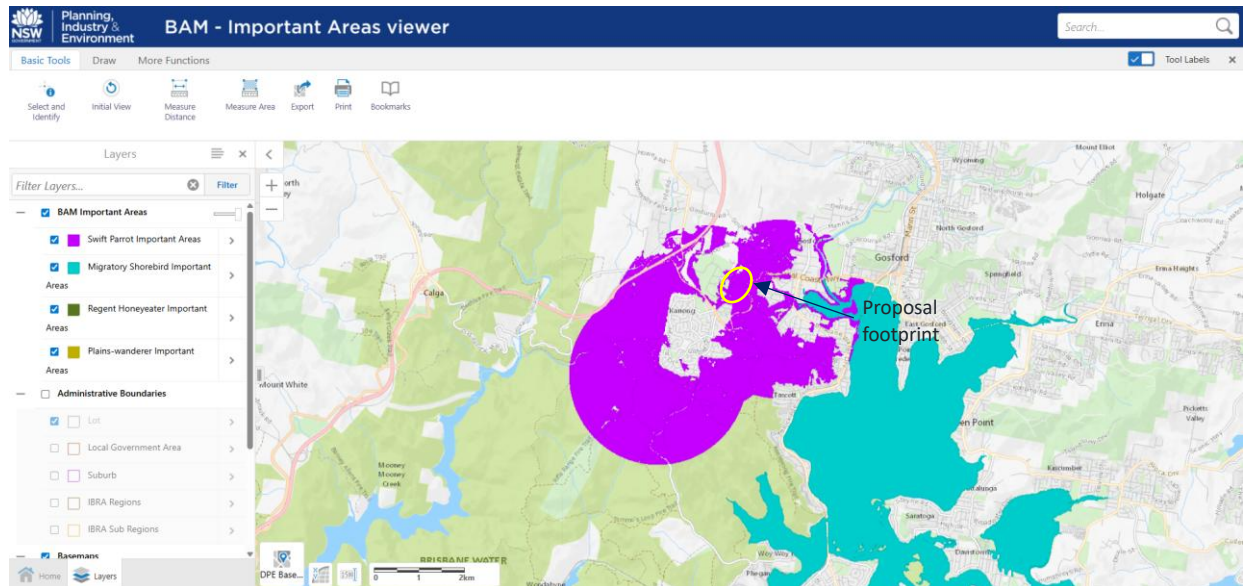


Figure 2-6. Important habitat map

2.5 Aquatic surveys

The proposal footprint does not contain key fish habitat, floodplains or wetlands (Figure 2-7), as such aquatic assessment is not required.

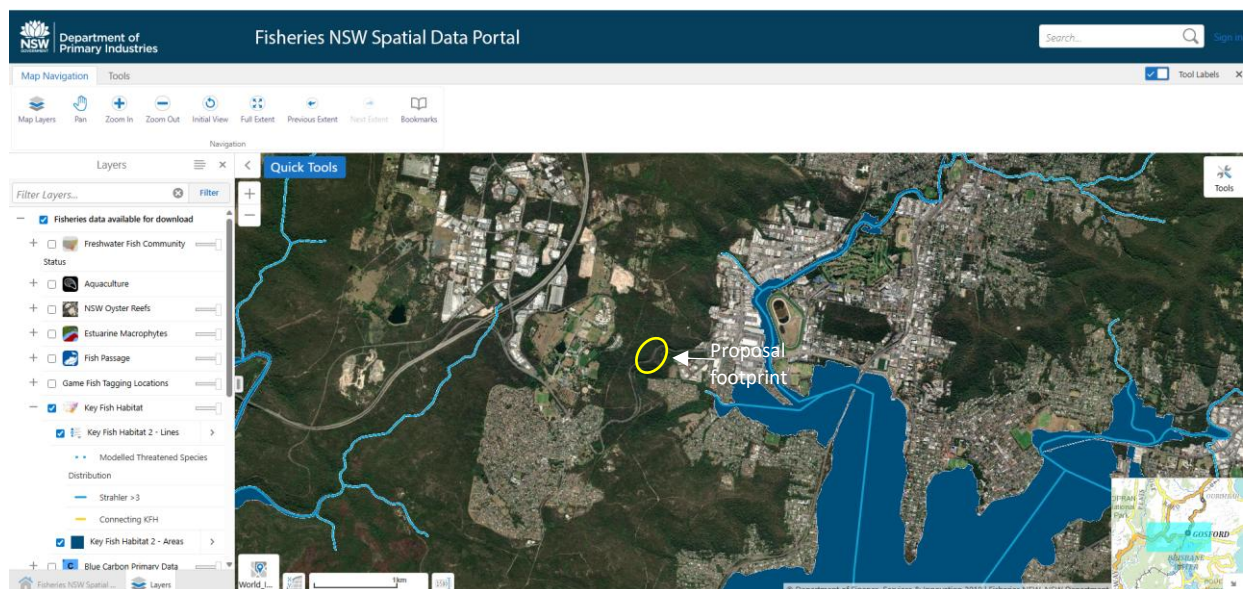


Figure 2-7. Key fish habitat (DPI Fisheries spatial data portal, accessed 25/08/25).

2.6 Limitations

Survey effort for targeted threatened species potentially utilising the proposal footprint were restricted due to:

- Project timing constraints which limited seasonal and/or repeat surveys
- The requirement for traffic control and lane closures to access to proposal footprint
- Safety aspects associated with the steepness and general inaccessibility of the proposal footprint

- Heavy rainfall experienced during the first site visit.

Due to these restrictions, most of the threatened flora and fauna species with moderate likelihood of occurring, were assumed to be present as surveys could not determine presence or absence of a species.

Regardless, flora survey techniques were considered adequate to identify most flora species, identify the appropriate PCT and undertake targeted flora surveys for species identifiable year-round and for cryptic species in flower at the time of survey.

As the actual distribution and the range of habitat utilised by some species is not fully understood, there is always a small possibility that other species could occur within the proposal footprint despite being considered to have a low likelihood of occurrence based on their known range and known habitats.

The conclusions in this report are based upon data acquired during desktop review, field surveys, the BAM and the known distribution and habitat preferences of species. The conclusions are, therefore, merely indicative of the likely biodiversity values, based on information available at the time of preparing the report, including the presence or otherwise of species. It should be recognised that, as more information becomes available, assessment of the likely presence of threatened species can change with time.

3. Existing environment

The proposal footprint occurs within the Sydney Basin IBRA region. IBRA bioregions are large, geographically distinct areas of land with common characteristics, such as climate, geology, landforms and ecosystems. The Sydney Basin bioregion features a shale/clay basin surrounded by sandstone plateau as well as rolling hills and coastal alluvial plains. It also exhibits some of the highest levels of species diversity in Australia largely because of the variety of rock types, topography and climates in the bioregion. The IBRA bioregions are further refined into subregions which are more localised and geomorphologically uniform. The proposal footprint is split between the Wyong and Pittwater sub-regions (Figure 1-1).

The proposal footprint adjoins native bushland which is connected to Brisbane Water National Park to the south and west.

The Mitchell Landscapes were mapped in 2002 using a combination of land systems in the west of NSW and geology and a Digital Elevation Model (DEM) in the east of NSW. The Mitchell Landscape of the proposal footprint is Gosford - Cooranbong Coastal Slopes (Figure 1-1). This landscape is described as:

“Coastal fall of the Sydney Basin, rolling hills and sandstone plateau outliers of Triassic Narrabeen sandstones, extensive rock outcrop and low cliffs along ridge margins, general elevation 0 to 75m. Texture-contrast soils on lithic sandstones and shales. Loamy sand alluvium along creeks. Organic sand and mud in lagoons and swamps. Open forest and woodland of smooth-barked apple (*Angophora costata*), red bloodwood (*Corymbia gummifera*), brown stringybark (*Eucalyptus capitellata*), Sydney peppermint (*Eucalyptus piperita*), spotted gum (*Corymbia maculata*), bastard mahogany (*Eucalyptus carnea*), northern grey ironbark (*Eucalyptus siderophloia*) and grey gum (*Eucalyptus punctata*) on hills and slopes. Small areas of closed forest with; turpentine (*Syncarpia glomulifera*), lilly pilli (*Acmena smithii*), mountain cedar wattle (*Acacia elata*), coachwood (*Ceratopetalum apetalum*), sassafras (*Doryphora sassafras*) and water gum (*Tristaniopsis laurina*) in gullies under high escarpments Prickly-leaved tea-tree (*Melaleuca stypheliodes*) and other shrubs with swamp mahogany (*Eucalyptus robusta*), swamp oak (*Casuarina glauca*), sedges and common reed (*Phragmites australis*) on swampy creek flats. Coastal heath subject to salt spray on headlands.”

3.1 Plant community types and vegetation zones

Two PCTs were identified within the proposal footprint resulting in two vegetation zones (Table 3-1; Figures 3-1).

Details of the patch size class for each vegetation zones as it was entered into the BAM-C and the vegetation integrity (VI) score calculated are provided in Table 3-1.

Table 3-1: Plant community types and vegetation zones including patch size and vegetation integrity (VI) score

Veg. zone	Plant community type (PCT)	Threatened ecological community	Proposal footprint	Patch size class	VI score
Zone 1 Plot 1	PCT 3150 Hunter Coast Ranges Turpentine Wet Forest	Not a TEC	0.36 ha	66 ha	67.3
Zone 2 Plot 2	PCT 3586 Northern Sydney Scribbly Gum Woodland	Not a TEC	<0.1 ha Tree trimming only	66 ha	49.1



0 12.5 25 50 75 100 Meters

Figure 3.1 Vegetation zones and threatened species
Kariang Hill Slope Stabilisation – HW30 Slope 85716
BD Infrastructure (for TfNSW) Job No. 241028 Date. 26/09/25

3.1.1 PCT 3150 Hunter Coast Ranges Turpentine Wet Forest

A very tall to extremely tall sclerophyll open forest with a mid-high sub-canopy of warm temperate rainforest trees and shrubs or rarely a tall closed rainforest with eucalypt emergents found in gullies and sheltered slopes of the Watagan range and hills of the Central and Hunter coasts. The tree canopy or emergent layer very frequently includes *Syncarpia glomulifera* occasionally with *Eucalyptus saligna* or rarely *Eucalyptus deanei*. The latter two species are occasionally replaced or accompanied by *Eucalyptus acmenoides* or *Eucalyptus pilularis* and rarely *Eucalyptus paniculata*. The mid-stratum is layered with a mix of taller mesophyll small trees, palms and lower growing shrubs. The taller stratum very frequently includes *Synoum glandulosum* subsp. *glandulosum*, commonly *Cryptocarya microneura*, *Acmena smithii* and *Eupomatia laurina*, occasionally *Glochidion ferdinandi*, *Elaeocarpus reticulatus* and *Guioa semiglaucula*, rarely with *Cryptocarya glaucescens*. Among the palms *Livistona australis* is occasional, *Archontophoenix cunninghamiana* rare, and both are recorded in the taller mid-stratum as well as the tree *Allocasuarina torulosa*, which is usually just a few individuals. The lower shrub layer commonly includes *Wilkiea huegeliana* and *Breynia oblongifolia*, occasionally with *Pittosporum revolutum* and *Trochocarpa laurina*. A diverse range of vines are found in in multiple strata and almost always include *Smilax australis*, very frequently *Dioscorea transversa*, *Gynochthodes jasminoides* and *Geitonoplesium cymosum*; and commonly with *Ripogonum fawcettianum*. The ground layer is characterised by ferns, very frequently including *Blechnum cartilagineum* and *Doodia aspera*, commonly with *Calochlaena dubia*, along with the graminoid *Gymnostachys anceps*. Primarily found on Narrabeen clays and shales, and sometimes on sandstone along the very wet escarpment and ranges of the Central Coast, Wyong and Lake Macquarie districts. Several low elevation coastal outliers occur on alluvial soils that fringe forested wetlands. This community is replaced by PCT 3158 north of Newcastle and PCT 3153 south of Sydney, both of which share moderate floristic relationships to this PCT. It grades into rainforest PCT 3029 in deeper gullies and very protected slopes. (BioNet Vegetation Classification, 2025).

Within the proposal footprint and along the Central Coast Highway roadside, there is a mix of large emergent canopy species including *Eucalyptus piperita*, *Eucalyptus saligna*, *Eucalyptus deanei*, *Eucalyptus botryoides*, *Angophora costata* *Angophora floribunda* and *Syncarpia glomulifera*. Further down the slope, *Syncarpia glomulifera* and *Eucalyptus saligna* become the dominant canopy species and sub-canopy species such as *Synoum glandulosum*, *Myrsine howittiana*, *Myrsine variabilis*, *Glochidion ferdinandi*, *Allocasuarina torulosa*, *Trochocarpa laurina*, *Acmena smithii*, *Livistona australis* and *Eupomatia laurina* dominate, with a medium dense layer of ferns (*Blechnum cartilagineum*, *Calochlaena dubia*, *Doodia aspera*) and vines (*Smilax australis* *Cissus hypoglauca*, *Dioscorea transversa*, *Geitonoplesium cymosum*).

The proposal footprint has been modified through past disturbance associated with the construction of the Central Coast Highway and erosion from drainage lines, however the vegetation is mostly intact and has a high VI score.

PCT ID	3150
PCT name	Hunter Coast Ranges Turpentine Wet Forest
Vegetation class	North Coast Wet Sclerophyll Forests
Vegetation formation	Wet Sclerophyll Forest (shrubby sub-formation)
Estimate of per cent cleared	10.36 %
Area in proposal footprint	0.36 ha
Conservation status	Not a TEC under BC Act or EPBC Act
Vegetation zones (condition) and plots	Zone 1 (High) – Plot 1

Justification for PCT selection:

A search of the BioNet vegetation classification identified four potential PCTs (Table 3-2) based on dominant species (i.e. *Eucalyptus botryoides*, *Eucalyptus piperita*, *Eucalyptus saligna*, *Angophora costata*, *Myrsine howittiana*, *Myrsine variabilis*, *Smilax australis*, *Allocasuarina torulosa*, *Eupomatia laurina*, *Eucalyptus siderophloia*, *Syncarpia glomulifera*, *Rhodamnia rubescens*, *Synoum glandulosum*, *Syzygium smithii*, *Trochocarpa laurina*, *Wilkiea huegeliana*, *Asplenium australasicum*, *Blechnum cartilagineum*, *Calochlaena dubia*, *Cissus hypoglauca*), vegetation formation (Wet Sclerophyll Forests (Shrubby sub-formation))), vegetation class (North Coast Wet Sclerophyll Forests), IBRA bioregion (Sydney Basin) and subregion (Wyong) .

The justification for PCT selection is provided in Table 3-2.

Table 3-2. Justification of PCT selection

PCT/description	Justification
PCT 3150 Hunter Coast Ranges Turpentine Wet Forest	High The species composition had a high match with the data entered into the filter and the vegetation was consistent with the class, formation and IBRA region. This PCT has been mapped as occurring in the northern portion of the study area on the NSW State Vegetation Type map.
PCT 3171 Northern Lowland Viney Wet Forest	Moderate The species composition had a high match with the data entered into the filter and the vegetation was consistent with the IBRA region however of the dominant canopy species of this PCT (i.e. <i>Eucalyptus saligna</i> , <i>Eucalyptus microcorys</i> , <i>Corymbia intermedia</i> and <i>Lophostemon confertus</i> ; and <i>Eucalyptus grandis</i>) only <i>E. saligna</i> was recorded in the proposal footprint. This PCT has not been mapped as occurring in the study area on the NSW State Vegetation Type map.
PCT 3234 Hunter Coast Lowland Spotted Gum Moist Forest	Moderate The species composition had a high match with the data entered into the filter and the vegetation was consistent with the IBRA region however the dominant canopy species of this PCT (i.e. <i>Corymbia maculata</i> , <i>Eucalyptus paniculata</i> and <i>Eucalyptus umbra</i>) were not recorded in the proposal footprint. This PCT has not been mapped as occurring in the study area on the NSW State Vegetation Type map.
PCT 3242 Lower North Ranges Turpentine Moist Forest	Moderate The species composition had a high match with the data entered into the filter and the vegetation was consistent with the IBRA region however of the dominant canopy species of this PCT (i.e. <i>Eucalyptus acmenoides</i> , <i>Eucalyptus saligna</i> , <i>Eucalyptus paniculata</i> , <i>Corymbia maculata</i> and <i>Eucalyptus pilularis</i>), only <i>E. saligna</i> was recorded in the proposal footprint. This PCT has not been mapped as occurring in the study area on the NSW State Vegetation Type map.

Note. PCT 3621 was mapped as the main PCT occurring in the proposal footprint on the NSW State Vegetation Type map however this PCT did not rank high in using the BioNet Vegetation Classification filter and it is a dry sclerophyll forest, which is not consistent with the vegetation in the proposal footprint.

PCT 3150 Hunter Coast Ranges Turpentine Wet Forest was selected as the most likely PCT within the proposal footprint based on landform, dominant species and NSW state vegetation type mapping. The dominant species recorded in the BAM plot are listed in Table 3-3.

Table 3-3: Floristic and structural summary of PCT 3150 within the study area

Growth form	Typical species
Trees	<i>Acmena smithii</i> <i>Allocasuarina torulosa</i> <i>Angophora costata</i> <i>Angophora floribunda</i> <i>Eucalyptus botryoides</i> <i>Eucalyptus deanei</i> <i>Eucalyptus piperita</i> <i>Eucalyptus saligna</i> <i>Eucalyptus siderophloia</i> <i>Glochidion ferdinandi</i> <i>Notelaea longifolia</i> <i>Syncarpia glomulifera</i> <i>Trochocarpa laurina</i>
Shrubs	<i>Backhousia myrtifolia</i> <i>Denhamia silvestris</i> <i>Eupomatia laurina</i> <i>Ficus coronata</i> <i>Homalanthus populifolius</i> <i>Myrsine howittiana</i> <i>Myrsine variabilis</i> <i>Phyllanthus gunnii</i> <i>Pittosporum undulatum</i>

Growth form	Typical species
	<i>Rhodamnia rubescens</i> <i>Rubus parvifolius</i> <i>Synoum glandulosum</i> <i>Wilkiea huegeliana</i>
Grass and grass-like	<i>Entolasia stricta</i> <i>Imperata cylindrica</i> <i>Lomandra longifolia</i>
Forb	<i>Dianella caerulea</i> <i>Hydrocotyle hirta</i>
Fern	<i>Adiantum aethiopicum</i> <i>Asplenium australasicum</i> <i>Blechnum cartilagineum</i> <i>Calochlaena dubia</i> <i>Dodonaea triquetra</i> <i>Doodia aspera</i> <i>Gleichenia dicarpa</i> <i>Protasparagus aethiopicus</i>
Other	<i>Cassytha pubescens</i> <i>Cissus hypoglauca</i> <i>Dioscorea transversa</i> <i>Geitonoplesium cymosum</i> <i>Gynochthodes jasminoides</i> <i>Hibbertia dentata</i> <i>Smilax australis</i> <i>Stephania japonica</i> <i>Livistona australis</i> <i>Gahnia clarkei</i>
Exotic	<i>Bidens pilosa</i> <i>Cinnamomum camphora</i> <i>Erythrina crista-galli</i> <i>Lantana camara</i> <i>Megathyrsus maximus</i> <i>Ochna serrulata</i> <i>Senna pendula</i> <i>Sida rhombifolia</i>
High Threat Exotic	<i>Bidens pilosa</i> <i>Cinnamomum camphora</i> <i>Erythrina crista-galli</i> <i>Lantana camara</i> <i>Megathyrsus maximus</i> <i>Ochna serrulata</i> <i>Senna pendula</i>

Condition states

One vegetation zone was identified in this PCT within the proposal footprint (Photo 3-1).



Photo 3-1: Plot 1 (PCT 3150 Hunter Coast Ranges Turpentine Wet Forest, vegetation zone 1)

3.1.2 PCT 3586 Northern Sydney Scribbly Gum Woodland

A mid-high to tall, rarely very tall, sclerophyll woodland with a diverse heathy shrub layer found on Hawkesbury Sandstone ridgetops on the coastal and hinterland parts of the Hornsby plateau, northern Sydney. The tree canopy very frequently consists of a sparse to mid-dense cover of *Eucalyptus haemastoma* commonly with *Corymbia gummifera*, *Angophora hispida* and/or *Banksia serrata*. *Allocasuarina littoralis* commonly occurs in the upper stratum in the Lane Cove area which may suggest a history of disturbance. A diverse and dense shrub layer is always present and includes *Banksia ericifolia*, *Banksia oblongifolia*, *Banksia serrata*, *Leptospermum trinervium*, *Grevillea buxifolia* and *Petrophile pulchella*. Other common shrubs include *Platysace linearifolia*, *Lambertia formosa* and *Acacia suaveolens*. The ground layer very frequently includes a sparse cover of grasses, forbs and sedges including *Actinotus minor*, *Cyathochaeta diandra*, *Lepyrodia scariosa* and *Entolasia stricta*. This PCT occurs extensively throughout the sandstone national parks north and south of the Hawkesbury River at elevations of between 40-290 metres asl and with a mean annual rainfall above 900 mm, extending west to the Maroota area. With increasing rock outcrop and decreasing soil depth, this PCT grades into the sandstone heath PCT 3807 (BioNet Vegetation Classification, 2025).

Within the proposal footprint, there is a diversity of large emergent canopy species including *Allocasuarina littoralis*, *Banksia serrata*, *Corymbia eximia*, *Corymbia gummifera*, *Eucalyptus acmenioides*, *Eucalyptus punctata*, *Allocasuarina torulosa*, *Eucalyptus siderophloia* and *Glochidion ferdinandi*. Middle stratum species consist of *Acacia ulicifolia*, *Boronia ledifolia*, *Grevillea buxifolia*, *Grevillea sericea*, *Leptospermum polyanthum*, *Homalanthus populifolius* and *Pittosporum undulatum* and there is a diversity of vines (*Parsonsia straminea*, *Smilax glycyphylla*, *Cissus hypoglauca*, *Stephania japonica*).

Within the proposal footprint, this PCT occurs as overhanging branches only. No clearing of vegetation is required in this PCT other than tree trimming.

PCT ID	3586
PCT name	Northern Sydney Scribbly Gum Woodland
Vegetation class	Sydney Coastal Dry Sclerophyll Forests

Vegetation formation	Dry Sclerophyll Forests (Shrubby sub-formation)
Estimate of per cent cleared	14.99 %
Area in proposal footprint	0.1 ha
Conservation status	Not a TEC under BC Act or EPBC Act
Vegetation zones (condition) and plots	Zone 1 (High) – Plot 2

Justification for PCT selection:

A search of the BioNet vegetation classification identified seven potential PCTs (Table 3-4) based on dominant species (i.e. *Allocasuarina littoralis*, *Banksia serrata*, *Corymbia eximia*, *Corymbia gummifera*, *Eucalyptus acmenoides*, *Eucalyptus punctata*, *Allocasuarina torulosa*, *Eucalyptus siderophloia*, *Glochidion ferdinandi*, *Acacia ulicifolia*, *Boronia ledifolia*, *Dodonaea triquetra*, *Grevillea buxifolia*, *Grevillea sericea*, *Leptospermum polyanthum*, *Homalanthus populifolius*, *Pittosporum undulatum*), vegetation formation (Dry Sclerophyll Forests (Shrubby sub-formation), vegetation class (Sydney Hinterland Dry Sclerophyll Forests), IBRA bioregion (Sydney Basin) and subregion (Pittwater) .

The justification for PCT selection is provided in Table 3-4.

Table 3-4. Justification of PCT selection

PCT	Likelihood of match?
PCT 3592 Sydney Coastal Enriched Sandstone Forest	Moderate This PCT is dominated by <i>Angophora costata</i> commonly in combination with <i>Corymbia gummifera</i> and <i>Eucalyptus piperita</i> . The dominant canopy species within the proposal footprint were <i>Corymbia gummifera</i> , <i>Corymbia eximia</i> , <i>Eucalyptus punctata</i> and <i>Eucalyptus acmenoides</i> , which is not consistent with this PCT.
PCT 3620 Sydney Hinterland Turpentine Sheltered Forest	Moderate The tree canopy of this PCT almost always includes a high cover of <i>Syncarpia glomulifera</i> , very frequently with <i>Angophora costata</i> and <i>Corymbia gummifera</i> and occasionally <i>Eucalyptus punctata</i> or <i>Eucalyptus piperita</i> . The dominant canopy species within the proposal footprint were <i>Corymbia gummifera</i> , <i>Corymbia eximia</i> , <i>Eucalyptus punctata</i> and <i>Eucalyptus acmenoides</i> , which is not consistent with this PCT. This PCT was not mapped in the landscape assessment area on the state vegetation type mapping.
PCT 3621 Sydney Hinterland Turpentine- Apple Gully Forest	Moderate The tree canopy of this PCT very frequently includes a high cover of <i>Angophora costata</i> and <i>Syncarpia glomulifera</i> with <i>Eucalyptus piperita</i> also common. The dominant canopy species within the proposal footprint were <i>Corymbia gummifera</i> , <i>Corymbia eximia</i> , <i>Eucalyptus punctata</i> and <i>Eucalyptus acmenoides</i> , which is not consistent with this PCT however this PCT was mapped in the proposal footprint on the state vegetation type mapping.
PCT 3586 Northern Sydney Scribbly Gum Woodland	High The tree canopy very frequently consists of a sparse to mid-dense cover of <i>Eucalyptus haemastoma</i> commonly with <i>Corymbia gummifera</i> , <i>Angophora hispida</i> and/or <i>Banksia serrata</i> . The dominant canopy species within the proposal footprint were <i>Corymbia gummifera</i> , <i>Corymbia eximia</i> , <i>Eucalyptus punctata</i> <i>Eucalyptus acmenoides</i> and <i>Banksia serrata</i> , which has some consistencies with this PCT. This PCT was mapped in the landscape assessment area on the state vegetation type mapping.
PCT 3595 Sydney Coastal Sandstone Gully Forest	Moderate The tree canopy very frequently includes a high cover of <i>Eucalyptus piperita</i> and <i>Angophora costata</i> with <i>Corymbia gummifera</i> occurring less frequently and with a lower cover. The dominant canopy species within the proposal footprint were <i>Corymbia gummifera</i> , <i>Corymbia eximia</i> , <i>Eucalyptus punctata</i> and <i>Eucalyptus acmenoides</i> , which has some consistencies with this PCT. This PCT was not mapped in the landscape assessment area on the state vegetation type mapping.
PCT 3617 Sydney Hinterland Peppermint- Apple Forest	Moderate The tree canopy almost always includes a high cover of <i>Eucalyptus piperita</i> and <i>Angophora costata</i> with <i>Corymbia gummifera</i> and <i>Syncarpia glomulifera</i> recorded less frequently. The dominant canopy species within the proposal footprint were <i>Corymbia gummifera</i> , <i>Corymbia eximia</i> , <i>Eucalyptus punctata</i> and <i>Eucalyptus acmenoides</i> , which has some consistencies with this PCT. This PCT was not mapped in the landscape assessment area on the state vegetation type mapping.
PCT 3619	Moderate

PCT	Likelihood of match?
Sydney Hinterland Enriched Sandstone Bloodwood Forest	The tree canopy very frequently includes a higher cover of <i>Corymbia gummifera</i> together with one or more species of stringybark eucalypts, of which <i>Eucalyptus oblonga</i> and <i>Eucalyptus globoidea</i> are most frequent. These may be occasionally accompanied or replaced by <i>Eucalyptus punctata</i> , <i>Angophora costata</i> or species of scribbly gum or mahogany eucalypts, of which <i>Eucalyptus sclerophylla</i> and <i>Eucalyptus resinifera</i> are most frequent respectively. The dominant canopy species within the proposal footprint were <i>Corymbia gummifera</i> , <i>Corymbia eximia</i> , <i>Eucalyptus punctata</i> and <i>Eucalyptus acmenoides</i> , which has some consistencies with this PCT. This PCT was not mapped in the landscape assessment area on the state vegetation type mapping.

None of the PCT descriptions were a direct match of the dominant canopy species recorded in the proposal footprint. As the plot was undertaken on the edge of the road, past clearing may have altered the composition of the PCT and/or the area is a transition zone between two PCTs. PCT 3586 was the most consistent in terms of dominant canopy species through the presence of *C. gummifera* and *B. serrata*, and it is mapped as occurring in the landscape assessment area nearby to the proposal footprint (site compound option 2) on the NSW State Vegetation Type map. As such, PCT 3586 was identified as the most likely PCT within the proposal footprint.

The dominant species recorded in the BAM plot are listed in Table 3-3.

Table 3-5: Floristic and structural summary of PCT 3586 within the proposal footprint

Growth form	Typical species
Trees	<i>Allocasuarina littoralis</i> <i>Banksia serrata</i> <i>Corymbia eximia</i> <i>Corymbia gummifera</i> <i>Eucalyptus acmenoides</i> <i>Eucalyptus punctata</i> <i>Allocasuarina torulosa</i> <i>Eucalyptus siderophloia</i> <i>Glochidion ferdinandi</i>
Shrubs	<i>Acacia ulicifolia</i> <i>Boronia ledifolia</i> <i>Dodonaea triquetra</i> <i>Grevillea buxifolia</i> <i>Grevillea sericea</i> <i>Leptospermum polyanthum</i> <i>Homalanthus populifolius</i> <i>Pittosporum undulatum</i>
Grass and grass-like	<i>Lomandra longifolia</i> <i>Entolasia stricta</i>
Forb	<i>Dianella caerulea</i>
Fern	<i>Hypolepis muelleri</i>
Other	<i>Parsonsia straminea</i> <i>Smilax glycyphylla</i> <i>Cissus hypoglauca</i> <i>Stephania japonica</i> <i>Lepidosperma laterale</i> <i>Gahnia clarkei</i>
Exotic	<i>Lantana camara</i> <i>Senna pendula</i>
High Threat Exotic	<i>Lantana camara</i> <i>Senna pendula</i>

Condition states

One vegetation zone was identified in this PCT within the proposal footprint (Photo 3-2).



Photo 3-2: Plot 2 (PCT 3586 Northern Sydney Scribbly Gum Woodland, vegetation zone 2)

3.2 Fauna habitat

There are several large trees at the top of the slope along the Central Coast Highway greater than 30 meters tall, eight of which were identified as having a total of 20 hollows. A ninth hollow bearing tree was identified further down the slope however this occurs outside of the proposal footprint but has been identified as a precautionary approach in the event of indirect affects to the root zone of this tree. The hollows range in size from 15 cm diameter pipe hollows to 25 cm diameter trunk hollows, providing potential habitat for a range of hollow dependent species such as arboreal mammals, microbats and birds. The hollows within the proposal footprint are unlikely to provide habitat for threatened forest owls as they lack the size and depth required by these species.

In addition, two culverts occur within the proposal footprint, which provide potential habitat for two species of threatened microbats (Little Bentwing-bat *Miniopterus australis* and Large Bentwing-bat *Miniopterus orianae oceanensis*). Direct inspection of these culverts was not possible due to their size and the presence of fast flowing water at the time of survey.

No large stick nests used by raptors however the drainage lines may provide habitat for (non-threatened) amphibians. There were no permanent bodies of water nearby to the proposal footprint or wetland areas with emergent macrophytes.

Grey Gum *Eucalyptus punctata*, is listed as a preferred Koala feed tree for the Central Coast area. This species was recorded in PCT 3586 in the site compound option 2 area.

Fauna habitat locations and details are shown in Figure 3-3 and HBT details are provided in Table 3-6.

Table 3-4. Fauna habitat locations and descriptions

ID	y_proj	x_proj	Tree species	Tree height m	Tree DBH cm	Notes
HT1	6300092.226	343044.4095	<i>E. piperita</i>	30	80	2 x 15 cm pipe hollors, 1 x 25 cm trunk hollow 
HT2	6300088.76	343042.6987	<i>Stag</i>	8	50	1 x 20 cm trunk hollow See above photo
HT3	6300087.545	343015.6543	<i>E. piperita</i>	14	35	3 x 25 cm trunk hollows 
HT4	6300084.194	343000.5492	<i>E. botryoides</i>	30	120	2 x 15 cm pipe hollows

ID	y_proj	x_proj	Tree species	Tree height m	Tree DBH cm	Notes
						
HT5	6300078.908	342968.7348	<i>E. botryoides</i>	30	130	3 x 15 cm pipe hollows 
HT6	6300080.581	342962.4764	<i>E. piperita</i>	26	90	1 x 15 cm pipe hollow

ID	y_proj	x_proj	Tree species	Tree height m	Tree DBH cm	Notes
						
HT7	6300084.686	342914.7918	<i>E. piperita</i> <i>stag</i>	12	35	1 x 30 cm trunk hollow
HT8	6300087.898	342907.6713	<i>E. piperita</i>	20	50	1 x10 cm trunk hollow
HT9	6300084.924	343093.354	<i>E. deanei</i>	30	120	1 x 100 cm base hollow, 4 x 15 cm pipe hollow



Figure 3.2. Fauna habitat (hollow bearing trees)
 Kariong Hill Slope Stabilisation – HW30 Slope 85716
 BD Infrastructure (for TfNSW) Job No. 241028 Date. 26/09/25

3.3 Threatened ecological communities

Neither PCT 3150 Hunter Coast Ranges Turpentine Wet Forest or PCT 3586 Northern Sydney Scribbly Gum Woodland are associated with a TEC listed under the BC Act or the EPBC Act.

3.4 Groundwater dependent ecosystems

The Bureau of Meteorology's GDE Atlas (BOM, 2023b) provides the following groundwater dependent ecosystem definitions:

- Aquatic ecosystems that rely on the surface expression of groundwater – this includes surface water ecosystems which may have a groundwater component, such as rivers, wetlands and springs.
- Terrestrial ecosystems that rely on the subsurface presence of groundwater – this includes all vegetation ecosystems.
- Subterranean ecosystems – this includes cave and aquifer ecosystems.

Based on these definitions, GDEs explicitly include any ecosystem that uses groundwater at any time or for any duration to maintain its composition and condition.

GDEs can rely on groundwater for the maintenance of some or all their ecological functions. This dependence on groundwater can be variable, ranging from partial and infrequent dependence, i.e. seasonal or episodic, to total, continual dependence however it is often difficult to determine the nature of this dependence (DPI, 2012).

The vegetation within the proposal footprint has been mapped as low potential on the GDE atlas (Figure 3-4).



3.5 Threatened species

The survey results and assessment requirements for ecosystem credits species and species credit species are summarised in Table 3-7.

Table 3-5: Threatened species surveys results

Scientific Name	State status	Comm status	Credit Species	Survey period	Identification method	Survey effort compliant?	Result
<i>Epacris purpurascens</i> var. <i>purpurascens</i>	V		Species	Sept-Oct	Not recorded	Yes	No <i>Epacris</i> or <i>Woollsia</i> species were identified, therefore this species is not present. No further assessment is required.
<i>Grammitis stenophylla</i> Narrow-leaf Finger Fern	E		Species	All year	Not recorded	Yes	This species was not recorded during targeted surveys. No further assessment is required.
<i>Melaleuca biconvexa</i> Biconvex Paperbark	V,P	V	Species	All year	Not recorded	Yes	This species was not recorded during targeted surveys. No further assessment is required.
<i>Prostanthera askania</i> Tranquility Mintbush	E	E	Species	Sep-Nov	Assumed	No	Surveys were conducted outside of the required survey period. As such, this species is assumed to be present and has been considered further in an assessment of significance (Appendix D & E).
<i>Rhodamnia rubescens</i> Scrub Turpentine	E4A	CE	Species	All year	Recorded	Yes	Three individual <i>Rhodamnia rubescens</i> were recorded during targeted surveys for this species (Figure 3-1). Individuals were 1 – 2 meters in height. The impacts of the proposal on this species are considered further in an assessment of significance (Appendix D & E).
<i>Rhodomyrtus psidioides</i> Native Guava	CE	CE	Species	All year	Not recorded	Yes	This species was not recorded during targeted surveys. No further assessment is required.
<i>Syzygium paniculatum</i>	E1,P	V	Species	Apr-Jun	Assumed	No	Surveys were conducted outside of the fruiting period for this species. <i>Acmena smithii</i> was recorded which

Scientific Name	State status	Comm status	Credit Species	Survey period	Identification method	Survey effort compliant?	Result
Magenta Lilly Pilly							can be difficult to distinguish from the threatened <i>S. paniculatum</i> without fruit. As such, this species was assumed to be present and has been considered further in an assessment of significance (Appendix D &E).
<i>Tetratheca glandulosa</i>	V		Species	Aug-Nov	Not recorded	Yes	This species was not recorded during targeted surveys. No further assessment is required.
<i>Birds</i>							
<i>Artamus cyanopterus cyanopterus</i> Dusky Woodswallow	V,P		Ecosystem	All year	Assumed	No	Surveys were not undertaken at dawn or dusk due to restrictions accessing the proposal footprint. As such, this species is assumed to be present and has been considered further in an assessment of significance (Appendix D).
<i>Burhinus grallarius</i> Bush Stone-curlew	E1,P		Species	All year	Assumed	No	Surveys were not undertaken at dawn or dusk due to restrictions accessing the proposal footprint. As such, this species is assumed to be present and has been considered further in an assessment of significance (Appendix D).
<i>Callocephalon fimbriatum</i> Gang-gang Cockatoo	V,P,3		Dual	Oct - Jan	Assumed	No	Suitable breeding habitat for this species occurs in the proposal footprint (i.e. hollows > 3m above the ground and > 7cm diameter), however most of the hollows are located along the busy highway and are sub-optimal for nesting. Regardless, as surveys were not undertaken at dawn or dusk due to restrictions accessing the proposal footprint, this species is assumed to be present and has been considered further in an assessment of significance (Appendix D).
<i>Calyptorhynchus lathamii</i>	V,P,2		Dual	Jan - Sept	Assumed	No	Suitable habitat for this species occurs in the proposal footprint (i.e. Allocasuarina present and hollows > 8m above the

Scientific Name	State status	Comm status	Credit Species	Survey period	Identification method	Survey effort compliant?	Result
South-eastern Glossy Black-Cockatoo							ground and > 15cm diameter), however most of the hollows are located along the busy highway and are sub-optimal for nesting. Regardless, as surveys were not undertaken at dawn or dusk due to restrictions accessing the proposal footprint, this species is assumed to be present and has been considered further in an assessment of significance (Appendix D).
<i>Climacteris picumnus victoriae</i> Brown Treecreeper (eastern subspecies)	V,P		Ecosystem	All year	Assumed	No	Surveys were not undertaken at dawn or dusk due to restrictions accessing the proposal footprint. As such, this species is assumed to be present and has been considered further in an assessment of significance (Appendix D).
<i>Daphoenositta chrysoptera</i> Varied Sittella	V,P		Ecosystem	All year	Assumed	No	Surveys were not undertaken at dawn or dusk due to restrictions accessing the proposal footprint. As such, this species is assumed to be present and has been considered further in an assessment of significance (Appendix D).
<i>Glossopsitta pusilla</i> Little Lorikeet	V,P		Ecosystem	All year	Assumed	No	Surveys were not undertaken at dawn or dusk due to restrictions accessing the proposal footprint. As such, this species is assumed to be present and has been considered further in an assessment of significance (Appendix D).
<i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle	V, P	C	Dual	July - Dec	No suitable habitat	Yes	No stick nests were recorded in the proposal footprint.
<i>Hieraaetus morphnoides</i> Little Eagle	V,P		Dual	Aug - Oct	No suitable habitat	Yes	No stick nests were recorded in the proposal footprint.
<i>Hirundapus caudacutus</i> White-throated Needle-tail	P	C,J,K	Ecosystem	All year	Not recorded	Yes	This species is aerial and does not need to be surveyed at dawn or dusk. This species was not detected during opportunistic surveys.

Scientific Name	State status	Comm status	Credit Species	Survey period	Identification method	Survey effort compliant?	Result
							No further assessment is required.
<i>Ixobrychus flavicollis</i> Black Bittern	V,P		Ecosystem	All year	No suitable habitat	Yes	No freshwater or estuarine wetlands occur within 40 m of the proposal footprint. No further assessment is required.
<i>Lathamus discolor</i> Swift Parrot	E	CE	Dual	Winter	Important habitat map	No	The proposal footprint occurs on the important habitat map for this species (BOAMS). As such, it is assumed to be present and has been considered further in an assessment of significance (Appendix D & E).
<i>Lophoictinia isura</i> Square-tailed Kite	V,P		Dual	Sept - Jan	No suitable habitat	Yes	No stick nests were recorded in the proposal footprint.
<i>Ninox connivens</i> Barking Owl	V,P,3		Dual	May - Dec	Assumed	No	Suitable nesting habitat for this species occurs in the proposal footprint (i.e. hollows > 4 m above the ground and > 20 cm diameter), however most of the hollows are located along the busy highway and are sub-optimal for nesting. Regardless, as surveys were not undertaken at dawn or dusk due to restrictions accessing the proposal footprint, this species is assumed to be present and has been considered further in an assessment of significance (Appendix D).
<i>Ninox strenua</i> Powerful Owl	V,P		Dual	May - Aug	Assumed	No	Suitable nesting habitat for this species occurs in the proposal footprint (i.e. hollows > 4 m above the ground and > 20 cm diameter), however most of the hollows are located along the busy highway and are sub-optimal for nesting. Regardless, as surveys were not undertaken at dawn or dusk due to restrictions accessing the proposal footprint, this species is assumed to be present and has been considered further

Scientific Name	State status	Comm status	Credit Species	Survey period	Identification method	Survey effort compliant?	Result
							in an assessment of significance (Appendix D).
<i>Pandion cristatus</i> Eastern Osprey	V,P,3	M	Dual	April - Nov	No suitable habitat	Yes	No stick nests were recorded in the proposal footprint.
<i>Tyto novaehollandiae</i> Masked Owl	V,P		Dual	May - Aug	Assumed	No	Suitable nesting habitat for this species occurs in the proposal footprint (i.e. hollows > 4 m above the ground and > 20 cm diameter), however most of the hollows are located along the busy highway and are sub-optimal for nesting. Regardless, as surveys were not undertaken at dawn or dusk due to restrictions accessing the proposal footprint, this species is assumed to be present and has been considered further in an assessment of significance (Appendix D).
<i>Mammal</i>							
<i>Cercartetus nanus</i> Eastern Pygmy-possum	V,P		Species	Oct - March	Assumed	No	Targeted surveys were not undertaken due to restrictions accessing the proposal footprint. As such, this species is assumed to be present and has been considered further in an assessment of significance (Appendix D).
<i>Chalinolobus dwyeri</i> Large-eared Pied Bat	V,P	V	Species	Nov - Jan	Assumed	No	There are cliffs and overhangs within 2 km of the proposal footprint. Targeted surveys were not undertaken as surveys were outside of the required survey period. As such, this species is assumed to be present and has been considered further in an assessment of significance (Appendix D & E).
<i>Dasyurus maculatus</i> Spotted-tailed Quoll	V,P	E	Ecosystem	All year	Assumed	No	Targeted surveys were not undertaken for this species. As such, this species is assumed to be present and is considered further in an assessment of significance (Appendix D & E).
<i>Falsistrellus tasmaniensis</i>	V,P		Ecosystem	Oct-mar	Assumed	No	There are hollows within the proposal footprint which provide potential roosting habitat for this species.

Scientific Name	State status	Comm status	Credit Species	Survey period	Identification method	Survey effort compliant?	Result
Eastern False Pipistrelle							Targeted surveys were not undertaken as surveys were outside of the required survey period. As such, this species is assumed to be present and is considered further in an assessment of significance (Appendix D).
<i>Macropus parma</i> Parma Wallaby	V		Species	All year	Assumed	No	There is dense vegetation which provides suitable habitat for this species. Targeted surveys were not undertaken as site access was restricted. As such, this species is assumed to be present and is considered further in an assessment of significance (Appendix D).
<i>Micronomus norfolkensis</i> Eastern Coastal Free tailed Bat	V,P		Ecosystem	Oct-Mar	Assumed	No	There are hollows within the proposal footprint which provide potential roosting habitat for this species. Targeted surveys were not undertaken as surveys were outside of the required survey period. As such, this species is assumed to be present and is considered further in an assessment of significance (Appendix D).
<i>Miniopterus australis</i> Little Bentwing-bat	V,P		Dual	Dec - Feb	Assumed	No	There are two culverts within the proposal footprint which may provide roosting habitat for this species. Direct inspection of the culverts was not possible due to their small size, and targeted surveys were not undertaken as surveys were outside of the required survey period. CCTV footage of the inside of the culvert was reviewed, however presence/absence of microbats was inconclusive as these species are small and dark coloured and were difficult to distinguish from dirt in the cracks from footage alone. As such, this species is assumed to be present and is considered further in an assessment of significance (Appendix D).

Scientific Name	State status	Comm status	Credit Species	Survey period	Identification method	Survey effort compliant?	Result
<i>Miniopterus orianae oceanensis</i> Large Bentwing-bat	V,P		Dual	Dec - Feb	Assumed	No	There are two culverts within the proposal footprint which may provide roosting habitat for this species. Direct inspection of the culverts was not possible due to their small size, and targeted surveys were not undertaken as surveys were outside of the required survey period. CCTV footage of the inside of the culvert was reviewed, however presence/absence of microbats was inconclusive as these species are small and dark coloured and were difficult to distinguish from dirt in the cracks from footage alone. As such, this species is assumed to be present and is considered further in an assessment of significance (Appendix D).
<i>Myotis Macropus</i> Southern Myotis	V		Species	Oct - March	No suitable habitat	Yes	There are no waterbodies > 3 m wide within 200 m of the proposal footprint. No further assessment is required.
<i>Petauroides volans</i> Southern Greater Glider	E	E	Species	All year	Assumed	No	There are hollow bearing trees within the proposal footprint which may provide roosting habitat for this species, however it is noted that most of the hollows occur along the edge of the busy highway and as such, provide sub-optimal nesting habitat. Targeted surveys were not undertaken as site access was limited. As such, this species is assumed to be present and is considered further in an assessment of significance (Appendix D & E).
<i>Petaurus australis</i> Yellow-bellied Glider	V	V	Ecosystem	All year	Assumed	No	There are hollow bearing trees within the proposal footprint which may provide roosting habitat for this species, however it is noted that most of the hollows occur along the edge of the busy highway and as such, provide sub-optimal nesting habitat. Targeted surveys were not undertaken as site

Scientific Name	State status	Comm status	Credit Species	Survey period	Identification method	Survey effort compliant?	Result
							access was limited. As such, this species is assumed to be present and is considered further in an assessment of significance (Appendix D & E).
<i>Petaurus norfolcensis</i> Squirrel Glider	V,P		Species	All year Mar-Aug	Assumed	No	There are hollow bearing trees within the proposal footprint which may provide roosting habitat for this species, however it is noted that most of the hollows occur along the edge of the busy highway and as such, provide sub-optimal nesting habitat. Targeted surveys were not undertaken as site access was limited. As such, this species is assumed to be present and is considered further in an assessment of significance (Appendix D).
<i>Phascolarctos cinereus</i> Koala	E	E	Species	All year	No suitable habitat	Yes	The preferred feed tree <i>E. punctata</i> was recorded to cover 10% of the canopy in PCT 3586. Only some tree trimming is required in this PCT where branches overhang the road. Regardless, this species is assumed to be present and is considered further in an assessment of significance (Appendix D & E).
<i>Potorous tridactylus tridactylus</i> Northern long-nosed Potoroo	V,P	V	Species	All year (easier in spring)	Assumed	No	There are areas of dense shrub layer and high canopy cover within the proposal footprint, which provides habitat for this species.. Targeted surveys were not undertaken as site access was limited. As such, this species is assumed to be present and is considered further in an assessment of significance (Appendix D & E).
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	V,P	V	Dual	Oct - Dec	No roosting camps	Yes	Habitat assessment did not detect roost camp within the proposal footprint. The nearest roost camp is Woy Woy Everglades (National Flying Fox viewer). The proposal provides potential foraging habitat only for this species. As such,

Scientific Name	State status	Comm status	Credit Species	Survey period	Identification method	Survey effort compliant?	Result
							this species is considered further in an assessment of significance (Appendix D).
<i>Saccolaimus flaviventris</i> Yellow-bellied Sheath-tail-bat	V,P		Ecosystem	Oct-Mar	Assumed	No	There are hollows within the proposal footprint which provide potential roosting habitat for this species. Targeted surveys were not undertaken as surveys were outside of the required survey period. As such, this species is assumed to be present and is considered further in an assessment of significance (Appendix D).
<i>Scoteanax rueppellii</i> Greater Broad-nosed Bat	V,P		Ecosystem	Oct-Mar	Assumed	No	There are hollows within the proposal footprint which provide potential roosting habitat for this species. Targeted surveys were not undertaken as surveys were outside of the required survey period. As such, this species is assumed to be present and is considered further in an assessment of significance (Appendix D).
<i>Vespadelus troungtoni</i> Eastern Cave Bat	V,P		Species	Nov - Jan	Assumed	No	There are cliffs and overhangs within 2 km of the proposal footprint. Targeted surveys were not undertaken as surveys were outside of the required survey period. As such, this species is assumed to be present and has been considered further in an assessment of significance (Appendix D).
<i>Amphibians</i>							
<i>Heleioporus australiacus</i> Giant Burrowing Frog	V	V	Species	Sept - May	No suitable habitat	Yes	One 2 nd order stream occurs to the west of the proposal footprint, however it is steep and does not have permanent pools or associated upland swamps. No further assessment is required.
<i>Litoria aurea</i> Green and Golden Bell Frog	E1,P	V	Species	Nov - March	No suitable habitat	Yes	One 2 nd order stream occurs to the west of the proposal footprint, however it is steep and does not have waterbodies with emergent aquatic vegetation associated with it.

Scientific Name	State status	Comm status	Credit Species	Survey period	Identification method	Survey effort compliant?	Result
							No further assessment is required.
<i>Pseudophryne australis</i> Red-crowned Toadlet	V		Species	All year	No suitable habitat	Yes	One 2 nd order stream occurs to the west of the proposal footprint, however it is steep and does not have permanent pools or associated upland swamps. No further assessment is required.

P = Protected, M = Migratory, V = Vulnerable, E = Endangered, CE = Critically Endangered

In summary, no threatened fauna species were recorded and one threatened flora species was recorded during surveys within the proposal footprint:

1. Scrub Turpentine *Rhodamnia rubescens* CE (BC Act), CE (EPBC Act)

The following 30 threatened species were assumed to be present as surveys were either inadequate (due to site access limitations or survey timing) or conducted outside of the required survey months or the proposal footprint was on the important habitat map for a particular species:

2. Tranquility Mintbush *Prostanthera askania* E (BC Act), E (EPBC Act)
3. Magenta Lilly Pilly *Syzygium paniculatum* E (BC Act), V (EPBC Act)
4. Dusky Woodswallow *Artamus cyanopterus cyanopterus* V (BC Act)
5. Bush Stone-curlew *Burhinus grallarius* E (BC Act)
6. Gang-gang Cockatoo *Callocephalon fimbriatum* V (BC Act)
7. South-eastern Glossy Black-Cockatoo *Calyptorhynchus lathami* V (BC Act)
8. Brown Treecreeper (eastern subspecies) *Climacteris picumnus victoriae* V (BC Act)
9. Varied Sittella *Daphoenositta chrysoptera* V (BC Act)
10. Little Lorikeet *Glossopsitta pusilla* V (BC Act)
11. Swift Parrot *Lathamus discolor* E (BC Act), CE (EPBC Act)
12. Barking Owl *Ninox connivens* V (BC Act)
13. Powerful Owl *Ninox strenua* V (BC Act)
14. Masked Owl *Tyto novaehollandiae* V (BC Act)
15. Eastern Pygmy-possum *Cercartetus nanus* V (BC Act)
16. Large-eared Pied Bat *Chalinolobus dwyeri* V (BC Act), V (EPBC Act)
17. Spotted-tailed Quoll *Dasyurus maculatus* V (BC Act), E (EPBC Act)
18. Eastern False Pipistrelle *Falsistrellus tasmaniensis* V (BC Act)
19. Parma Wallaby *Macropus parma* V (BC Act)
20. Eastern Coastal Free tailed Bat *Micronomus norfolkensis* V (BC Act)
21. Little Bentwing-bat *Miniopterus australis* V (BC Act)
22. Large Bentwing-bat *Miniopterus orianae oceanensis* V (BC Act)
23. Southern Greater Glider *Petauroides volans* E (BC Act), E (EPBC Act)
24. Yellow-bellied Glider *Petaurus australis* V (BC Act), V (EPBC Act)

25. Squirrel Glider *Petaurus norfolcensis* V (BC Act)
26. Koala *Phascolarctos cinereus* E (BC Act), E (EPBC Act)
27. Northern long-nosed Potoroo *Potorous tridactylus tridactylus* V (BC Act), V (EPBC Act)
28. Grey-headed Flying-fox *Pteropus poliocephalus* V (BC Act), V (EPBC Act)
29. Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris* V (BC Act)
30. Greater Broad-nosed Bat *Scoteanax rueppellii* V (BC Act)
31. Eastern Cave Bat *Vespadelus trougtoni* V (BC Act)

These 31 threatened species have been assessed in accordance with the [Threatened Species Test of Significance Guidelines](#) (Appendix D) and [EPBC Act Significant Impact Guidelines 1.1](#) (Appendix E) (where relevant). The results of these assessments are summarised in section 5.4.



Photo 3-3. The threatened Scrub Turpentine *Rhodamnia rubescens* within the proposal footprint

3.6 Areas of outstanding biodiversity value

No areas of outstanding biodiversity value occur within the proposal footprint.

3.7 Wildlife connectivity corridors

The proposal footprint adjoins Brisbane Water National Park and thus forms part of an extensive wildlife corridor.

3.8 SEPPs

3.8.1 SEPP Resilience and Hazards (2021)

The Resilience and Hazards SEPP gives effect to the objectives of the *Coastal Management Act 2016* from a land use planning perspective, by specifying how development proposals are to be assessed if they fall within the coastal zone.

Detailed interactive maps accompany the SEPP (Figure 3-4). The proposal footprint falls within the *Coastal Environment Area* but outside the Coastal Wetland area. Activities under Part 5 of the EP&A Act do not require council consent for works in coastal environment areas. The objectives of these areas are still considered below to ensure protections of the coastal environment.

Coastal Environment Area

2.10 Development on land within the coastal environment area

1. Development consent must not be granted to development on land that is within the coastal environment area unless the consent authority has considered whether the proposed development is likely to cause an adverse impact on the following:

a) the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment,

The proposal footprint is separated from coastal wetlands by bushland, industrial and residential, and the proposed works do not require extensive trenching or excavation and as such, are unlikely to have an adverse impact on the integrity and resilience of surface or groundwater or the coastal environment.

b) coastal environmental values and natural coastal processes,

The proposed works will be undertaken with consideration of the natural coastal processes, with appropriate erosion and sediment control measures installed to ensure works do not result in excess turbidity in nearby waterways.

c) the water quality of the marine estate (within the meaning of the Marine Estate Management Act 2014), in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1,

The proposed works are unlikely to impact the water quality through increased turbidity and mobilisation of metals/nutrients in the sediments as clearing and ground disturbance are relatively minor and mitigation measures will be put in place prior to the commencement of works to ensure any potential impacts are minimised.

d) marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms,

The proposed works will result in the clearing of 0.36 ha of native vegetation however it would not impact marine vegetation, undeveloped headlands or rock platforms. The loss of trees would be mitigated through TfNSW no net loss guidelines.

e) existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,

N/A.

f) Aboriginal cultural heritage, practices and places,

Refer Review of Environmental Factors (REF)

g) the use of the surf zone.

N/A.

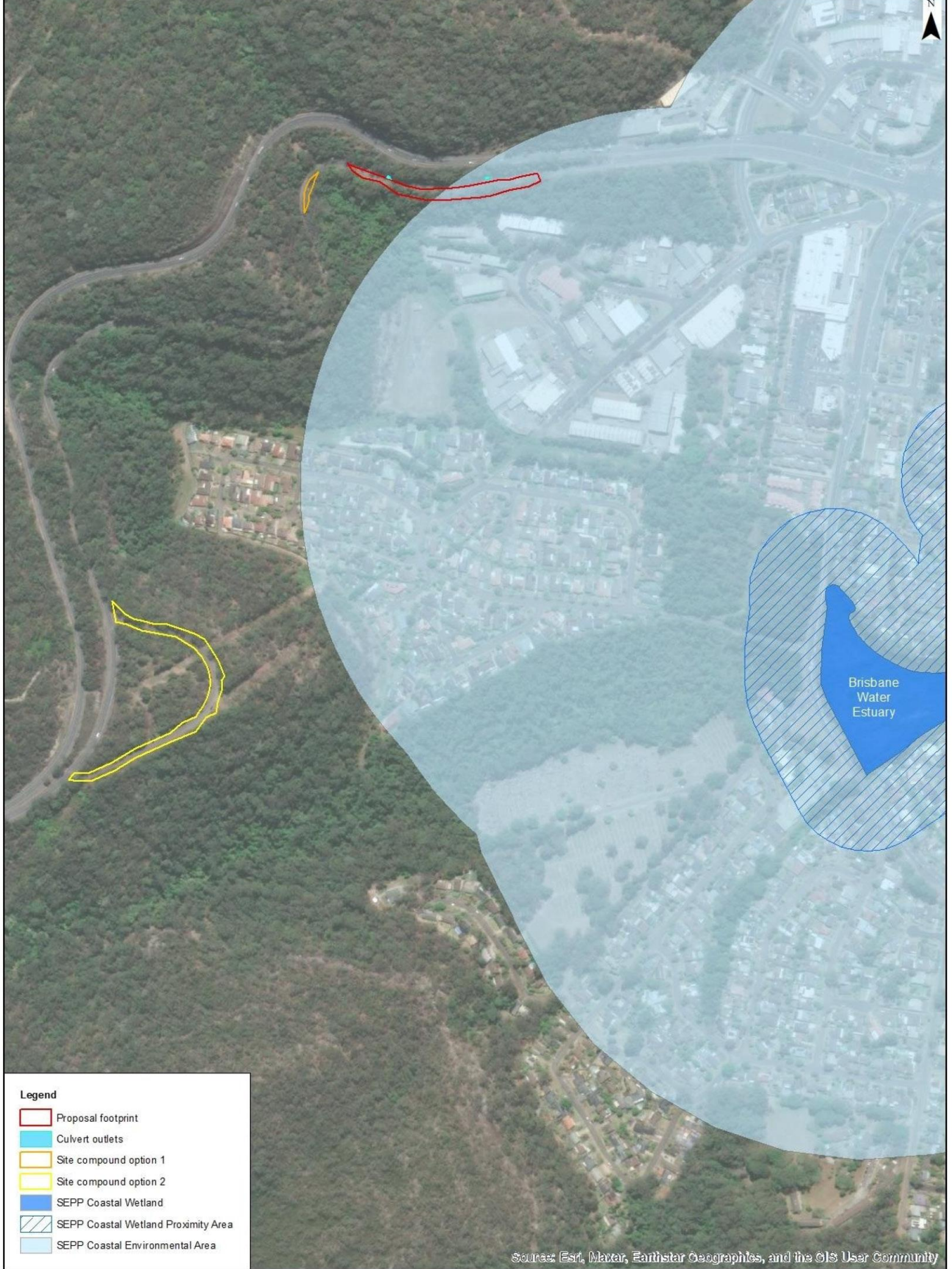
2. Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that:

- a) the development is designed, sited and will be managed to avoid an adverse impact referred to in subclause (1), or*
- b) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or*
- c) if that impact cannot be minimised—the development will be managed to mitigate that impact.*

The location of the proposal footprint is based on slope remediation requirements and as such cannot be modified, however the mitigation measures such as appropriate erosion and sediment control measures will minimise the potential impacts of the proposal on receiving waters.

- h) This clause does not apply to land within the Foreshores and Waterways Area within the meaning of Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005.*

N/A.



3.8.2 SEPP Biodiversity and Conservation 2021

Chapter 4 Koala Habitat Protection 2021 of SEPP Biodiversity and Conservation 2021 aims to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline.

SEPP Biodiversity and Conservation 2021 is not triggered by the proposal as development is permissible without consent under SEPP Transport and Infrastructure 2021. This SEPP only applies to ‘development’ under Part 4 of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act), specifically excluding Part 5 ‘activities’ (which are also excluded from assessment under the Biodiversity Assessment Method).

Regardless, Chapter 4 Koala Habitat Protection is considered here to ensure protection of Koalas.

Specifically, this assessment considers if the proposal footprint:

- Includes any trees belonging to the koala use tree species listed in Schedule 2 for the relevant koala management area, or
- Contains core koala habitat, or
- Includes any trees with a diameter at breast height over bark of more than 10 centimetres.

The proposal footprint falls under the Central Coast Koala Management Area. One Koala use tree species from the Central Coast area list was identified within the proposal footprint:

- Grey Gum *Eucalyptus punctata* (secondary feed species).

Grey Gum *E. punctata* was only recorded in PCT 3586 Northern Sydney Scribbly Gum Woodland, which does not require clearing, only tree trimming. Approximately 10% of the canopy consisted of *E. punctata*.

core koala habitat means—

- (a) an area of land where koalas are present, or
- (b) an area of land—
 - (i) which has been assessed by a suitably qualified and experienced person in accordance with the Guideline as being highly suitable koala habitat, and
 - (ii) where koalas have been recorded as being present in the previous 18 years.

The nearest Koala records on BioNet is from 2024, approximately 1.8 km to the northeast. However, there are no records within the proposal footprint or in adjoining habitat, and while the proposal area may be used on rare occasion as a movement corridor, it is unlikely to support a breeding population. The Central Coast Highway presents a barrier to movement to the north and west of the proposal footprint.

As Koalas are unlikely to utilise the proposal footprint on a regular basis, and the percent cover of preferred feed trees is 10%, the proposal footprint is not considered to be core koala habitat.

3.9 Matters of national environmental significance

A search of the EPBC Protected Matters Search Tool was completed for an area within 10 km of the proposal footprint on 23/06/25. A summary of results from database searches are provided in Table 3-8.

Table 3-6: Summary of Matters of National Environmental Significance within a 10 km radius of the proposal footprint (Protected Matters Search Tool)

MNES	Within 10 km radius
World Heritage Properties	None
National Heritage Places	None
Wetlands of International Importance	None
Nationally Important Wetlands	Brisbane Water Estuary
Great Barrier Reef Marine Park	None
Commonwealth Marine Area	None

Listed Threatened Ecological Communities (TEC's)	6 TECS: 1. Coastal Swamp Oak (<i>Casuarina glauca</i>) Forest of New South Wales and South East Queensland Ecological Community (E) 2. Coastal Upland Swamps in the Sydney Basin Bioregion (E) 3. <i>Posidonia australis</i> seagrass meadows of the Manning-Hawkesbury ecoregion (E) 4. River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria (CE) 5. Subtropical and Temperate Coastal Saltmarsh (V) 6. Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland (E)
Listed Threatened Species	114 (refer Annexure B)
Listed Migratory Species	64 (refer Annexure B)

Of the listed threatened and migratory species, one threatened species was recorded and ten threatened species were considered to have potential habitat and were assumed to be present due to inadequate survey:

1. Tranquility Mintbush *Prostanthera askania* E (EPBC Act) - assumed
2. Scrub Turpentine *Rhodamnia rubescens* CE (EPBC Act) - recorded
3. Magenta Lilly Pilly *Syzygium paniculatum* V (EPBC Act) - assumed
4. Swift Parrot *Lathamus discolor* CE (EPBC Act) - assumed
5. Large-eared Pied Bat *Chalinolobus dwyeri* V (EPBC Act) - assumed
6. Spotted-tailed Quoll *Dasyurus maculatus* E (EPBC Act) - assumed
7. Southern Greater Glider *Petauroides volans* E (EPBC Act) – assumed
8. Koala *Phascolarctos cinereus* E (EPBC Act) – assumed
9. Grey-headed Flying-fox *Pteropus poliocephalus* V EPBC Act – assumed (foraging only)
10. Yellow-bellied Glider *Petaurus australis* V (EPBC Act) - assumed
11. Northern long-nosed Potoroo *Potorous tridactylus tridactylus* V (EPBC Act) - assumed

Assessment has been completed in accordance with the Significant Impact Guidelines 1.1 - Matters of National Environmental Significance (Commonwealth of Australia 2013a) (Appendix E).

No other MNES were identified within the proposal footprint.

4. Avoidance and minimisation

A key part of Transport's management of biodiversity for this proposal is the application of the 'avoid, minimise, mitigate and offset' hierarchy as follows:

1. Avoid and minimise impacts.
2. Mitigate impacts.
3. Offset impacts in accordance with Transport's guidelines.

The principles in Section 8.1 of the BAM have been considered to avoid and minimise impacts on native vegetation and habitat, where possible, through the project development process. The constraints identified in the BAR will assist in the next stage of planning for the proposal. However, as the proposal is aimed at slope maintenance, consideration of alternative options was not possible.

Biodiversity values identified in this report include:

- Native vegetation belonging to PCT 3150 and PCT 3586
- Hollow bearing trees, fallen timber and leaf litter
- Microbat roosting habitat

Direct impacts on biodiversity values can be minimised by:

- Clearing only vegetation necessary to achieve the aims of the proposal (i.e. slope stabilisation)
- Locate compounds, stockpiles and ancillary facilities in cleared areas where there are no biodiversity values
- Stabilising disturbed areas following works to minimise run-off entering adjoining vegetation and nearby waterways.

5. Impact assessment

5.1 Construction direct impacts

The potential impacts likely to result from the proposal are considered in detail below.

5.1.1 Removal of native vegetation

The proposed slope stabilisation works requires impact to 0.36 ha of PCT 3150 and some tree trimming within PCT 3586.

No TEC's listed under the BC Act or EPBC Act have been identified within the proposal footprint. Table 5-1 summarises the impacts on native vegetation within the proposal footprint.

Table 5-1: Summary of direct impacts on native vegetation

Veg. zone	Plant community type (PCT)	Broad condition class	Threatened ecological community	Proposal footprint
Zone 1 Plot 1	PCT 3150 Hunter Coast Ranges Turpentine Wet Forest	High	Not a TEC	3,603.7 m ² (0.36 ha)
Zone 2 Plot 2 4	PCT 3586 Northern Sydney Scribbly Gum Woodland	High	Not a TEC	Tree trimming only

5.1.2 Removal of threatened fauna habitat

The proposal requires the removal of up to 0.36 ha of vegetation (Table 5-2), potential impacts to microbat roosting habitat and impacts to eight hollow bearing trees containing approximately 20 hollows.

Table 5-2: Summary of direct impacts on threatened fauna and habitat

Species name	BC Act	EPBC Act	Credit type ¹	Potential occurrence (Moderate, High, Recorded)	Associated habitat in subject land	Impact (ha)
Dusky Woodswallow <i>Artamus cyanopterus cyanopterus</i>	V		Ecosystem	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha foraging only
Bush Stone-curlew <i>Burhinus grallarius</i>	E		Species	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha
Gang-gang Cockatoo <i>Callocephalon fimbriatum</i>	V		Dual	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha
South-eastern Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i>	V		Dual	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha
Brown Treecreeper (eastern subspecies) <i>Climacteris picumnus victoriae</i>	V		Ecosystem	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha
Varied Sittella <i>Daphoenositta chrysoptera</i>	V		Ecosystem	Moderate	PCT 3150	0.36 ha

Species name	BC Act	EPBC Act	Credit type ¹	Potential occurrence (Moderate, High, Recorded)	Associated habitat in subject land	Impact (ha)
				(assumed)	PCT 3586	
Little Lorikeet <i>Glossopsitta pusilla</i>	V		Ecosystem	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha
Swift Parrot <i>Lathamus discolor</i>	E	CE	Dual	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha foraging only
Barking Owl <i>Ninox connivens</i>	V		Dual	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha
Powerful Owl <i>Ninox strenua</i>	V		Dual	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha
Masked Owl <i>Tyto novaehollandiae</i>	V		Dual	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha
Eastern Pygmy-possum <i>Cercartetus nanus</i>	V		Species	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha
Large-eared Pied Bat <i>Chalinolobus dwyeri</i>	V	V	Species	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha foraging only
Spotted-tailed Quoll <i>Dasyurus maculatus</i>	V	E	Ecosystem	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha
Eastern False Pipistrelle <i>Falsistrellus tasmaniensis</i>	V		Ecosystem	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha
Parma Wallaby <i>Macropus parma</i>	V		Species	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha
Eastern Coastal Free tailed Bat <i>Micronomus norfolkensis</i>	V		Ecosystem	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha
Little Bentwing-bat <i>Miniopterus australis</i>	V		Dual	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha foraging and roosting habitat (culverts)
Large Bentwing-bat <i>Miniopterus orianae oceanensis</i>	V		Dual	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha foraging and roosting habitat (culverts)
Southern Greater Glider <i>Petauroides volans</i>	E	E	Species	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha
Yellow-bellied Glider <i>Petaurus australis</i>	V	V	Ecosystem	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha
Squirrel Glider <i>Petaurus norfolcensis</i>	V		Species	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha
Koala <i>Phascolarctos cinereus</i>	E	E	Species	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha

Species name	BC Act	EPBC Act	Credit type ¹	Potential occurrence (Moderate, High, Recorded)	Associated habitat in subject land	Impact (ha)
Northern long-nosed Potoroo <i>Potorous tridactylus tridactylus</i>	V	V	Species	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	V	V	Dual	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha foraging only
Yellow-bellied Sheath-tail-bat <i>Saccolaimus flaviventris</i>	V		Ecosystem	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha
Greater Broad-nosed Bat <i>Scoteanax rueppellii</i>	V		Ecosystem	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha
Eastern Cave Bat <i>Vespadelus troughtoni</i>	V		Species	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha foraging only

V = Vulnerable, E = Endangered

5.1.3 Removal of threatened flora

One threatened flora was recorded within the study area and two with moderate likelihood of occurring based on habitat features, were assumed present as surveys were conducted outside of their required survey period. The direct impacts on these species are summarised in Table 5-3.

Table 5-3: Summary of direct impacts on threatened flora

Species name	EPBC Act	BC Act	Potential occurrence (Moderate, High, Recorded)	Associated habitat in subject land ¹	Impact (ha or individuals) ¹
Scrub Turpentine <i>Rhodamnia rubescens</i>	CE	CE	Recorded	PCT 3150 PCT 3586	3 individuals
Tranquility Mintbush <i>Prostanthera askania</i>	E	E	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha
Magenta Lilly Pilly <i>Syzygium paniculatum</i>	V	V	Moderate (assumed)	PCT 3150 PCT 3586	0.36 ha

¹ Where assumed present, number of individuals is not known. As such, only area estimates are available.

5.1.4 Aquatic impacts

No KFH or other aquatic habitats would be impacted by the proposal.

5.1.5 Injury and mortality

The proposal footprint provides suitable nesting, denning, roosting and breeding habitat for range of threatened and non-threatened species in important habitat features such as hollow-bearing trees, culverts and dense scrub. There is potential for injury and mortality during construction where impacts to these habitat features are required. Night works are proposed which does reduce the likelihood of nocturnal hollow dependant fauna being injured during tree felling. There is also potential for fauna to be injured if scared onto the highway during clearing disturbance.

The proposal is unlikely to result in the creation of habitat such as new water or food sources, that would alter animal behaviour and attract them to the roadside.

5.1.6 Groundwater dependent ecosystems

The vegetation within the proposal footprint has been mapped as low potential terrestrial GDE (Figure 3-4). As such, it is not consistent with the GDE classifications for Subsurface Ecosystems or Surface Ecosystems in Appendix 2, Table 1 of the *Risk assessment guidelines for groundwater dependent ecosystems* (DPI (2012)). The proposal does not require extensive excavation and is unlikely to substantially modify or destroy any abiotic factors or indirectly impact groundwater dependent ecosystems in the area.

5.2 Indirect and operational impacts

Following completion of works, the proposal would not result in a change to the current operation of the adjoining road. As such, the risk of negative operational impacts is negligible.

No indirect impacts have been identified in this assessment. The proposal is unlikely to impact the SEPP Coastal Wetland (Brisbane Water) due to the distance from the proposal footprint.

5.2.1 Edge effects on adjacent native vegetation and habitat

The proposal footprint occurs on the edge of an existing road, and as such the proposal would not result in the creation of new edges. The native vegetation associated with the proposal footprint is relatively free of exotic species however the proposal would result in the loss of many large trees, which will allow more light into the thin strip of retained vegetation and potentially lead to increased weed invasion.

5.2.2 Wildlife connectivity and habitat fragmentation

The proposal footprint is part of a thin strip (34 m) of vegetation between the Central Coast Highway and industrial areas. This strip connects to Brisbane Water National Park which forms an extensive wildlife corridor in the LGA. The proposal would not result in fragmentation or isolation of habitat, however it will reduce the corridor and potentially change the composition of the corridor with increased weed invasion following clearing.

5.2.3 Injury and mortality

As the proposal requires works on an existing road, the operation of the proposal would not increase the risk of injury and mortality from the existing risk.

5.2.4 Invasion and spread of weeds and pest species

The proposal footprint has past disturbance as evident by exotic invasion, mainly along the road edges. There were patches of the high threat exotic (HTE) Lantana *Lantana camara* which covered 4% of the BAM plot 1 and 3% of BAM plot 2, and Cassia *Senna pendula*, which covered 0.1% of the BAM plot 2. As discussed above, the removal of numerous large canopy trees would likely increase the risk of exotic invasion in the retained strip of bushland.

No evidence of invasive or pest fauna species was observed during surveys. In addition, the operation of the road will not change from the existing use and therefore is unlikely to increase the risk of spread of exotic flora or fauna.

5.2.5 Invasion and spread of pathogens and disease

Pathogens can be spread on footwear, infested plant material, vehicles and machinery, particularly during wet weather or in wet conditions. Strict precautions are necessary to prevent the spread of some pathogens. Some pathogens cannot be eradicated from infected sites so controlling their introduction and spread is a high priority.

The DPE list four key threatening processes (KTPs) that relate to invasion by pathogens and disease:

1. Introduction and establishment of Exotic Rust Fungi of the order *Pucciniales* pathogenic on plants of the family Myrtaceae (Myrtle Rust)- a fungal disease which infects plants in the Myrtaceae family such as eucalyptus, willow myrtle, turpentine, bottlebrush, paperbark, tea tree and lilly pilly.
2. Infection of native plants by *Phytophthora cinnamomic* - a soil borne pathogen that spreads in plant roots and appears to be widespread in coastal forests.
3. Infection by Psittacine circoviral (beak and feather) disease (PCD) affecting endangered psittacine species

4. Infection of frogs by amphibian chytrid causing the disease chytridiomycosis.

Myrtle rust is a plant disease caused by the introduced fungus *Uredo rangelli*. It was first detected in NSW in April 2010 and has spread across the eastern Australian landscape in bushland reserves, home gardens, commercial operations and amenity settings such as parks and street plantings. Myrtle rust can now be found in New South Wales, Victoria, Queensland, Tasmania and on the Tiwi Islands in the Northern Territory.

Myrtle rust attacks the young leaves, shoot tips and stems of Myrtaceous plants (e.g. Bottle Brush, Tea Tree, Lilly Pilly and Turpentine) eventually killing the plant. Myrtle rust is an air-borne fungus that may be spread by moving infected plant material, contaminated clothing (especially hats), equipment and vehicles.

One Scrub Turpentine *Rhodamnia rubescens* recorded within the proposal footprint showed signs of Myrtle Rust as evident by the brown spots on the leaf (Photo 3-10). The proposal does not contribute to the Myrtle Rust KTP as it is already present within the proposal footprint, however it does have the potential to spread Myrtle Rust into the adjacent patch of Scrub Turpentine downslope of the proposal footprint (as identified on BioNet). The identification of one infected individual is however manageable, and mitigation measures have been provided to reduce the risk of spreading this fungus into adjoining bushland during clearing.

There were no signs of other pathogens and disease affecting native vegetation during surveys. As the proposal requires only minor clearing, it is unlikely to contribute to PCD. As the proposal footprint does not provide optimal habitat for threatened amphibians, the risk of the spread of chytrid fungus in frogs is not relevant to this proposal.

The operation of the proposal will not change from the existing use and therefore will not increase the risk of spread of pathogens and disease.

5.2.6 Changes to hydrology

The proposal would improve the management of surface flows, and reduce erosion and sedimentation to receiving waterways.

5.2.7 Noise, light, dust and vibration

Night work is proposed and additional lighting may alter the behaviour of fauna utilising the proposal footprint. Noise and vibration during construction may result in disturbance to fauna, however there is suitable adjoining habitat for fauna movement so impacts would be temporary and minor.

The proposal footprint has been affected by noise, light and vibration from vehicles travelling on the highway and it is likely that fauna utilising the proposal footprint are adapted to disturbance. As the proposal involves maintenance works only, the impacts of noise, light and vibration from passing vehicles during the operation phase will not alter from existing operational impacts.

5.3 Cumulative impacts

As the proposal requires only minor clearing works, the assessment area of cumulative impacts considers local slope work projects only. Seven projects that potentially impact biodiversity have been identified within the locality (Table 5-4).

Table 5-4: Present and future project/proposals

Project/proposal	Biodiversity value impacted	Construction impacts	Operational impacts
M1 slopes remediation (Slopes 18840, 18842, 18858, 48834, 48836)	Potential habitat for 14 threatened species: - Thick-leaf Star-hair <i>Astrotricha crassifolia</i> <i>Darwinia biflora</i> - Spreading Guinea Flower <i>Hibbertia procumbens</i> <i>Lasiopetalum joyceae</i> <i>Tetradthea glandulosa</i> - Eastern Pygmy-possum <i>Cercartetus nanus</i>	Clearing of 0.1 ha of PCT 3621 Sydney Hinterland Turpentine Apple Gully Forest and 0.04 ha of PCT 3617 Sydney Hinterland Peppermint-Apple Forest. Removal of 2 hollow bearing trees.	The proposal is slope maintenance on an existing road (M1) and is therefore unlikely to contribute to existing operational impacts.

Project/proposal	Biodiversity value impacted	Construction impacts	Operational impacts
	7. Eastern Coastal Free tailed Bat <i>Micronomus norfolkensis</i> - Recorded 8. Little Bentwing-bat <i>Miniopterus australis</i> 9. Large Bentwing-bat <i>Miniopterus orianae oceanensis</i> 10. Squirrel Glider <i>Petaurus norfolkensis</i> - Recorded 11. Koala <i>Phascolarctos cinereus</i> 12. Grey-headed Flying-fox <i>Pteropus poliocephalus</i> 13. Eastern Cave Bat <i>Vespadelus troungtoni</i> 14. Red-crowned Toadlet <i>Pseudophryne australis</i>		
M1 slopes remediation (Slope 48281)	Potential habitat for 24 threatened species: 1. Spreading Guinea Flower <i>Hibbertia procumbens</i> 2. <i>Hibbertia puberula</i> 3. Tranquility Mintbush <i>Prostanthera askania</i> 4. Somersby Mintbush <i>Prostanthera junonis</i> 5. <i>Tetradlea glandulosa</i> 6. Dusky Woodswallow <i>Artamus cyanopterus cyanopterus</i> 7. Gang-gang Cockatoo <i>Callocephalon fimbriatum</i> 8. Varied Sittella <i>Daphoenositta chrysoptera</i> 9. Little Lorikeet <i>Glossopsitta pusilla</i> 10. Black-chinned Honeyeater (eastern subspecies) <i>Meliphreptus gularis gularis</i> 11. Red-backed Button-quail <i>Turnix maculosus</i> 12. Eastern Pygmy-possum <i>Cercartetus nanus</i> 13. Spotted-tailed Quoll <i>Dasyurus maculatus</i> 14. Eastern False Pipistrelle <i>Falsistrellus tasmaniensis</i> 15. Parma Wallaby <i>Macropus parma</i> 16. Eastern Coastal Free tailed Bat <i>Micronomus norfolkensis</i> 17. Southern Greater Glider <i>Petauroides volans</i> 18. Koala <i>Phascolarctos cinereus</i> 19. Northern Long-nosed Potoroo <i>Potorous tridactylus tridactylus</i> 20. Grey-headed Flying-fox <i>Pteropus poliocephalus</i> 21. Yellow-bellied Sheath-tail-bat <i>Saccolaimus flaviventris</i>	Clearing of 0.14 ha of PCT 3593 Sydney Coastal Sandstone Bloodwood Shrub Forest. Removal of 2 hollow bearing trees	The proposal is slope maintenance on an existing road (M1) and is therefore unlikely to contribute to existing operational impacts.

Project/proposal	Biodiversity value impacted	Construction impacts	Operational impacts
M1 slopes remediation (Slope 19031)	22. Greater Broad-nosed Bat <i>Scoteanax rueppellii</i> 23. Giant Burrowing Frog <i>Heleioporus australiacus</i> 24. Red-crowned Toadlet <i>Pseudophryne australis</i>		
	Potential habitat for 14 species and recorded habitat for one species: 1. Leafless Tongue Orchid <i>Cryptostylis hunteriana</i> V BC Act, V EPBC Act 2. <i>Epacris purpurascens</i> var. <i>purpurascens</i> V BC Act 3. Spreading Guinea Flower <i>Hibbertia procumbens</i> E BC Act 4. Tranquility Mintbush <i>Prostanthera askania</i> E BC Act, E EPBC Act 5. Somersby Mintbush <i>Prostanthera junonis</i> E BC Act, E EPBC Act 6. <i>Tetratheca glandulosa</i> V BC Act 7. Bush Stone-curlew <i>Burhinus grallarius</i> E BC Act 8. Red-backed Button-quail <i>Turnix maculosus</i> V BC Act 9. Eastern Pygmy-possum <i>Cercartetus nanus</i> V BC Act 10. Grey-headed Flying-fox <i>Pteropus poliocephalus</i> (foraging only) V BC Act, V EPBC Act 11. Eastern Cave Bat <i>Vespadelus troughtoni</i> V BC Act - recorded 12. Giant Burrowing Frog <i>Heleioporus australiacus</i> (non-breeding habitat only) V BC Act, V EPBC Act 13. Stuttering Frog <i>Mixophyes balbus</i> (non-breeding habitat only) E BC Act, V EPBC Act 14. Red-crowned Toadlet <i>Pseudophryne australis</i> (non-breeding habitat only) V BC Act 15. Stephens' Banded Snake <i>Hoplocephalus stephensii</i> V BC Act	Clearing 0.26 ha of PCT 3593 Sydney Coastal Sandstone Bloodwood Shrub Forest and 0.12 ha of Disturbed rock face and native re-growth,	
Kariong Hill drain maintenance M1 Motorway (proposed)	Potential habitat for 11 threatened species: 1. Eastern Pygmy-possum <i>C. nanus</i> 2. Yellow-bellied Glider <i>P. australis</i> 3. Eastern Coastal Free tailed Bat <i>M. norfolkensis</i>	Clearing of 1.5 ha of PCT 1642 Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast.	The proposal is drain maintenance on an existing road (M1) and is therefore unlikely to contribute to existing operational impacts.

Project/proposal	Biodiversity value impacted	Construction impacts	Operational impacts
	4. Large-eared Pied Bat <i>C. dwyeri</i> 5. Eastern False Pipistrelle <i>F. tasmaniensis</i> 6. Greater Broad-nosed Bat <i>S. rueppellii</i> 7. Little Bentwing Bat <i>M. australis</i> 8. Large Bentwing Bat <i>M. orianae oceanensis</i> 9. Eastern Cave Bat <i>V. trouhntoni</i> 10. Giant Burrowing Frog <i>H. australiacus</i> 11. Red-crowned Toadlet <i>P. australis</i>		
Memorial Ave slope stabilisation (proposed)	Potential habitat for 11 threatened species: 1. Spotted-tailed Quoll <i>Dasyurus maculatus</i> 2. Yellow-bellied Glider <i>Petaurus australis</i> 3. Grey-headed Flying-fox <i>Pteropus poliocephalus</i> 4. Large-eared Pied Bat <i>Chalinolobus dwyeri</i> 5. Eastern False Pipistrelle <i>Falsistrellus tasmaniensis</i> 6. Eastern Coastal Free tailed Bat <i>Micronomus norfolkensis</i> 7. Little Bentwing-bat <i>Miniopterus australis</i> 8. Large Bentwing-bat <i>Miniopterus orianae oceanensis</i> 9. Yellow-bellied Sheath-tail-bat <i>Saccolaimus flaviventris</i> 10. Greater Broad-nosed Bat <i>Scoteanax rueppellii</i> 11. Eastern Cave Bat <i>Vespadelus trouhntoni</i>	Clearing of 0.2 ha of PCT 3230 Central Coast Escarpment Moist Forest	The proposal is slope maintenance to an existing road and is therefore unlikely to contribute to existing operational impacts.
Memorial Avenue/Barrenjoey Road intersection upgrade by Transport	Potential habitat for six threatened fauna species: 1. Dusky Woodswallow <i>Artamus cyanopterus cyanopterus</i> 2. Varied Sittella <i>Daphoenositta chrysoptera</i> 3. Little Lorikeet <i>Glossopsitta pusilla</i> 4. Grey-headed Flying fox <i>Pteropus poliocephalus</i> 5. Little Bent-winged Bat <i>Miniopterus australis</i> and	Clearing of 0.09 ha of PCT 1776 Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast. Removal of two hollow-bearing trees.	The proposal is a road upgrade and is therefore unlikely to contribute to existing operational impacts.

Project/proposal	Biodiversity value impacted	Construction impacts	Operational impacts
	6. Large Bent-winged Bat <i>Miniopterus orianae oceanensis</i> .		
Mooney Mooney slope stabilisation, Old Pacific Highway	Potential habitat for 8 threatened fauna species: 1. <i>Ninox strenua</i> Powerful Owl 2. <i>Cercartetus nanus</i> Eastern Pygmy-possum 3. <i>Falsistrellus tasmaniensis</i> Eastern False Pipistrelle 4. <i>Micronomus norfolkensis</i> Eastern Coastal Free tailed Bat 5. <i>Miniopterus australis</i> Little Bentwing-bat 6. <i>Miniopterus orianae oceanensis</i> Large Bentwing-bat 7. <i>Pteropus poliocephalus</i> Grey-headed Flying-fox 8. <i>Scoteanax rueppellii</i> Greater Broad-nosed Bat.	Clearing of 0.07 ha of PCT 3230 Central Coast Escarpment Moist Forest. This includes disturbed areas with a high level of exotic species and areas of native regrowth.	The proposal is a slope remediation along a road side and is therefore unlikely to contribute to existing operational impacts.

Given that the total vegetation removal from cumulative impacts (assessed to date) is less than 2.52 ha and consists of a variety of PCTs, the cumulative impacts are not considered significant.

5.4 Assessments of significance

Assessments of significance have been undertaken for each threatened species listed under the BC Act and EPBC Act that have a moderate likelihood of occurrence and were either recorded or assumed present. A summary of the results of the assessment of significance under the BC Act and EPBC Act are provided Table 5-5 and Table 5-6, and details of these assessments are provided in Appendix D and Appendix E respectively.

5.4.1 BC Act

The assessment under the BC Act concluded that the proposal would impact 0.36 ha of potential habitat for 31 threatened flora and fauna species. The proposal would result in removal of three individual Scrub Turpentine *Rhodamnia rubescens* recorded in the proposal footprint. The proposal would reduce the existing thin strip of wildlife corridor from 34 m to 16 m however it would not result in fragmentation or isolation of habitat. The proposal requires removal of 115 trees including several large trees along the top of the slope adjoining the highway and eight mature hollow bearing trees with 20 hollows of varying size. These hollows provide potential habitat for 15 threatened species assumed to be present in the proposal footprint (i.e. Gang-gang Cockatoo, South-eastern Glossy Black-Cockatoo, Little Lorikeet, Barking Owl, Powerful Owl, Masked Owl, Eastern Pygmy-possum, Spotted-tailed Quoll, Eastern False Pipistrelle, Eastern Coastal Free tailed Bat, Southern Greater Glider, Yellow-bellied Glider, Squirrel Glider, Yellow-bellied Sheath-tail-bat and Greater Broad-nosed Bat). While the hollows are of suitable diameter for these hollow dependant species, it is noted that the presence of the adjoining Central Coast Highway may reduce the utilisation rate of these hollows. There are also two culverts in the proposal footprint which provide potential roosting habitat for threatened microbats (i.e. Little Bentwing-bat and Large Bentwing-bat). These culverts may require works, and as such, it has been assumed that there would be impacts to microbat roosting habitat within the culverts.

There is potential for harm to hollow dependent fauna occupying a hollow at the time of clearing, and potential to harm microbats utilising the culverts during culvert remediation works.

In addition, the proposal would contribute to four key threatening processes, including clearing of native vegetation, the establishment of Myrtle Rust (which was observed on Scrub Turpentine *Rhodamnia rubescens* within the proposal footprint), the loss of hollow bearing trees and the spread of *Lantana camara*.

Despite the many negative environmental outcomes of the proposal, it is considered unlikely to have a significant impact on the long-term survival of a local population of a threatened species as the extent of clearing is relatively small (0.36 ha) and there is similar adjoining habitat, including hollow bearing trees and culverts, that would not be impacted and would continue to provide habitat for these threatened species. Mitigation measures have been provided to minimise direct impacts of the proposal on any threatened species considered likely to occur within the proposal footprint.

Table 5-5: Summary of BC Act significance assessments findings

Significance assessment question (per Section 7.2 of the BC Act and Threatened Species Test of Significance Guidelines (OEH 2018))						
Threatened species, or communities	a	b	c	d	e	Likely significant impact?
Scrub Turpentine <i>Rhodamnia rubescens</i>	No	X	Yes	X	Yes	No
Tranquility Mintbush <i>Prostanthera askania</i>	No	X	No	X	Yes	No
Magenta Lilly Pilly <i>Syzygium paniculatum</i>	No	X	Yes	X	Yes	No
Dusky Woodswallow <i>Artamus cyanopterus cyanopterus</i>	No	X	No	X	Yes	No
Bush Stone-curlew <i>Burhinus grallarius</i>	No	X	No	X	Yes	No
Gang-gang Cockatoo <i>Callocephalon fimbriatum</i>	No	X	Yes	X	Yes	No
South-eastern Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i>	No	X	Yes	X	Yes	No
Brown Treecreeper (eastern subspecies) <i>Climacteris picumnus victoriae</i>	No	X	No	X	Yes	No

Significance assessment question (per Section 7.2 of the BC Act and Threatened Species Test of Significance Guidelines (OEH 2018))						
Threatened species, or communities	a	b	c	d	e	Likely significant impact?
Varied Sittella <i>Daphoenositta chrysoptera</i>	No	X	No	X	Yes	No
Little Lorikeet <i>Glossopsitta pusilla</i>	No	X	Yes	X	Yes	No
Swift Parrot <i>Lathamus discolor</i>	No	X	No	X	Yes	No
Barking Owl <i>Ninox connivens</i>	No	X	Yes	X	Yes	No
Powerful Owl <i>Ninox strenua</i>	No	X	Yes	X	Yes	No
Masked Owl <i>Tyto novaehollandiae</i>	No	X	Yes	X	Yes	No
Eastern Pygmy-possum <i>Cercartetus nanus</i>	No	X	Yes	X	Yes	No
Large-eared Pied Bat <i>Chalinolobus dwyeri</i>	No	X	No	X	Yes	No
Spotted-tailed Quoll <i>Dasyurus maculatus</i>	No	X	Yes	X	Yes	No
Eastern False Pipistrelle <i>Falsistrellus tasmaniensis</i>	No	X	Yes	X	Yes	No
Parma Wallaby <i>Macropus parma</i>	No	X	No	X	Yes	No
Eastern Coastal Free tailed Bat <i>Micronomus norfolkensis</i>	No	X	Yes	X	Yes	No
Little Bentwing-bat <i>Miniopterus australis</i>	No	X	Yes	X	Yes	No
Large Bentwing-bat <i>Miniopterus orianae oceanensis</i>	No	X	Yes	X	Yes	No
Southern Greater Glider <i>Petauroides volans</i>	No	X	Yes	X	Yes	No
Yellow-bellied Glider <i>Petaurus australis</i>	No	X	Yes	X	Yes	No
Squirrel Glider <i>Petaurus norfolcensis</i>	No	X	Yes	X	Yes	No
Koala <i>Phascolarctos cinereus</i>	No	X	No	X	No	No
Northern long-nosed Potoroo <i>Potorous tridactylus tridactylus</i>	No	X	No	X	Yes	No
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	No	X	Yes	X	Yes	No
Yellow-bellied Sheath-tail-bat <i>Saccolaimus flaviventris</i>	No	X	Yes	X	Yes	No
Greater Broad-nosed Bat <i>Scoteanax rueppellii</i>	No	X	Yes	X	Yes	No
Eastern Cave Bat <i>Vespadelus trouhntoni</i>	No	X	No	X	Yes	No
Y = Yes (negative impact), N = No (no or positive impact), X = Yes/No answer not applicable, ? = unknown impact.						

5.4.2 EPBC Act

The assessment under the EPBC Act concluded that in regard to Tranquility Mintbush *Prostanthera askania*, Swift Parrot *Lathamus discolor*, Koala *Phascolarctos cinereus* and Southern Greater Glider *Petauroides volans*, the assumed populations within the proposal footprint do not constitute a 'population' of these species as there have been no records of these species on or near to the proposal footprint and therefore it is unlikely to support a geographically distinct regional population or a population that occurs within a bioregion. No further assessment of impact to these endangered and critically endangered species is required.

In relation to Magenta Lilly Pilly *Syzygium paniculatum*, Large-eared Pied Bat *Chalinolobus dwyeri*, Grey-headed Flying-fox *Pteropus poliocephalus*, Yellow-bellied Glider *Petaurus australis* and Northern long-nosed Potoroo *Potorous tridactylus tridactylus*, the proposal footprint does not support an 'important population' of these species as it does not constitute a key source population for breeding or dispersal, is not a population necessary for maintaining genetic diversity, and is not a population that is near the limit of the species range. As such, no further assessment of impact to these vulnerably listed threatened species is required.

The proposal footprint may support a 'population of a species' of the endangered Spotted-tailed Quoll *Dasyurus maculatus* and is known to provide habitat to the critically endangered Scrub Turpentine *Rhodamnia rubescens*, however assessment of impact determined that the proposal was unlikely to have a significant impact on these species as the proposal would not lead to a long term decrease in the size of the population, significantly reduce the area of occupancy, fragment an existing population, affect habitat critical to their survival, disrupt the breeding cycle or interfere with the recovery of these species. It would impact 0.36 ha of potential habitat, including nesting and denning habitat for the Spotted-tailed Quoll, however this is a relatively small area and large areas of suitable nearby habitat would remain as habitat for this species. It may also result increased impacts to *Rhodamnia rubescens* from invasive species such as *Lantana camera* and potentially facilitate the further spread of Myrtle Rust into nearby *Rhodamnia rubescens* populations. Mitigation measures have been included to minimise any direct impacts on these species.

As such, the proposal does not require referral to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) for impacts on MNES.

Table 5-6: Summary of EPBC Act significance assessments findings

Threatened species	Important population (per Significant Impact Guidelines 1.1 (DoE 2013))	Likely significant impact?
Scrub Turpentine <i>Rhodamnia rubescens</i>	Yes	No
Tranquility Mintbush <i>Prostanthera askania</i>	No	No
Magenta Lilly Pilly <i>Syzygium paniculatum</i>	No	No
Swift Parrot <i>Lathamus discolor</i>	No	No
Large-eared Pied Bat <i>Chalinolobus dwyeri</i>	No	No
Spotted-tailed Quoll <i>Dasyurus maculatus</i>	Yes	No
Koala <i>Phascolarctos cinereus</i>	No	No
Southern Greater Glider <i>Petauroides volans</i>	No	No
Yellow-bellied Glider <i>Petaurus australis</i>	No	No
Northern long-nosed Potoroo <i>Potorous tridactylus tridactylus</i>	No	No

Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	No	No
Y = Yes (negative impact), N = No (no or positive impact), X = Yes/No answer not applicable, ? = unknown impact.		

6. Mitigation

Measures to minimize impacts on threatened species, habitats and biodiversity are included in Table 6-1.

Table 6-1: Mitigation measures

ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
B01	Removal of native vegetation	Native vegetation removal and threatened fauna habitat removal will be minimised through pre-construction planning and the retention of trees where possible.	Detailed design	Effective	<0.36 ha	Transport
B02		Pre-clearing surveys and final pre-clearing checks will be undertaken in accordance with <i>Guide 1: Pre-clearing process of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects</i> (TfNSW 2024). This includes counts of trees and hollows to be removed to provide accurate offsetting requirements in accordance with Transports tree and hollow replacement guidelines (TfNSW 2022).	Prior to construction	Effective	No	Transport
B03		Vegetation removal would be carried out in accordance with Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Management Guideline (Transport for NSW, 2024). Disturbed areas that are not stabilised using shotcrete are to be stabilised using mesh and hydroseed, and mulch from trees cleared from the proposal footprint and/or vegetation (native ground cover) following completion of works.	During construction	Effective	No	Contractor
B04		Native vegetation will be re-established in areas adjacent to retained bushland in accordance with <i>Guide 3: Re-establishment of native vegetation of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects</i> (TfNSW 2024). Species should be selected from the appropriate PCT and density should include 5 ground cover species and one middle stratum species per square meter. This is important to reduce exotic invasion in the downslope native bushland where Scrub Turpentine <i>Rhodamnia rubescens</i> have been recorded on BioNet.	Post construction	Effective	No	Transport
B05		An unexpected threatened species finds procedure is to be developed as part of the CEMP using the template in <i>Guide 1: Pre-clearing process of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects</i> (TfNSW 2024). The procedure is to be followed if threatened ecological communities, either new TECs or new occurrences of known TECs, not assessed in the biodiversity assessment, are identified in the proposal footprint.	During construction	Proven	No	Ecologist, Transport, Contractors

ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
B06	Removal of threatened flora habitat	The three Scrub Turpentine <i>Rhodamnia rubescens</i> identified within the proposal footprint occur along the southern boundary. If the two uninfected individuals can be avoided, tree protection zones (including fencing) will be established prior to construction works.	Detailed design During construction	Effective	No	Transport
B07		The unexpected species find procedure is to be followed under <i>Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects</i> (TfNSW 2024) if threatened flora, not assessed in the biodiversity assessment, are identified in the proposal footprint.	During construction	Proven	No	Ecologist, Transport, Contractors
B08	Removal of threatened fauna habitat	Threatened fauna habitat removal will be minimised through detailed design.	Detailed design	Effective	<0.36 ha	Transport
B09		Habitat removal will be undertaken by staged clearing in accordance with <i>Guide 4: Clearing of vegetation and removal of bushrock</i> of the <i>Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects</i> (TfNSW 2024). Non hollow bearing trees and understory vegetation is to be cleared first, to allow fauna to relocate. Hollow bearing trees that require removal are to be inspected by an ecologist or contractors engaged to clear trees (under the supervision of an ecologist) immediately prior to felling, using a burrow scope or the like. Alternatively, the hollow is to be plugged with a towel, and the hollow section cut and lowered to the ground for inspection. It is preferable to undertake clearing of hollow bearing trees at night, when threatened nocturnal fauna are less likely to be occupying the hollows.	During construction	Effective	No	Ecologist, Transport, Contractors
B10		Koala feed trees (Grey Gum <i>Eucalyptus punctata</i>) located at the proposed site compound option 2, are to be inspected by an ecologist during pre-clearing surveys, prior to any tree trimming to ensure no occupation by koalas. Any injured fauna is to be taken to the nearest vet or wildlife carer.	During construction	Effective	No	Ecologist, Transport, Contractors
B11		Were possible culvert works are to be carried out at night when microbats are unlikely to be roosting in the culvert. If this is not possible, microbat exclusion covers are to be placed over each end of the culvert after dark prior to the commencement of works, and be re-installed every afternoon for the duration of works.	During construction	Effective	No	Transport, Contractors
B12		Habitat will be replaced or re-instated in accordance with <i>Guide 5: Re-use of woody debris and bushrock</i> and <i>Guide 8: Artificial hollows</i> of the <i>Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects</i> (TfNSW 2024). A total of five artificial hollows should be installed in nearby habitat and include 15 - 20 cm diameter entrances.	Post construction	Effective	No	Ecologist, Transport, Contractors

ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
B13		An unexpected threatened species finds procedure is to be developed as part of the CEMP using the template in <i>Guide 1: Pre-clearing process of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects</i> (TfNSW 2024). The procedure is to be followed if threatened fauna, either new species or new occurrences of known species, not assessed in the biodiversity assessment, are identified in the proposal site.	During construction	Proven	No	Ecologist, Transport, Contractors
B14		Exclusion zones will be set up at the limit of clearing in accordance with Guide 2: Exclusion zones of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects (Transport for NSW, 2024).	During construction	Proven	No	Contractors
B15		Fauna that may be present on site during works will be managed in accordance with Guide 9: Fauna handling of the Biodiversity Management Guideline (TfNSW, 2024).	During construction	Proven	No	Ecologist
B16		Inspections for the presence of any sheltering native species would be carried out under vehicles and machinery prior to their use.	During construction	Proven	No	Transport, Contractors
B17	Invasion and spread of weeds	Weed species will be managed in accordance with <i>Guide 6: Weed management of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects</i> (TfNSW 2024). Lantana <i>Lantana camera</i> and other exotics are to be cleared and mulched separately from native vegetation and are not to be re-used for mulching on site. This is to occur as per NSW Weedwise removal guidelines with disposal at a licenced facility.	During construction	Effective	No	Ecologist, Transport, Contractors
B18	Invasion and spread of pathogens and disease	Pathogens will be managed in accordance with <i>Guide 7: Pathogen management of the Biodiversity Management Guideline: Protecting and managing biodiversity on Transport for NSW projects</i> (TfNSW 2024). The following controls are required to prevent the spread of Myrtle Rust identified in Scrub Turpentine <i>Rhodamnia rubescens</i> within the proposal footprint: Before beginning the project: – Ensure vehicles, plant and machinery are clean prior to accepting on site. Machinery including vehicles should not park in known infested areas. – Programming of works should move from uninfected areas to infected areas. – Set up exclusion zones with fencing and signage to restrict access into contaminated areas. – All personnel (including visitors) to be inducted on Myrtle rust management measures for the site. Where contact with biosecurity matter is unavoidable, the following processes are to be implemented:	During construction	Effective	No	Ecologist, Transport, Contractors

ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
		- Disinfect vehicle and machinery using one of the disinfectant options in Table 7 of DPIE Hygiene Guidelines (see extract below). - Personnel working in an infected site should remove any seed and plant material from clothing, shower and launder clothes (especially hats) before moving to another bushland site. - Provide boot wash-down facility. - Disinfect footwear and equipment using one of the disinfectant options in Table 7 of DPIE Hygiene Guidelines (see extract below) - Use a designated clean bay - Clean all soil and plant material from vehicle (inside and out), equipment and clothing. - Brush off/vacuum/use a blower to clean inside of vehicle and under the hood. - Clean from top of the vehicle down. - Use a pressure washer, where available, to remove debris from vehicle, paying particular attention to high-risk areas that have been in contact with weeds such as tyres. - If adequate cleaning facilities are unavailable onsite, clean the vehicle at a suitable wash-down facility before proceeding to another site. - Infected plant material should be buried on site if possible.				

ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility																								
		Table 7Disinfectants <table><tr><th>Disinfectant</th><th>Application</th><th>Notes</th></tr><tr><td>70% methylated spirits in water</td><td>Spraying absorbent and non-absorbent materials, including vehicle interiors. Can also be used to disinfect hands.</td><td>Store in a closed container to reduce evaporation. Solutions at lower or higher concentrations may be less effective or even completely ineffective. Can be used on clothing.</td></tr><tr><td>1% sodium hypochlorite in water</td><td>Soaking non-absorbent materials</td><td>Dilution of household bleach is sufficient. Use only in a well-ventilated area. Do not use on clothing. Bleach has a limited shelf life. Degradation increases with exposure to UV light and at higher temperatures. See manufacturer's details for further information.</td></tr><tr><td>Benzalkonium chloride (various concentrations)</td><td>Spraying or soaking materials (e.g. equipment, vehicles, boot-cleaning stations)</td><td>Some commercial fungicidal products are available (e.g. Phytoclean®). Use as per manufacturer's instructions. Avoid contact with skin or items likely to come into contact with skin (e.g. clothing).</td></tr><tr><td>Industrial strength detergent</td><td>Cleaning and disinfecting vehicle exteriors, shoes and equipment</td><td>There are several commercial products available. Use as per manufacturer's instructions.</td></tr><tr><td>Chloramine and chlorhexadine-based products</td><td>Disinfecting hands, footwear and equipment</td><td>Examples include <i>Halamid</i>®, <i>Halasept</i>® and <i>Hexifoam</i>®. Use as per manufacturer's instructions.</td></tr><tr><td>Alcohol wipes</td><td>Wiping down vehicle interiors</td><td>For multi-use packets, ensure the packaging is properly sealed between uses.</td></tr><tr><td>Alcohol gel</td><td>Disinfecting hands</td><td></td></tr></table>	Disinfectant	Application	Notes	70% methylated spirits in water	Spraying absorbent and non-absorbent materials, including vehicle interiors. Can also be used to disinfect hands.	Store in a closed container to reduce evaporation. Solutions at lower or higher concentrations may be less effective or even completely ineffective. Can be used on clothing.	1% sodium hypochlorite in water	Soaking non-absorbent materials	Dilution of household bleach is sufficient. Use only in a well-ventilated area. Do not use on clothing. Bleach has a limited shelf life. Degradation increases with exposure to UV light and at higher temperatures. See manufacturer's details for further information.	Benzalkonium chloride (various concentrations)	Spraying or soaking materials (e.g. equipment, vehicles, boot-cleaning stations)	Some commercial fungicidal products are available (e.g. Phytoclean®). Use as per manufacturer's instructions. Avoid contact with skin or items likely to come into contact with skin (e.g. clothing).	Industrial strength detergent	Cleaning and disinfecting vehicle exteriors, shoes and equipment	There are several commercial products available. Use as per manufacturer's instructions.	Chloramine and chlorhexadine-based products	Disinfecting hands, footwear and equipment	Examples include <i>Halamid</i> ®, <i>Halasept</i> ® and <i>Hexifoam</i> ®. Use as per manufacturer's instructions.	Alcohol wipes	Wiping down vehicle interiors	For multi-use packets, ensure the packaging is properly sealed between uses.	Alcohol gel	Disinfecting hands					
Disinfectant	Application	Notes																												
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Alcohol wipes	Wiping down vehicle interiors	For multi-use packets, ensure the packaging is properly sealed between uses.																												
Alcohol gel	Disinfecting hands																													
B19	Noise, light, dust and vibration	Shading and artificial light impacts will be minimised through detailed design.	Detailed design	Effective	No	Transport																								

ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
B20	Offsetting	Transport’s Tree and hollow replacement guidelines apply to this proposal and the removal of approximately 115 trees, and 20 hollows require offsetting. Accurate counts of trees and hollows removed during construction will be undertaken during pre-clearing surveys. Where possible, revegetation will be undertaken in the retained strip of bushland to reduce the spread of exotics downslope, where there are BioNet records of Scrub Turpentine <i>Rhodamnia rubescens</i> . Artificial tree hollows would also be installed close to the disturbed area. If tree planting is proposed, a Tree Replacement Plan is to be prepared.	Pre construction	Effective	No	Transport, Contractors

7. Offsets and other measures

7.1 Thresholds

Table 7-1 summarises the requirements to ensure Biodiversity Policy commitments are implemented for REF projects in accordance with the No Net Loss Guidelines (Transport, 2022a). The proposal does not require entry into the biodiversity offset scheme.

Table 7-1: Transport biodiversity policy requirements

Description of impact	Threshold triggered?
Does the project trigger the NSW Biodiversity Offset Scheme?	No The proposal is unlikely to have a significant impact on threatened species and TECs listed under the BC Act in accordance with the assessment of significance.
Does the project require a controlled action referral or trigger the EPBC Act strategic assessment approval for road projects?	No The proposal is unlikely to have a significant impact on threatened species and TECs listed under the EPBC Act.
Are the works exempt from offsetting under the Biodiversity Policy?	No. The works are not an activity that is excluded from offsetting under the Transport Biodiversity Policy.
Do the works involve clearing above the Biodiversity Offset Thresholds?	No, refer Table 7-2.
Will the project remove any native trees or amenity trees	Yes, refer Table 7-2.
Are the works excluded from the tree and hollow replacement requirements?	No, refer Table 7-2.

As summarised in Table 7-1, offsetting is required under the Tree and Hollow replacement guidelines as native trees > 5 cm diameter at breast height (DBH) would be impacted (Table 7-2).

Table 7-2: Offset thresholds (Transport No Net Loss Guidelines)

Impact	Threshold	Trigger?
Works involving clearing of a <u>CEEC</u>	Where there is any clearing of an <u>CEEC</u> in 'moderate to good' condition	No CEEC occur within the proposal footprint.
Works involving clearing of an <u>EEC</u>	Where clearing of a <u>EEC</u> ≥ 2 ha in 'moderate to good' condition	No EEC occur within the proposal footprint
Works involving clearing of <u>VEC</u>	Where clearing of <u>VEC</u> ≥ 5 ha in 'moderate to good' condition	No VEC occur within the proposal footprint
Works involving clearing of any habitat for a known species credit fauna species or clearing of breeding habitat (as defined by the TBDC) for dual-credit fauna species (excluding exotic and planted vegetation that cannot be assigned to a plant community type)	Where clearing ≥ 1 ha in 'moderate to good' condition	No. Proposed clearing is < 1 ha.
Works involving removal of known threatened flora species and their habitat	Where loss of individuals is ≥10 or where clearing of habitat is ≥ 1 ha	No. Three Scrub Turpentine <i>Rhodamnia rubescens</i> would be impacted by the proposal and the area of threatened flora species habitat is < 1 ha.

Impact	Threshold	Trigger?
Type 1 or Type 2 key fish habitats	Where there is a net loss of habitat	No key fish habitat occurs within the proposal footprint.
Any residual biodiversity impact that doesn't require offsets in accordance with the No Net Loss Guideline is to be assessed against the requirements of the Tree and Hollow Replacement Guideline.	Any clearing of hollows and/or trees ≥5cm DBH	Yes Eight hollow bearing trees (20 hollows) and approximately 115 native trees (DBH > 5 cm) occur within the proposal footprint.

7.2 Preliminary offset and tree/hollow replacement calculations

7.2.1 Preliminary offset calculations

As the proposed clearing area is < 1 ha of non-threatened vegetation, no offsets are required.

7.2.2 Preliminary tree and hollow replacement estimates

115 trees with a DBH >5cm are estimated to occur within the proposal footprint however it is likely that not all these trees would require removal.

The number of trees and hollows potentially impacted and their size class (DBH) is summarised in Table 7-3.

Table 7-3: Counts of trees impacted by the proposal

Veg. zone	Impact (ha)	Plots	Direct count of trees in proposal footprint				
			5-19 cm	20-49 cm	50-99 cm	>100 cm	Hollows
Zone 1	0.36	1	42	40	19	14	20
Zone 2	0	2	0	0	0	0	0

Based on direct counts of native trees to be impacted (Table 7-3), pre-liminary estimates of tree replacement costs are provided in Table 7-4.

Table 7-4: Pre-liminary estimates of trees replacement requirements

Category	Estimated No. impacted		Replacement requirement per tree/hollow removed ¹		Estimates number to be replaced ²		Estimated equivalent payment to Transport conservation fund ²
	Native trees	Amenity trees	Planting required	Contribution required	Native trees	Amenity trees	
Very large tree (DBH ≥100cm)	14	0	Plant minimum 16 trees	\$2,500	224	0	\$35,000.00
Large tree (DBH ≥50 to <100cm)	19	0	Plant minimum 8 trees	\$1,000	152	0	\$19,000.00
Medium tree (DBH ≥20 to <50 cm)	40	0	Plant minimum 4 trees	\$500	160	0	\$20,000.00
Small tree (DBH ≥ 5cm to <19 cm)	42	0	Plant minimum 2 trees	\$125	84	0	\$5,250.00
Hollow	20 hollows, occupancy not confirmed		Provide 3 artificial hollows for every occupied hollow removed*	\$500	12		\$6,000.00
Totals	115				620		\$85,250.00

NOTE 1: As per the Transport Tree and Hollow Replacement Guidelines

NOTE 2: An equivalent payment to the Transport Conservation Fund can be used where replanting is not feasible or fully achievable within the project boundary or adjacent land.

* Assume 20% occupancy rate. For every five hollows identified (or where less than five hollows will be impacted), assume one hollow will be occupied and requires replacement. Where hollows are inspected during the clearing process, actual occupation can be used as the basis for the replacement requirement.

7.3 Biodiversity offset strategy/tree and hollow replacement plan

Transport is required to prepare a tree replacement plan in accordance with the Tree and Hollow Replacement Guidelines (Transport 2022b), prior to the commencement of works: If this is not possible within or adjacent to the proposal footprint, an equivalent payment to the Transport Conservation Fund can be made prior to commencement of works.

8. Conclusion

Two PCTs were identified within the proposal footprint equating to two vegetation zones:

- Vegetation zone 1 - PCT 3150 Hunter Coast Ranges Turpentine Wet Forest
- Vegetation zone 2 - PCT 3586 Northern Sydney Scribbly Gum Woodland

The vegetation integrity score for zone 1 was 67.3 (high condition) and for zone 2 was 49.1 (high condition).

No threatened ecological communities (TECs) listed under the *Biodiversity Conservation Act 2016* (BC Act) or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) were identified within the study area.

Following habitat assessment and survey, the following 31 species were either recorded or assumed present:

1. **Scrub Turpentine *Rhodamnia rubescens* CE (BC Act), CE (EPBC Act) - recorded**
2. Tranquility Mintbush *Prostanthera askania* E (BC Act), E (EPBC Act) – assumed present
3. Magenta Lilly Pilly *Syzygium paniculatum* E (BC Act), V (EPBC Act) – assumed present
4. Dusky Woodswallow *Artamus cyanopterus cyanopterus* V (BC Act) – assumed present
5. Bush Stone-curlew *Burhinus grallarius* E (BC Act) – assumed present
6. Gang-gang Cockatoo *Callocephalon fimbriatum* V (BC Act) – assumed present
7. South-eastern Glossy Black-Cockatoo *Calyptorhynchus lathami* V (BC Act) – assumed present
8. Brown Treecreeper (eastern subspecies) *Climacteris picumnus victoriae* V (BC Act) – assumed present
9. Varied Sittella *Daphoenositta chrysoptera* V (BC Act) – assumed present
10. Little Lorikeet *Glossopsitta pusilla* V (BC Act) – assumed present
11. Swift Parrot *Lathamus discolor* E (BC Act), CE (EPBC Act) – assumed present
12. Barking Owl *Ninox connivens* V (BC Act) – assumed present
13. Powerful Owl *Ninox strenua* V (BC Act) – assumed present
14. Masked Owl *Tyto novaehollandiae* V (BC Act) – assumed present
15. Eastern Pygmy-possum *Cercartetus nanus* V (BC Act) – assumed present
16. Large-eared Pied Bat *Chalinolobus dwyeri* V (BC Act), V (EPBC Act) – assumed present
17. Spotted-tailed Quoll *Dasyurus maculatus* V (BC Act), E (EPBC Act) – assumed present
18. Eastern False Pipistrelle *Falsistrellus tasmaniensis* V (BC Act) – assumed present
19. Parma Wallaby *Macropus parma* V (BC Act) – assumed present
20. Eastern Coastal Free tailed Bat *Micronomus norfolkensis* V (BC Act) – assumed present
21. Little Bentwing-bat *Miniopterus australis* V (BC Act) – assumed present
22. Large Bentwing-bat *Miniopterus orianae oceanensis* V (BC Act) – assumed present
23. Southern Greater Glider *Petauroides volans* E (BC Act), E (EPBC Act) – assumed present
24. Yellow-bellied Glider *Petaurus australis* V (BC Act), V (EPBC Act) – assumed present
25. Squirrel Glider *Petaurus norfolcensis* V (BC Act) – assumed present
26. Koala *Phascolarctos cinereus* (E BC Act, E EPBC Act) – assumed present
27. Northern long-nosed Potoroo *Potorous tridactylus tridactylus* V (BC Act), V (EPBC Act) – assumed present
28. Grey-headed Flying-fox *Pteropus poliocephalus* (V BC Act, V EPBC Act) – assumed foraging habitat
29. Yellow-bellied Sheath-tail-bat *Saccolaimus flaviventris* V (BC Act) – assumed present
30. Greater Broad-nosed Bat *Scoteanax rueppellii* V (BC Act) – assumed present

31. Eastern Cave Bat *Vespadelus troughtoni* V (BC Act) – assumed present

These 31 threatened species were assessed in accordance with the Threatened Species Test of Significance Guidelines and EPBC Act Significant Impact Guidelines 1.1. The results of these assessments are summarised below.

The assessment under the BC Act concluded that the proposal would impact 0.36 ha of potential habitat for 31 threatened flora and fauna species. The proposal would result in removal of three individual Scrub Turpentine *Rhodamnia rubescens* recorded in the proposal footprint. The proposal would reduce the existing thin strip of wildlife corridor from 34 m to 16 m however it would not result in fragmentation or isolation of habitat. The proposal requires removal of 115 trees, including numerous mature trees along the top of the slope and eight hollow bearing trees with approximately 20 hollows of varying size. These hollows provide potential habitat for 15 threatened species assumed to be present in the proposal footprint (i.e. Gang-gang Cockatoo, South-eastern Glossy Black-Cockatoo, Little Lorikeet, Barking Owl, Powerful Owl, Masked Owl, Eastern Pygmy-possum, Spotted-tailed Quoll, Eastern False Pipistrelle, Eastern Coastal Free tailed Bat, Southern Greater Glider, Yellow-bellied Glider, Squirrel Glider, Yellow-bellied Sheath-tail-bat and Greater Broad-nosed Bat). While the hollows are of suitable diameter for these hollow dependant species, it is noted that the presence of the adjoining busy Central Coast Highway may reduce the utilisation rate of these hollows.

There are also two culverts in the proposal footprint which provide potential roosting habitat for threatened microbats (i.e. Little Bentwing-bat and Large Bentwing-bat). These culverts may require works, and as such, it has been assumed that there would be impacts to microbat roosting habitat within the culverts.

In addition, the proposal would contribute to four key threatening processes, including clearing of native vegetation, the establishment of Myrtle Rust (which was observed on Scrub Turpentine *Rhodamnia rubescens* within the proposal footprint), the loss of hollow bearing trees and the spread of *Lantana camara*.

Despite the negative environmental outcomes of the proposal, the proposal is considered unlikely to have a significant impact on the long-term survival of a local population of a threatened species as the extent of clearing is relatively small (0.36 ha) and there is similar adjoining habitat, including hollow bearing trees and culverts, that would not be impacted and would continue to provide habitat for these threatened species. As such, a BDAR is not required. Mitigation measures have been provided to minimise direct impacts of the proposal on threatened species considered likely to occur within the proposal footprint.

The assessment under the EPBC Act concluded that in regard to Tranquility Mintbush *Prostanthera askania*, Swift Parrot *Lathamus discolor*, Koala *Phascolarctos cinereus* and Southern Greater Glider *Petauroides volans*, the assumed populations within the proposal footprint do not constitute a 'population' of these species as there have been no records of these species on or near to the proposal footprint and therefore it is unlikely to support a geographically distinct regional population or a population that occurs within a bioregion. No further assessment of impact to these endangered and critically endangered species is required.

In relation to Magenta Lilly Pilly *Syzygium paniculatum*, Large-eared Pied Bat *Chalinolobus dwyeri*, Grey-headed Flying-fox *Pteropus poliocephalus*, Yellow-bellied Glider *Petaurus australis* and Northern long-nosed Potoroo *Potorous tridactylus*, the proposal footprint does not support an 'important population' of these species as it does not constitute a key source population for breeding or dispersal, is not a population necessary for maintaining genetic diversity, and is not a population that is near the limit of the species range. As such, no further assessment of impact to these vulnerably listed threatened species is required.

The proposal footprint may support a 'population of a species' of the endangered Spotted-tailed Quoll *Dasyurus maculatus* and is known to provide habitat to the critically endangered Scrub Turpentine *Rhodamnia rubescens*, however assessment of impact determined that the proposal was unlikely to have a significant impact on these species as the proposal would not lead to a long term decrease in the size of the population, significantly reduce the area of occupancy, fragment an existing population, affect habitat critical to their survival, disrupt the breeding cycle or interfere with the recovery of these species. The proposal would impact 0.36 ha of potential habitat, including nesting and denning habitat for the Spotted-tailed Quoll, however this is a relatively small area and large areas of suitable nearby habitat would remain as habitat for this species. It may also result increased impacts to *Rhodamnia rubescens* from invasive species such as *Lantana camara* and potentially facilitate the further spread of Myrtle Rust into nearby *Rhodamnia rubescens* populations. Mitigation measures have been included to minimise any direct impacts on these species.

The proposal does not require referral to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) for impacts on MNES.

In addition to standard Transport mitigation measures are the following recommendations:

Native vegetation - Disturbed areas that are not stabilised using shotcrete are to be stabilised using mesh and hydroseed, hydromulch and/or vegetation (native ground cover) following completion of works.

Threatened flora – The three Scrub Turpentine *Rhodamnia rubescens* identified in the proposal footprint are located near the lower boundary of the proposal footprint. If detailed design determines that these three individuals can be avoided, they are to be fenced *in-situ*. They are currently marked with pink flagging tape.

Fauna habitat - Hollow bearing trees identified within the proposal footprint are located on the edge of the Central Coast Highway, and on the top of a steep slope. As such, direct inspection prior to clearing may not be possible due to safety issues. Hollow bearing trees that require removal are to be felled at night (to avoid direct impacts to nocturnal hollow dependent fauna potentially utilising the hollows) and inspected by the tree lopper using a burrow scope, under the supervision of an ecologist. Alternatively, the hollow can be plugged (using a towel) and the hollow section can be cut and lowered to the ground for inspection. Works on the culverts are to be undertaken at night to avoid direct impacts on microbats potentially utilising the culverts for roosting. Alternatively, bat exclusion covers are to be placed over the culvert input and output ends after dark prior to the commencement of works, and be re-installed every afternoon for the duration of works.

Koala feed trees (Grey Gum *Eucalyptus punctata*) located at the proposed site compound option 2, are to be inspected by an ecologist during pre-clearing surveys, prior to any tree trimming to ensure no occupation by koalas.

Any injured fauna is to be taken to the nearest vet or wildlife carer.

Pests and pathogens – Hygiene protocols detailed in the mitigation measures are to be implemented to reduce the spread of Myrtle Rust. In addition, it is recommended that revegetation be undertaken in the retained strip of bushland to reduce the spread of exotics downslope where there are BioNet records of Scrub Turpentine *Rhodamnia rubescens*.

The proposal does not trigger the biodiversity offset scheme as no threatened species would be significantly impacted, nor does it trigger Transport's Biodiversity Policy as no TEC would be cleared, clearing of threatened fauna habitat is < 1 ha and there are < 10 threatened plants being impacted by the proposal.

Tree and hollow replacement guidelines apply to this proposal and the removal of approximately 115 trees and twenty hollows require offsetting. The clearing limit may vary from the proposal footprint assessed. As such, accurate counts of trees and hollows to be removed should be undertaken during pre-clearing surveys.

9. Glossary

Term	Definition
Accredited person or assessor	Means as person accredited under section 6.10 (of the BC Act) to prepare reports in accordance with the BAM.
Biodiversity Assessment Method	The Biodiversity Assessment Method is established under section 6.7 of the BC Act. The BAM is established for the purpose of assessing certain impacts on threatened species and threatened ecological communities (TECs), and their habitats, and the impact on biodiversity values.
Biodiversity Assessment Method Calculator	Biodiversity Assessment Method Calculator (BAM-C) – the online computer program that provides decision support to assessors and proponents by applying the BAM and referred to as the BAM-C. The BAM-C contains biodiversity data from the BioNet Vegetation Classification and the Threatened Biodiversity Data Collection that the assessor is required to use in a BAM assessment. The BAM-C applies the equations used in the BAM, including those to determine the number and class of biodiversity credits required to offset the impacts of a development, or created at a biodiversity stewardship site. It is published by the Department (DPIE 2020a).
Biodiversity credit report	The report produced by the BAM-C that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site (DPIE 2020a).
Biodiversity offsets	The gain in biodiversity values achieved from the implementation of management actions on areas of land, to compensate for losses to biodiversity values from the impacts of development (DPIE 2020a).
Biodiversity Offsets and Agreement Management System	The online system used to administer the Biodiversity Offsets Scheme. The BOAMS is used by accredited assessors (to carry out specific BAM-related tasks involving access to the BAM-C to perform assessments, submit data, generate credits and calculate a credit price), by landholders (to apply for a Biodiversity Stewardship Agreement and manage ongoing reporting obligations for their agreement) and by proponents of developments (to view their credit obligation or the payment required to the Biodiversity Conservation Fund).
Biodiversity risk weighting	A factor of the formulas used by the BAM to calculate credits. The biodiversity risk weighting (BRW) is a score given to each vegetation zone and species based on the 'sensitivity to loss' versus the 'sensitivity to gain'. The value is set for threatened species and listed in the TBDC. The BRW for vegetation is calculated for each vegetation zone by the BAM-C using a factor of the 'sensitivity to loss' of the PCT or TEC (located in the BioNet vegetation classification) and the 'sensitivity to gain' of the ecosystem credit species (in the TBDC) that are predicted to occur.
Biodiversity Stewardship site	Refers to land which is the subject to a Biodiversity Stewardship Agreement under the BC Act.
BioNet Atlas	The DPIE database of flora and fauna records (formerly known as the NSW Wildlife Atlas). The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails listed under the BC Act) and some fish (DPIE 2020a).
BioNet Vegetation classification	Refers to the vegetation community-level classification for use in vegetation mapping programs and regulatory biodiversity impact assessment frameworks in NSW. Refer About BioNet Vegetation Classification NSW Environment and Heritage (DPE 2020a).
Construction footprint	The area to be directly impacted by the proposal during construction activities. See also definition for subject land.

Term	Definition
Cumulative impact	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Refer to Clause 228(2) of the EP&A Regulation 2000 for cumulative impact assessment requirements.
Direct impact	Direct impacts on biodiversity values include those related to clearing native vegetation and threatened species habitat and impacts on biodiversity values prescribed by the Biodiversity Conservation Regulation 2017 (the BC Regulation) (DPIE 2020a).
Ecosystem credit species	Threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for ecosystem credits. This is analogous with the definition of 'predicted species'.
Ecosystem credits	A measurement of the value of threatened ecological communities, threatened species habitat for species that can be reliably predicted to occur with a PCT, and PCTs generally. Ecosystem credits measure the loss in biodiversity values at a development, activity, clearing or biodiversity certification site and the gain in biodiversity values at a biodiversity stewardship site (DPIE 2020a).
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic component (DPIE 2020a).
Indirect impact	Impacts that occur when the proposal affects native vegetation and threatened species habitat beyond the development footprint or within retained areas (e.g. transporting weeds or pathogens, dumping rubbish). This includes impacts from activities related to the construction or operational phase of the proposal and prescribed impacts (DPIE 2020a).
Landscape assessment area	The area which includes the subject land and a 1500 m buffer surrounding the outside edge of the boundary of the subject land or 500 m along each side of the centre line of a linear-shaped proposal
Local population	The population that occurs in the study area. The assessment of the local population may be extended to include individuals beyond the study area if it can be clearly demonstrated that contiguous or interconnecting parts of the population continue beyond the study area, according to the following definitions: • <i>The local population of a threatened plant species comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the study area.</i> • <i>The local population of resident fauna species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area.</i> • <i>The local population of migratory or nomadic fauna species comprises those individuals that are likely to occur in the study area from time to time or return year to year (OEH 2018).</i>
Matter of national environmental significance	A matter of national environmental significance (MNES) is any of the nine defined components protected by a provision of Part 3 of the EPBC Act (Commonwealth).
Mitigation	Action to reduce the severity of an impact.
Native vegetation	Has the same meaning as in section 1.6 of the BC Act and section 60B of the LLS Act. In summary, - trees (including any sapling or shrub or any scrub) - understorey <u>plants</u>

Term	Definition
	c) groundcover (being any type of herbaceous vegetation) d) <u>plants</u> occurring in a wetland. A <u>plant</u> is native to New South Wales if it was established in New South Wales before European settlement (BC Act). Native vegetation does not extend to marine vegetation (being mangroves, seagrasses or any other species of plant that at any time in its life cycle must inhabit water other than fresh water). Marine vegetation is covered by the provisions of the FM Act.
NSW (Mitchell) landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000 (DPIE 2020a).
Operational footprint	The area that will be subject to ongoing operational impacts from the proposal. This includes the road, surrounding safety verges and infrastructure, fauna connectivity structures and maintenance access tracks and compounds.
Patch size	An area of native vegetation that: - occurs on the development site or biodiversity stewardship site - includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or ≤30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site or biodiversity stewardship site (DPIE 2020a).
PlantNET	An online database of the flora of New South Wales which contains currently accepted taxonomy for plants found in the State, both native and exotic.
Population	A group of organisms, all of the same species, occupying a particular area (DPIE 2020a).
Spatial datasets	Spatial databases required to prepare a BAR - BioNet NSW (Mitchell) Landscapes – Version 3.1 - NSW Interim Biogeographic Regions of Australia (IBRA region and sub-regions) – Version 7 - NSW soil profiles - hydrogeological landscapes - acid sulfate soils risk - digital cadastral database - Vegetation Information Systems maps - Geological sites of NSW.
Species credit species	Threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for species credits (DPIE 2020a). This is analogous with the definition of ‘candidate species’.
Species credits	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection (DPIE 2020a).
Species polygon	An area of land identified in Chapter 5 (of the BAM) that contains habitat or is occupied by a threatened species (DPIE 2020a).
Study area	The area directly affected by the proposal (subject land or construction footprint) and any additional areas likely to be affected by the proposal, either directly or indirectly.
Subject land	Land subject to a development, activity, clearing, biodiversity certification or a biodiversity stewardship proposal. It excludes the landscape assessment area which surrounds the subject land (i.e., the area of land in the 1500 m buffer zone around the subject land or 500m buffer

Term	Definition
	zone for linear proposals). In the case of a biodiversity certification proposal, subject land includes the biodiversity certification assessment area (DPIE 2020a). See also definition for construction footprint.
Threatened Biodiversity Data Collection	A publicly assessable online database (registration required) which contains information for listed threatened species, populations and ecological communities (DPIE 2020a). Part of the BioNet database, published by the EHG and accessible from the BioNet website at www.bionet.nsw.gov.au .
Vegetation integrity (score)	The condition of native vegetation assessed for each vegetation zone against the benchmark for the PCT. The vegetation integrity score is the quantitative measure of vegetation condition calculated by the BAM-C (DPIE 2020a).
Vegetation zone	A relatively homogeneous area of native vegetation on a development site, clearing site, land to be biodiversity certified or biodiversity stewardship site that is the same PCT and has the same broad condition state (DPIE 2020a).

10. Abbreviations

Term	Definition
AOBV	Area of Outstanding Biodiversity Value
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method calculator
BC Act	Biodiversity Conservation Act 2016 (NSW)
BC Regulation	Biodiversity Conservation Regulation 2017 (NSW)
BDAR	Biodiversity Development Assessment Report
BOAMS	Biodiversity Offsets and Agreement Management System
BOS	Biodiversity Offset Scheme
BRW	Biodiversity risk weighting
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DIWA	Directory of Important Wetlands in Australia
DPE	Department of Planning and Environment
DPI	Department of Primary Industries
EEC	Endangered ecological community
EHG	NSW Environment and Heritage Group within the Department of Planning and Environment
EIS	Environmental Impact Statement
EP&A Act	<i>Environment Planning and Assessment Act 1979</i> (NSW)
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth)
Fisheries NSW Policy and guidelines	Fisheries NSW Policy and guidelines for fish habitat conservation and management (Update 2013)
FM Act	Fisheries Management Act 1994 (NSW)
GDE	Groundwater dependent ecosystems
IBRA	Interim Biogeographically Regionalisation of Australia
MNES	Matters of national environmental significance
PCT	Plant community type
PMST	Protected Matters Search Tool
REF	Review of Environmental Factors
SAII	Serious and Irreversible Impacts
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SSD	State Significant Development
SSI	State Significant Infrastructure
TBDC	Threatened Biodiversity Data Collection
TECs	Threatened ecological communities (VECs, EECs and CEECs)
Transport	Transport for NSW
VEC	Vulnerable Ecological Community

11. References

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- DPE (2022a), Biodiversity Assessment Method 2020 Operational Manual – Stage 1 (nsw.gov.au)
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- RTA (2011), Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects. Roads and Traffic Authority, NSW. Available at: Biodiversity Guidelines (nsw.gov.au).
- Transport (2022a), No Net Loss Guidelines
- Transport (2022b), Tree and Hollow Replacement Guidelines

12. Appendix A: Species recorded

Recorded flora

Form	Scientific Name	Common Name	Status ¹	PCT 3150	PCT 3621	N, E, HTE ²	BAM 1 %	BAM 1 #	BAM 2 %	BAM 2 #
S	<i>Acacia ulicifolia</i>	Prickly Moses	P		x	N			0.2	6
T	<i>Acmena smithii</i>	Lilly Pilly	P	X		N	1	1		
E	<i>Adiantum aethiopicum</i>	Common Maidenhair	P	x		N	0.1	15		
T	<i>Allocasuarina littoralis</i>	Black She-Oak	P		x	N			0.5	2
T	<i>Allocasuarina torulosa</i>	Forest Oak	P	x	x	N	1	5	1	2
T	<i>Angophora costata</i>	Sydney Red Gum	P	x		N				
T	<i>Angophora floribunda</i>	Rough-barked Apple	P	x		N	8	3		
E	<i>Asplenium australasicum</i>	Bird's Nest Fern	P	x		N	1.5	2		
S	<i>Backhousia myrtifolia</i>	Grey Myrtle	P	x		N	2.5	4		
T	<i>Banksia serrata</i>	Old-man Banksia	P		x	N			1	1
	<i>Bidens pilosa</i>	Cobbler's Pegs		x		HTE - NM				
E	<i>Blechnum cartilagineum</i>	Gristle Fern	P	x		N	3	100		
S	<i>Boronia ledifolia</i>	Sydney Boronia	P		x	N			4	10
E	<i>Calochlaena dubia</i>	Rainbow Fern	P	x		N	5	75		
L	<i>Cassytha pubescens</i>	Downy Dodder-laurel	P	x		N				
	<i>Cinnamomum camphora</i>	Camphor Laurel		x		HTE – M				
L	<i>Cissus hypoglauca</i>	Giant Water Vine	P	x	x	N	3	30	0.5	10
T	<i>Corymbia eximia</i>	Yellow Bloodwood	P		x	N			10	3
T	<i>Corymbia gummifera</i>	Red Bloodwood	P		x	N			20	8
S	<i>Denhamia silvestris</i>	Narrow-leaved Orangebark	P	x		N				
F	<i>Dianella caerulea</i>	Blue Flax-lily	P	x		N	0.2	6		
L	<i>Dioscorea transversa</i>	Native Yam	PP	x		N				
E	<i>Dodonaea triquetra</i>	Large-leaf Hop-bush	P	x	x	N			1	6
E	<i>Doodia aspera</i>	Prickly Rasp Fern	P	x		N	0.2	15		
G	<i>Entolasia stricta</i>	Wiry Panic	P	x		N	0.3	80		
T	<i>Eucalyptus acmenioides</i>		P		x	N			8	3
T	<i>Eucalyptus botryoides</i>	Bangalay	P	x		N				
T	<i>Eucalyptus deanei</i>	Mountain Blue Gum	P	x		N				
T	<i>Eucalyptus piperita</i>	Sydney Peppermint	P	x		N				
T	<i>Eucalyptus punctata</i>	Grey Gum	P		x	N			10	5

Form	Scientific Name	Common Name	Status ¹	PCT 3150	PCT 3621	N, E, HTE ²	BAM 1 %	BAM 1 #	BAM 2 %	BAM 2 #
T	<i>Eucalyptus saligna</i>	Sydney Blue Gum	P	x		N	15	3		
T	<i>Eucalyptus siderophloia</i>	Grey Ironbark	P	x	x	N			5	1
S	<i>Eupomatia laurina</i>	Bolwarra	P	x		N	20	25		
	<i>Erythrina crista-galli</i>	Cockspur Coral Tree		x		HTE - M				
S	<i>Ficus coronata</i>	Creek Sandpaper Fig	P	x		N				
V	<i>Gahnia clarkei</i>	Tall Saw-sedge	P	x	x	N			8	15
L	<i>Geitonoplesium cymosum</i>	Scrambling Lily	P	x		N				
E	<i>Gleichenia dicarpa</i>	Pouched Coral Fern	P	x		N				
T	<i>Glochidion ferdinandi</i>	Cheese Tree	P	x	x	N			5	3
S	<i>Grevillea buxifolia</i>	Grey Spider Flower	P		x	N			0.5	3
S	<i>Grevillea sericea</i>	Pink Spider Flower	P		x	N			0.5	3
L	<i>Gynochthodes jasminoides</i>	Sweet Morinda	P	x		N	0.5	10		
L	<i>Hibbertia dentata</i>	Twining Guinea Flower	P	x		N	0.1	2		
S	<i>Homalanthus populifolius</i>		P	x	x	N			0.2	2
F	<i>Hydrocotyle hirta</i>	Hairy Pennywort	P	x		N				
G	<i>Imperata cylindrica</i>	Blady Grass	P	x		N				
	<i>Lantana camara</i>	Lantana		x	x	HTE-M	4	25	3	30
V	<i>Lepidosperma laterale</i>	Variable Sword-sedge	P		x	N			5	80
S	<i>Leptospermum polyanthum</i>		P		x	N			0.5	2
P	<i>Livistona australis</i>	Cabbage Palm	P	x		N	5	4		
R	<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	P	x		N	3	4		
	<i>Megathyrsus maximus</i>	Guinea Grass	P	x		HTE - NM				
S	<i>Myrsine howittiana</i>	Brush Muttonwood	P	x		N				
S	<i>Myrsine variabilis</i>		P	x		N				
T	<i>Notelaea longifolia</i>	Large Mock-olive	P	x		N	1	2		
	<i>Ochna serrulata</i>	Mickey Mouse Plant		x		HTE - NM				
L	<i>Parsonsia straminea</i>	Common Silkpod	P		x	N			2	20
S	<i>Phyllanthus gunnii</i>		P	x		N				
S	<i>Pittosporum undulatum</i>	Sweet Pittosporum	P	x	x	N			2	2
E	<i>Protasparagus aethiopicus</i>	Sprengeri Fern	P	x		N				
S	<i>Rhodamnia rubescens</i>	Scrub Turpentine	CE (BC Act) CE (EPBC Act)	x		N	0.1	1		
S	<i>Rubus parvifolius</i>	Native Raspberry	P	x		N				
	<i>Senna pendula</i>			x	x	HTE-M			0.1	1
	<i>Sida rhombifolia</i>	Paddy's Lucerne		x		E	0.1	30		
L	<i>Smilax australis</i>	Lawyer Vine	P	x		N	5	28		

Form	Scientific Name	Common Name	Status ¹	PCT 3150	PCT 3621	N, E, HTE ²	BAM 1 %	BAM 1 #	BAM 2 %	BAM 2 #
L	<i>Smilax glycyphylla</i>	Sweet Sarsparilla	P		x	N			5	10
L	<i>Stephania japonica</i>	Snake vine	P	x	x	N	0.2	15	0.1	1
T	<i>Syncarpia glomulifera</i>	Turpentine	P	x		N	20	15		
S	<i>Synoum glandulosum</i>	Scentless Rosewood	P	x		N	4	4		
T	<i>Trochocarpa laurina</i>	Tree Heath	P	x		N				
S	<i>Wilkiea huegeliana</i>	Veiny Wilkiea	P	x		N	0.4	3		

Note: *Cover determined in accordance with the BAM.

¹P=Protected, E = Endangered, CE = Critically Endangered

²N=Native, E=Exotic, HTE=High threat exotic.

Recorded fauna

Scientific name	Common name	Status	
		BC Act	EPBC Act
<i>Acanthiza pusilla</i>	Brown Thornbill	P	P
<i>Cacatua galerita</i>	Sulphur-crested Cockatoo	P	P
<i>Corvus coronoides</i>	Australian Raven	P	P
<i>Gymnorhina tibicen</i>	Australian Magpie	P	P
<i>Meliphaga lewinii</i>	Lewin's Honeyeater	P	P
<i>Pachycephala pectoralis</i>	Golden Whistler	P	P
<i>Psophodes olivaceus</i>	Eastern whipbird	P	P
<i>Trichoglossus haematodus</i>	Rainbow Lorikeet	P	P

13. Appendix B: Habitat suitability assessment

The below criteria was used to determine the likelihood that a threatened species could occur in the study area. Only recorded sightings from BioNet are valid for these criteria.

Likelihood	Criteria
Recorded	The species was observed in the study area during the current survey or has been recorded within the past five years (known from a reputable source).
High	A species is considered highly likely to occur in the study area if: <i>There are previous credible records on BioNet within the study area from the last 10 years and suitable habitat is present.</i> OR <i>The species is highly mobile, is dependent on identified suitable habitat within the study area (i.e., for breeding or important life cycle periods such as winter flowering resources) and has been recorded recently (within five years) on BioNet in the locality. This also includes species known or likely to visit the study area during regular seasonal movements or migration.</i>
Moderate	A species is considered moderately likely to occur in the study area if: <i>Any suitable habitat (e.g., foraging) is present in the study area, the species is highly mobile and has been recorded in the locality in the last 10 years on BioNet. The species may be unlikely to maintain sedentary populations, however, may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area.</i> OR <i>The species is not highly mobile, is dependent on identified suitable habitat features (e.g., hollows, rocky outcrops) within the study area and has been recorded in the locality in the last 10 years on BioNet.</i> OR <i>For flora species that are associated with PCTs in the study area (see TBDC) or have been recorded in the locality in the last 10 years on BioNet – the associated PCT/habitat present in the study area is not degraded and the species was not targeted by surveys in accordance with the BAM and relevant survey guidelines. In addition, for flora species known to occur in disturbed areas (e.g., orchids), records from any time within the locality may warrant inclusion in this category.</i>
Low	A species is considered to have a low likelihood of occurring in the study area if: <i>For highly mobile species, the species may be an occasional visitor, but habitat similar to the study area is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the study area and the species has not been recorded in the locality in the last 10 years on BioNet.</i> OR <i>The species is not highly mobile, is dependent on identified suitable habitat features (e.g., hollows, rocky outcrops) within the study area and has not been recorded in the locality in the last 10 years on BioNet.</i> OR <i>For flora species that are associated with PCTs in the study area (see TBDC) and the species was not identified following targeted surveys in accordance with the BAM and relevant survey guidelines. Flora species that have been recorded in the locality on BioNet at any time, associated suitable habitat (see the TBDC) is not present in the study area, though similar habitats of the same vegetation formation is present in the study area.</i>
Unlikely	Suitable habitat for the species is absent from the study area.

Habitat suitability assessment table

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
<i>Astrotricha crassifolia</i> Thick-leaf Star-hair	V,P	V	Species	July to Dec	Two populations - Brisbane Water and Woronora. Brisbane Water population is Sterile or primarily clonal. It is unknown if the Woronora population produces viable seed, currently only mature plants and resprouters present. Parallel field traverses (10 metres apart in open vegetation, 5 m apart in dense vegetation; DPIE, 2020c).	Shrub to 2.4 m high, root-suckering. Branchlets have a deep, firm covering of dense hairs. Occurs near Patonga (Gosford LGA), and in Royal NP and on the Woronora Plateau (Sutherland and Campbelltown LGAs). Occurs in dry sclerophyll woodland on sandstone. Flowers in spring. Resprouter from root suckers or basal stem buds after fire. Seed storage and dispersal ecology and germination requirements are unknown. Not enough data to rank sensitivity to either frequent or infrequent fires.	PMST	Low Not recorded previously in the locality on BioNet and not associated with PCT 3150.
<i>Callistemon linearifolius</i> Netted Bottle Brush	V		Species	Oct-Jan	Highly polyploid, with morphological variation within related species. <i>Callistemon linearifolius</i> group requires genetic and taxonomic review Parallel field traverses (20 metres apart in open vegetation, 10 m apart in dense vegetation; DPIE, 2020c).	Grows in dry sclerophyll forest on the coast and adjacent ranges. Flowers spring – summer.	BioNet 35 records PCT 3586	Low Not recorded during surveys.
<i>Epacris purpurascens</i> var. <i>purpurascens</i>	V		n/a	Sept-Oct	Use flowers to identify, as easily confused with <i>E. pulchella</i> and <i>Woollsia</i> . Flowering peak Sep - Oct, but flowers sporadically throughout the year. Requires a voucher specimen RBG. Parallel field traverses (20 metres apart in open vegetation, 10 m apart in dense vegetation; DPIE, 2020c).	Found in a range of habitat types, most of which have a strong shale soil influence. Lifespan is recorded to be 5-20 years, requiring 2-4 years before seed is produced in the wild. Killed by fire and re-establishes from soil-stored seed. Identifiable all year, but easiest during flowering (July-Sept. on coast, mainly Oct.-Nov. on tablelands)	BioNet 2 records PCT 3150 PCT 3586	Low Not recorded during surveys
<i>Darwinia glaucophylla</i>	V		n/a	All year	Dispersal: seeds mainly dispersed by ants. References: Nomination; Payne, R. (2007) flora and fauna	Occurs in sandy heath, scrub and woodlands often associated with sandstone rock platforms or near hanging swamps and friable sandstone shallow soils. Associated species in scrub include: <i>Banksia ericifolia</i> , <i>Acacia</i>	BioNet 674 records PCT 3586	Low Not recorded during surveys.

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
					survey-Kariong High School; Payne, R. (2007) Addendum to flora and fauna survey-Kariong High School; Booyens, C. (2010) The effect of disturbance regimes (fire and slashing) on populations of <i>Darwinia glaucophylla</i> on the Central Coast of NSW, Australia; Booyens, C. et al (2014) The Effect of Disturbance Regime on <i>Darwinia glaucophylla</i> (Myrtaceae) and its Habitat; Mulcahy, A. (2018) Targeted Surveys and Monitory of <i>Darwinia glaucophylla</i> at Priority Management Sites, Saving Our Species Program. Parallel field traverses (10 metres apart in open vegetation, 5 m apart in dense vegetation; DPIE, 2020c).	<i>terminalis</i>, <i>A. oxycedrus</i>, <i>Angophora hispida</i>, <i>Hakea teretifolia</i>, <i>Bauera rubioides</i>, and in woodland: <i>Corymbia gummifera</i>, <i>C. eximia</i>, <i>Eucalyptus haemastoma</i> and <i>E. punctata</i>. Flowers winter and spring. Seed is dispersed by ants. Germination is from soil stored seed which requires heat to break seed dormancy. Germination is unlikely in the absence of fire. Killed by fire and populations may fluctuate in relation to time since the last fire. Highly sensitive to too frequent and infrequent fire. Recommended fire interval is 5-10 years. Hybrids with <i>D. fascicularis</i> are readily identifiable by their erect habit. Identifiable all year, but best when flowering (May to Dec)		
<i>Eucalyptus camfieldii</i> Camfield's Stringybark	V,P	V	n/a	All year	Parallel field traverses (40 metres apart in open vegetation, 20 m apart in dense vegetation; DPIE, 2020c).	Poor coastal country in shallow sandy soils overlying Hawkesbury sandstone. Coastal heath mostly on exposed sandy ridges. Occurs mostly in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas. Associated species frequently include stunted species of <i>E. oblonga</i> Narrow-leaved Stringybark, <i>E. capitellata</i> Brown Stringybark and <i>E. haemastoma</i> Scribbly Gum. Population sizes are difficult to estimate because its extensive lignotubers may be 20 m across. A number of stems arise from these lignotubers giving the impression of individual plants. Flowering period is irregular, flowers recorded throughout the year. Poor response to too frequent fires.	BioNet 6 records PMST	Low Not associated with PCT 3150.

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
<i>Eucalyptus nicholii</i> Narrow-leaved Black Peppermint	V	V	Species	All year	Easily confused with <i>E. acaciiformis</i> and <i>E. radiata</i> and is often planted well outside range. Parallel field traverses (40 metres apart in open vegetation, 20 m apart in dense vegetation; DPIE, 2020c).	This species is sparsely distributed but widespread on the New England Tablelands from Nundle to north of Tenterfield, being most common in central portions of its range. Found largely on private property and roadsides, and occasionally in conservation reserves. Planted as urban trees, windbreaks and corridors. Typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or metasedimentary rock. Seedling recruitment is common, even in disturbed soils, if protected from grazing and fire. Tends to grow on lower slopes in the landscape.	BioNet 1 record	Low Not associated with PCT 3150.
<i>Grammitis stenophylla</i> Narrow-leaf Finger Fern	E		Species	All year	Survey after significant rainfall event. Species is difficult to detect after long dry periods. Parallel field traverses (10 metres apart in open vegetation, 5 m apart in dense vegetation; DPIE, 2020c).	<i>Grammitis stenophylla</i> is known from thirty (30) locations across New South Wales. The species is known to occur in twenty four (24) conservation reserves. It is common in several areas, such as the Mount Warning Shield, the sandstone reserves of the lower Clarence, the granites of Washpool, Gibraltar and Nymbioda National Parks, and also Mt Jerusalem and Nightcap National Park. The species was also recently recorded from New England National Park. The Endangered status of this species does not appear to be warranted, and requires review. <i>Grammitis stenophylla</i> has an EOO (15892407km ²), AOO (696km ²) and number of localities= 25 that place the species in IUCN status of least concern. This species is a candidate for delisting from the NSW Biodiversity Conservation Act 2016. Is found in moist places, usually near streams, on rocks in rainforest and dry and moist eucalypt forest.	BioNet 1 record PCT 3150 PCT 3586	Low Not recorded during targeted surveys
<i>Grevillea shiressii</i>	V	V	Species	Jul-Dec, maybe Jan	Use flowers to identify, as easily confused with <i>Hakea</i> and <i>Stenocarpus</i> . Limit to flowering. May also flower into Jan, depending on conditions. Parallel field traverses (20 metres apart in open vegetation, 10 m apart in dense vegetation; DPIE, 2020c).	Grows along creek banks in wet sclerophyll forest with a moist understorey in alluvial sandy or loamy soils. Flowers mainly late winter to Spring (July-Dec), with seed released at maturity in October. Flowers are bird pollinated and seeds are dispersed by ants. A fire sensitive obligate seeder that is highly susceptible to local extinction due to frequent fire, however, fire is likely to be relatively infrequent in the habitat of <i>G. shiressii</i> . Seed germination does occur in the absence of	BioNet 1192 records PMST	Low Not associated with PCT 3150.

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
						fire, however some physical disturbance is likely to promote seed germination.		
<i>Hibbertia procumbens</i> Spreading Guinea Flower	E		Species	Oct-Jan	Parallel field traverses (10 metres apart in open vegetation, 5 m apart in dense vegetation; DPIE, 2020c).	Majority of known populations occur within <i>Banksia ericifolia</i> – <i>Angophora hispida</i> – <i>Allocasuarina distyla</i> scrub/heath on skeletal sandy soils. May also be found associated with 'hanging swamp' vegetation communities on sandy deposits. Flowers in summer. Is capable of resprouting following fire and has a persistent soil-stored seed bank. Identifiable when flowering, generally between Dec and March depending on prevailing climatic conditions.	BioNet 1820 records	Low Not associated with PCT 3150.
<i>Hibbertia puberula</i>	E		Species	Oct-Dec	Use flowers to locate and identify as species is cryptic. Survey when temperature is below 25 degrees (drops petals at higher temperatures). Use local reference site within 10 km and at similar elevation, to determine flowering period. Requires voucher confirmation from RBG, petals not required for voucher confirmation (will drop from sample once picked). Parallel field traverses (10 metres apart in open vegetation, 5 m apart in dense vegetation; DPIE, 2020c).	This species is widespread, but never common. It extends from Wollemi National Park south to Morton National Park and the south coast near Nowra. Early records of this species are from the Hawkesbury River area and Frenchs Forest in northern Sydney, South Coogee in eastern Sydney, the Hacking River area in southern Sydney, and the Blue Mountains. It favours low heath on sandy soils or rarely in clay, with or without rocks underneath. Flowering time is October to December, sometimes into January. Occurs on sandy soil often associated with sandstone, or on clay. Habitats are typically dry sclerophyll woodland communities, although heaths are also occupied. One of the recently (2012) described subspecies also favours upland swamps.	BioNet 7 record	Low Not associated with PCT 3150.
<i>Macadamia tetraphylla</i> Rough-shelled Bush Nut	V	V	Species	All year		Confined chiefly to the north of the Richmond River in north-east NSW, extending just across the border into Queensland. Many records, particularly those further south, are thought to be propagated. Found in subtropical rainforest, usually near the coast.	BioNet 1 record	Low Not associated with PCT 3150.
<i>Melaleuca biconvexa</i>	V,P	V	Species	All year	Parallel field traverses (20 metres apart in open vegetation,	Biconvex Paperbark generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	BioNet 228 records	Low

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
Biconvex Paperbark					10 m apart in dense vegetation; DPIE, 2020c).	Flowering occurs over just 3-4 weeks in September and October. Resprouts following fire.	PMST PCT 3150	Not recorded during targeted surveys
<i>Melaleuca deanei</i> Deane's Paperbark	V	V	Species	All year	Optimum time for flowering is Oct - Nov, but flowers infrequently and unpredictably. Detectable vegetatively all year round. Parallel field traverses (20 metres apart in open vegetation, 10 m apart in dense vegetation; DPIE, 2020c).	Deane's Paperbark occurs in two distinct areas, in the Kuring-gai/Berowra and Holsworthy/Wedderburn areas respectively. There are also more isolated occurrences at Springwood (in the Blue Mountains), Wollemi National Park, Yalwal (west of Nowra) and Central Coast (Hawkesbury River) areas. The species occurs mostly in ridgetop woodland, with only 5% of sites in heath on sandstone. Flowers appear in summer but seed production appears to be small and consequently the species exhibits a limited capacity to regenerate.	PMST PCT 3586	Low Not recorded previously in the locality on BioNet.
<i>Micromyrtus blakelyi</i>	V	V	Species	All year	Skeletal soils and Rock areas - Hawkesbury sandstone rock platforms and outcrops or within 50m are a habitat constraint for this species. Parallel field traverses (20 metres apart in open vegetation, 10 m apart in dense vegetation; DPIE, 2020c).	Restricted to areas near the Hawkesbury River, north of Sydney. Distribution extends from north of Maroota in the north, to Cowan in the south. All known populations occur within the Baulkham Hills and Hornsby local government areas. Typically occurs within heathlands in shallow sandy soil in cracks and depressions of sandstone rock platforms. Flowers in Spring from September to November and produces fruit (an indehiscent nut) October to November. Fire sensitive, with adults killed by fire and recruitment occurring from a soil seed bank. It is not known whether germination occurs in the absence of disturbance.	PMST PCT 3586	Low Not recorded previously in the locality on BioNet.
<i>Prostanthera askania</i> Tranquility Mintbush	E	E	Species	Sep-Nov	Use flowers to locate. Identify species by leaf traits to distinguish from most other co-occurring species. <i>P. incisa</i> is similar in appearance, but can be separated by leaf size and indumentum. Parallel field traverses (15 metres apart in open vegetation,	Occurs adjacent to, but not immediately in, drainage lines on flat to moderately steep slopes formed on Narrabeen sandstone and alluvial soils derived from it. Occurs in moist sclerophyll forest and warm temperate rainforest communities, and the ecotone between them. These communities are generally tall forests with a mesic understorey; Sydney Blue Gum Eucalyptus saligna and Turpentine Syncarpia glomulifera are usually present, though canopy species present can be highly variable. Ecological knowledge about this species is very limited. The species is likely to be fire-sensitive given the moist	BioNet 465 records PMST PCT 3150	Moderate Assumed present

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
					10 m apart in dense vegetation; DPIE, 2020c).	forest habitats it occupies, however, its fire ecology is currently unknown. May be a colonising species that takes advantage of increased light following natural canopy-cover disturbance. May be out competed by invading weed species such as Lantana. Appears in some locations to propagate vegetatively by 'stem-layering' where prostrate branches take root where they remain in contact with the soil. This characteristic and the species' tendency at many sites to form dense clumps make accurate counting of individual plants within populations difficult. Flowering usually occurs in spring, however, it is known that the timing of both flowering and fruiting can be variable. Most easily identifiable when in flower between September to Dec, if conditions are favourable.		
<i>Prostanthera junonis</i> Somersby Mintbush	E	E	Species	Oct-Dec	Use flowers to locate. Survey when most likely to flower Oct - Dec. Species also sporadically flowers at other times throughout the year. Parallel field traverses (15 metres apart in open vegetation, 10 m apart in dense vegetation; DPIE, 2020c).	The species is restricted to the Somersby Plateau. It occurs on both the Somersby and Sydney Town soil landscapes on gently undulating country over weathered Hawkesbury sandstone within open forest/low woodland/open scrub. It occurs in both disturbed and undisturbed sites. The dominant flowering period for this species is October to mid-Dec depending on weather/site conditions. The plant is very difficult to identify outside of this time. While mature plants appear to be incapable of resprouting after fire, it may trigger seed germination. Cryptic, only detectable when in flower between September to Nov depending on prevailing climatic conditions.	BioNet 920 records PMST	Low Not associated with PCT 3150.
<i>Rhizanthella slateri</i> Eastern Underground Orchid	V	E	Species	Sep-Nov	Use buds, flowers and/or fruit to identify to species. Parallel field traverses (10 metres apart in open vegetation, 5 m apart in dense vegetation; DPIE, 2020c).	<i>Rhizanthella slateri</i> is restricted to New South Wales where it is currently known from 14 populations including Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra. <i>Rhizanthella slateri</i> flowers from September to Nov. Apparently prefers sclerophyll forest with a reasonably deep layer of organic litter although little else is known about the habitat of this species. The ecology of <i>Rhizanthella slateri</i> is poorly known given that it grows almost completely below the soil surface, with flower heads being the only part of the plant that can occur	PCT 3150 PCT 3586	Low Not recorded previously in the locality on BioNet

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
						above ground. Therefore plants are usually located only when the soil is disturbed.		
<i>Rhodamnia rubescens</i> Scrub Turpentine	CE	CE	Species	All year	Parallel field traverses (15 metres apart in open vegetation, 10 m apart in dense vegetation; DPIE, 2020c).	Shrub or small tree to 25 m high with reddish/brown, fissured bark. Young stems densely covered in fine hairs. Leaves 5–10 cm long, 2–5 cm wide, upper surface green and sparsely hairy, lower surface paler and sparsely to densely hairy. Leaves strongly 3-veined from base with moderately dense, translucent oil dots. Petiole 4–9 mm long. Inflorescences 1–3 per axil, usually 3-flowered with petals 4–6 mm diam. and white. Fruit globose, 5–8 mm diam., red turning black. Occurs in coastal districts north from Batemans Bay in New South Wales, approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Populations of <i>Rhodamnia rubescens</i> typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m a.s.l. in areas with rainfall of 1,000–1,600 mm. Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. This species is characterised as highly to extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	BioNet 432 records PMST PCT 3150	Recorded 3 records
<i>Rhodomyrtus psidioides</i> Native Guava	CE	CE	Species	All year	Parallel field traverses (15 metres apart in open vegetation, 10 m apart in dense vegetation; DPIE, 2020c).	A shrub or small tree to 12 m high with brown scaly bark. Young branchlets and inflorescences covered with pale hairs. Leaves 5–25 cm long, 2.5–6.5 cm wide with upper surface hairless and glossy, and paler lower surface. Leaves have conspicuous lateral veins and numerous oil glands. Petiole 15–20 mm long. Flowers clustered and on a long stalk (10–25 mm long). Petals 7–10 mm long, white or pink. Berry 15–25 mm long, 10–15 mm wide, yellow and fleshy. Occurs from Broken Bay, approximately 90 km north of Sydney, New South Wales, to Maryborough in Queensland. Populations are typically restricted to coastal and sub-coastal areas of low elevation however the species does occur up to c. 120 km inland in the Hunter and Clarence River catchments and along the Border Ranges in NSW.	BioNet 1 record PMST PCT 3150 PCT 3586	Low Not recorded during targeted surveys.

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
						Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines. This species is characterised being extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.		
<i>Syzygium paniculatum</i> Magenta Lilly Pilly	E1,P	V	Species	Apr-Jun	Use fruit to identify. Naturally occurring plants generally produce low numbers of fruit, while cultivated individuals and offspring generally produce high numbers of fruit. Samples need to be verified by RBG to detect hybridisation. Parallel field traverses (20 metres apart in open vegetation, 10 m apart in dense vegetation; DPIE, 2020c).	On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	BioNet 13 records PMST PCT 3150	Moderate Assumed present
<i>Tetratheca glandulosa</i>	V		Species	Aug-Nov	Use flowers to locate. Occasionally flowers in Jul. Survey Aug - Nov. Parallel field traverses (10 metres apart in open vegetation, 5 m apart in dense vegetation; DPIE, 2020c).	Associated with shale-sandstone transition habitat where shale-cappings occur over sandstone, with associated soil landscapes such as Lucas Heights, Gynea, Lambert and Faulconbridge. Topographically, the plant occupies ridgetops, upper-slopes and to a lesser extent mid-slope sandstone benches. Soils are generally shallow, consisting of a yellow, clayey/sandy loam. Stony lateritic fragments are also common in the soil profile on many of these ridgetops. Vegetation structure varies from heaths and scrub to woodlands/open woodlands, and open forest. Common woodland tree species include: <i>Corymbia gummifera</i>, <i>C. eximia</i>, <i>Eucalyptus haemastoma</i>, <i>E. punctata</i>, <i>E. racemosa</i>, and/or <i>E. sparsifolia</i>, with an understorey dominated by species from the families Proteaceae, Fabaceae, and Epacridaceae. Resprouts from a woody root following fire, however the role fire plays in seed germination and persistence of the species is unclear. In a similar species, <i>Tetratheca hirsuta</i>, it has been shown that exposure of the seed to cold smoke and/or smoked water derived from burnt native vegetation promoted germination.	BioNet 2 records PCT 3586	Low Not recorded during surveys.

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
						Field observations following fire indicate that the plant is likely to be clonal. Best identified when in flower between July and Nov.		
<i>Tetradlea juncea</i> Black-eyed Susan	V,P	V	Species	Sep-Oct	Peak flowering Sep - Oct, though will flower sporadically at other times throughout the year. Parallel field traverses (10 metres apart in open vegetation, 5 m apart in dense vegetation; DPIE, 2020c).	It is usually found in low open forest/woodland with a mixed shrub understory and grassy groundcover. However, it has also been recorded in heathland and moist forest. Most populations occur on low nutrient soils associated with the Awaba Soil Landscape. It generally prefers well-drained sites below 200m elevation and annual rainfall between 1000 - 1200mm. The preferred substrates are sandy skeletal soil on sandstone, sandy-loam soils, low nutrients; and clayey soil from conglomerates, pH neutral. Cryptic, only detectable when in flower generally July to Dec but may be irregular due to prevailing climatic conditions.	PMST	Low Not recorded previously in the locality on BioNet and not associated with PCT 3150.
<i>Birds</i>								
<i>Anthochaera Phrygia</i> Regent Honeyeater	E4A,P	CE	Dual Ecosystem Foraging only Species breeding	N/A	No survey required. The species is assessed for species credits via the Important Habitat Map in BOAMS. Area search < 1 ha = 20 minutes at dawn or dusk	Non-breeding flocks of the Regent Honeyeater forage in flowering coastal Swamp Mahogany and Spotted Gum forests, particularly on the central coast and occasionally on the upper north coast. Birds are occasionally seen on the south coast. There are three known key breeding areas, two of them in NSW - Capertee Valley and Bundarra-Barraba regions. The species breeds between July and January in Box-Ironbark and other temperate woodlands and riparian gallery forest dominated by River Sheoak. Nomadic and/or possibly migratory; coastal visitor mostly March – August.	BioNet 4 records PMST PCT 3586	Low Proposal footprint is not on the important habitat map for this species.
<i>Apus pacificus</i> Fork-tailed Swift	P	C,J,K	n/a	n/a	Area search < 1 ha = 20 minutes at dawn or dusk	The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher. The Fork-tailed Swift leaves its breeding grounds in Siberia from August–September and usually arrives in Australia around October. In their breeding range, they nest on mountain cliffs or island rock caves, inside narrow crevices or in cracks on vertical cliff faces.	BioNet 2 records	Low Not associated with PCT 3150.

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
<i>Artamus cyanopterus cyanopterus</i> Dusky Woodswallow	V,P		Ecosystem	N/A	N/A	The Dusky Woodswallow is widespread in eastern, southern and southwestern Australia. In New South Wales it is widespread from coast to inland, including the western slopes of the Great Dividing Range and farther west. It is sparsely scattered in, or largely absent from, much of the Upper Western region The Dusky Woodswallow is often reported in woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations. It has also been recorded in shrublands and heathlands and various modified habitats, including regenerating forests; very occasionally in moist forests or rainforests. At sites where Dusky Woodswallows are recorded the understorey is typically open with sparse eucalypt saplings, acacias and other shrubs, including heath. The ground cover may consist of grasses, sedges or open ground, often with coarse woody debris. Birds are also often observed in farm land, usually at the edges of forest or woodland or in roadside remnants or wind breaks with dead timber. In western New South Wales this species is primarily associated with River Red Gum/Black Box/Coolibah open forest/woodland associated with larger river/creek systems and is less common and far more patchily distributed in other communities such as mallee and cypress-pine woodland.	BioNet 6 records PCT 3150 PCT 3586	Moderate Assumed present
<i>Botaurus poiciloptilus</i> Australasian Bittern	E1,P	E	Ecosystem	N/A	Brackish or freshwater wetlands are habitat constraints for this species. Surveying in breeding season is best as species relatively cryptic but call when breeding but water must be present (ie can not survey when wetlands are dry). Unit of measure: Area	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (<i>Typha</i> spp.) and spikerushes (<i>Eleocharis</i> spp.). Hides during the day amongst dense reeds or rushes and feed mainly at night on frogs, fish, yabbies, spiders, insects and snails. Feeding platforms may be constructed over deeper water from reeds trampled by the bird; platforms are often littered with prey remains. Breeding occurs in summer from October to January; nests are built in secluded places in densely-vegetated wetlands on a platform of reeds; there are usually six olive-brown eggs to a clutch.	BioNet 3 records PMST	Low Not associated with PCT 3150.

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
<i>Burhinus grallarius</i> Bush Stone-curlew	E1,P		Species	All year	Fallen/standing dead timber logs are habitat constraints to this species. Unit of measure: Area	Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber. Largely nocturnal, being especially active on moonlit nights. Feed on insects and small vertebrates, such as frogs, lizards and snakes. Nest on the ground in a scrape or small bare patch. Two eggs are laid in spring and early summer.	BioNet 162 records PCT 3150	Moderate Assumed present
<i>Calidris ferruginea</i> Curlew Sandpiper	E1,P	CE,C,J,K	Dual Species Ecosystem	N/A	No survey required. The species is assessed for species credits via the Important Habitat Map in BOAMS. Unit of measure: Area	It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland. It forages in or at the edge of shallow water, occasionally on exposed algal mats or waterweed, or on banks of beach-cast seagrass or seaweed. It roosts on shingle, shell or sand beaches; spits or islets on the coast or in wetlands; or sometimes in salt marsh, among beach-cast seaweed, or on rocky shores. Curlew Sandpipers are omnivorous, feeding on worms, molluscs, crustaceans, insects and some seeds. Birds breed at 2 years of age and the oldest recorded bird is 19 years old. Most birds caught in Australia are between 3 and 5 years old. Identifiable from September – March.	BioNet 1 record PMST	Low Not associated with PCT 3150.
<i>Callocephalon fimbriatum</i> Gang-gang Cockatoo	VP,3		Dual Ecosystem Foraging only Species Breeding	Oct - Jan	Hollow bearing trees and Eucalypt tree species with hollows at least 3 m above the ground and with hollow diameter of 7 cm or larger are habitat constraints. Species sensitive to degraded habitat. Habitat assessment to determine breeding/nesting opportunities. (a) lone adult males identified during the	In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. May also occur in sub-alpine Snow Gum (<i>Eucalyptus pauciflora</i>) woodland and occasionally in temperate	BioNet 6 records PMST PCT 3150 PCT 3586	Moderate Assumed present

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
					breeding season (October to January); or (b) an occupied nest. Area search < 1 ha = 20 minutes at dawn or dusk	rainforests. Favours old growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are 10 cm in diameter or larger and at least 9 m above the ground in eucalypts.		
<i>Calyptrorhynchus lathamii</i> South-eastern Glossy Black-Cockatoo	V,P,2		Dual Ecosystem Foraging only Species Breeding	Jan - Sept	Habitat constraints include the presence of Allocasuarina and casuarina species, hollow bearing trees, living or dead trees with hollows greater than 15cm diameter and greater than 8m above ground. Species sensitive to degraded habitat. Habitat assessment to determine breeding/nesting opportunities (a) begging birds of any age or sex; or (b) lone adult males identified during the breeding season (April to August); or (c) an occupied nest. Area search < 1 ha = 20 minutes at dawn or dusk	Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (<i>Allocasuarina littoralis</i>) and Forest Sheoak (<i>A. torulosa</i>) are important foods. Inland populations feed on a wide range of sheoaks, including Drooping Sheoak, <i>Allocasuarina diminuta</i> , and <i>A. gymnathera</i> . Belah is also utilised and may be a critical food source for some populations. In the Riverina, birds are associated with hills and rocky rises supporting Drooping Sheoak, but also recorded in open woodlands dominated by Belah (<i>Casuarina cristata</i>). Feeds almost exclusively on the seeds of several species of she-oak (<i>Casuarina</i> and <i>Allocasuarina</i> species), shredding the cones with the massive bill. Dependent on large hollow-bearing eucalypts for nest sites. A single egg is laid between March and May.	BioNet 42 records PMST PCT 3150 PCT 3586	Moderate Assumed present
<i>Charadrius leschenaultii</i> Greater Sand Plover	V	V	Dual Ecosystem foraging only Species	N/A	No survey required. The species is assessed for species credits via the Important Habitat Map in BOAMS.	The Greater Sand-plover breeds in central Asia from Armenia to Mongolia, moving further south for winter. In Australia the species is commonly recorded in parties of 10-20 on the west coast, with the far northwest being the stronghold of the population. The species is apparently rare on the east coast, usually found singly. In NSW, the species has been recorded between the northern rivers and the Illawarra, with most records coming from the Clarence and Richmond estuaries.	BioNet 1 records	Low Not associated with PCT 3150.
<i>Climacteris picumnus victoriae</i> Brown Treecreeper (eastern subspecies)	V,P		Ecosystem	All year	The species is allocated to ecosystem credit species given that hollows are now on the credit profile, therefore likely to capture suitable breeding habitat for the species.	Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species;	BioNet 1 record PCT 3150 PCT 3586	Moderate Assumed present

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
					Unit of measure: Area	also found in mallee and River Red Gum (<i>Eucalyptus camaldulensis</i>) Sedentary, considered to be resident in many locations throughout its range; present in all seasons or year-round at many sites; territorial year-round, though some birds may disperse locally after breeding. Hollows in standing dead or live trees and tree stumps are essential for nesting.		
<i>Daphoenositta chrysoptera</i> Varied Sittella	V,P		Ecosystem	All year	Area search < 1 ha = 20 minutes at dawn or dusk	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticated bark, dead branches, standing dead trees and small branches and twigs in the tree canopy. Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years. Generation length is estimated to be 5 years.	BioNet 21 records PCT 3150 PCT 3586	Moderate Assumed present
<i>Falco subniger</i> Black Falcon	V,P		Ecosystem	N/A	No survey comments. Unit of measure: Area	Inhabits plains, grasslands, foothills, timbered watercourses, wetland environs, crops, occasionally over towns and cities. Circles over driven sheep, quail shooters, harvesting machines. Waiting for quail, pipits to flush. Often pirates prey from other raptors.	BioNet 1 record	Low Not associated with PCT 3150.
<i>Glossopsitta pusilla</i> Little Lorikeet	V,P		Ecosystem	All year	Area search < 1 ha = 20 minutes at dawn or dusk	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species. Feeds mostly on nectar and pollen, occasionally on native fruits such as mistletoe, and only rarely in orchards Gregarious, travelling and feeding in small flocks (<10), though often with other lorikeets. Flocks numbering	BioNet 25 records PCT 3150 PCT 3586	Moderate Assumed present

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
						hundreds are still occasionally observed and may have been the norm in past centuries. Roosts in treetops, often distant from feeding areas. Nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts. Entrance is small (3 cm) and usually high above the ground (2–15 m). These nest sites are often used repeatedly for decades, suggesting that preferred sites are limited. Riparian trees often chosen, including species like Allocasuarina. Nesting season extends from May to September. In years when flowering is prolific, Little Lorikeet pairs can breed twice, producing 3-4 young per attempt. However, the survival rate of fledglings is unknown.		
<i>Grantiella picta</i> Painted Honeyeater	V	V	Ecosystem	All year	Mistletoes present at a density of greater than five mistletoes per hectare are a habitat constraint	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits Boree/ Weeping Myall (<i>Acacia pendula</i>), Brigalow (<i>A. harpophylla</i>) and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus <i>Amyema</i>. Insects and nectar from mistletoe or eucalypts are occasionally eaten. Nest from spring to autumn in a small, delicate nest hanging within the outer canopy of drooping eucalypts, she-oak, paperbark or mistletoe branches.	PMST	Low Not recorded previously in the locality on BioNet and not associated with PCT 3150.
<i>Haematopus fuliginosus</i> Sooty Oystercatcher	V,P		Species	Aug - Jan	Located within 100 m of estuarine areas and the ocean is a habitat constraint. Survey during the breeding period of August to January to reliably detect	Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. Forages on exposed rock or coral at low tide for foods such as limpets and mussels. Breeds in spring and summer, almost exclusively on offshore islands, and occasionally on isolated	BioNet 2 records	Low Not associated with PCT 3150.

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
					presence/absence because they may be highly mobile at other times. Unit of measure: Area	promontories. The nest is a shallow scrape on the ground, or small mounds of pebbles, shells or seaweed when nesting among rocks.		
<i>Haematopus longirostris</i> Pied Oystercatcher	E1,P	-	Species	Aug-Jan	Located within 100 m of estuarine areas and the ocean is a habitat constraint. Survey during the breeding period of August to January to reliably detect presence/absence because they may be highly mobile at other times.	Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide, for molluscs, worms, crabs and small fish. The chisel-like bill is used to pry open or break into shells of oysters and other shellfish. Nests mostly on coastal or estuarine beaches although occasionally they use saltmarsh or grassy areas. Nests are shallow scrapes in sand above the high tide mark, often amongst seaweed, shells and small stones. Two to three eggs are laid between August and January. The female is the primary incubator and the young leave the nest within several days.	BioNet 170 records	Low Not associated with PCT 3150.
<i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle	V, P	C	Dual Ecosystem Foraging only Species Breeding	July - Dec	Waterbodies - Within 1km of rivers, lakes, dams, creeks and coastlines as well as living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines are habitat constraints. Habitat assessment to detect large stick nests within 1 km of waterbodies. Area search < 1 ha = 20 minutes	The White-bellied Sea-Eagle is distributed along the coastline (including offshore islands) of mainland Australia and Tasmania. It also extends inland along some of the larger waterways, especially in eastern Australia. The White-bellied Sea-Eagle feeds opportunistically on a variety of fish, birds, reptiles, mammals and crustaceans, and on carrion and offal. Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest). Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large	BioNet 118 records PCT 3150 PCT 3586	Low No suitable habitat detected during surveys

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
						emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Nests are large structures built from sticks and lined with leaves or grass. Feed mainly on fish and freshwater turtles, but also waterbirds, reptiles, mammals and carrion. Hunts its prey from a perch or whilst in flight (by circling slowly, or by sailing along 10–20 m above the shore). Prey is usually carried to a feeding platform or (if small) consumed in flight, but some items are eaten on the ground. May be solitary, or live in pairs or small family groups consisting of a pair of adults and dependent young. Typically lays two eggs between June and September with young birds remaining in the nest for 65-70 days.		
<i>Hieraaetus morphnoides</i> Little Eagle	V,P		Dual Ecosystem Foraging only Species Breeding	Aug - Oct	Habitat assessment to detect nest trees in live or large old tress and presence of a male and female with nesting material. Area search < 1 ha = 20 minutes	Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. Lays two or three eggs during spring, and young fledge in early summer. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion.	BioNet 16 records PCT 3150 PCT 3586	Low No suitable habitat detected during surveys
<i>Hirundapus caudacutus</i> White-throated Needletail	P	C,J,K	Ecosystem	N/A	Area search < 1 ha = 20 minutes at dawn or dusk. EPBC listed species	In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. The White-throated Needletail is widespread in eastern and south-eastern Australia. After breeding in eastern Siberia, north-eastern China and Japan, the species leaves the breeding grounds between late August and October, flying singly or in scattered flocks and enter Australia via the Torres Strait, usually during September and October.	BioNet 42 records PMST PCT 3150 PCT 3586	Low Not recorded
<i>Irediparra gallinacean</i>	V,P		Ecosystem	All year	Habitat constraints include freshwater wetlands with a good	The Comb-crested Jacana occurs on freshwater wetlands in northern and eastern Australia, mainly in coastal and subcoastal regions, from the north-eastern Kimberley	BioNet 1 record	Low

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
Comb-crested Jacana					surface cover of floating aquatic vegetation No survey comment	Division of Western Australia to Cape York Peninsula then south along the east coast to the Hunter region of NSW, with stragglers recorded in south-eastern NSW (possibly in response to unfavourable conditions further north). Beyond Australia, the Comb-crested Jacana occurs from Borneo and the Philippines, south and east through Sulawesi, the Moluccas and Lesser Sunda Islands, to the Aru Islands, New Guinea and New Britain.		Not associated with PCT 3150.
<i>Ixobrychus flavicollis</i> Black Bittern	V,P		Ecosystem	N/A	Waterbodies - Land within 40 m of freshwater and estuarine wetlands, in areas of permanent water and dense vegetation are habitat constraints The species was allocated to ecosystem credit because it's presence can be predicted based on vegetation and it is difficult to survey. It is primarily a vagrant to NSW. Feeds on fish, frogs and lizards therefore considered a top order predator.	Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves. Feeds on frogs, reptiles, fish and invertebrates, including snails, dragonflies, shrimps and crayfish, with most feeding done at dusk and at night. During the day, roosts in trees or on the ground amongst dense reeds. When disturbed, freezes in a characteristic bittern posture (stretched tall, bill pointing up, so that shape and streaked pattern blend with upright stems of reeds), or will fly up to a branch or flush for cover where it will freeze again. Generally solitary, but occurs in pairs during the breeding season, from Dec to March. Like other bitterns, but unlike most herons, nesting is solitary. Nests, built in spring are located on a branch overhanging water and consist of a bed of sticks and reeds on a base of larger sticks. Between three and five eggs are laid and both parents incubate and rear the young.	BioNet 10 records PCT 3150	Low No suitable habitat recorded during surveys
<i>Lathamus discolor</i> Swift Parrot	E1,P,3	CE	Dual Ecosystem Foraging Species	N/A	Check important habitat map for this species. Habitat assessment to detect preferred feed trees. Area search < 1 ha = 20 minutes at dawn or dusk	Migrates to the Australian south-east mainland between March and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany <i>Eucalyptus robusta</i> , Spotted Gum <i>Corymbia maculata</i> , Red Bloodwood <i>C. gummifera</i> , Mugga Ironbark <i>E. sideroxylon</i> , and White Box <i>E. albens</i> .	BioNet 9 records PMST PCT 3150 PCT 3586	Moderate Proposal footprint is on the important habitat map for this species (Figure 2-6).

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
			Breeding			Commonly used lerp infested trees include Inland Grey Box <i>E. microcarpa</i>, Grey Box <i>E. moluccana</i> and Blackbutt <i>E. pilularis</i>. Return to some foraging sites on a cyclic basis depending on food availability. Following winter they return to Tasmania where they breed from September to January, nesting in old trees with hollows and feeding in forests dominated by Tasmanian Blue Gum <i>Eucalyptus globulus</i>. Identifiable from March to September.		
<i>Limosa limosa</i> Black-tailed Godwit	V,P	C,J,K	Dual	No survey required	The species is a dual credit species, assessed for species credits (important habitat map) and ecosystem credits (all other areas the species is likely to occur). No survey is required if the subject land is on an important habitat map for a species unless the species profile in the TBDC states otherwise. The species is considered present and the part of the subject land that is within the important habitat map forms the species polygon used to generate species credits (BAM section 5.2.5 Box 2). Any remaining habitat on the subject land, e.g. unmapped locations used by these species is assessed for ecosystem credits. If the species is at risk of a serious and irreversible impact (SAII), the area mapped as important habitat is the area identified as a potential SAI and section 9.1 of the BAM must be addressed. For guidance on important habitat map species on biodiversity stewardship	The Black-tailed Godwit is a migratory wading bird that breeds in Mongolia and Eastern Siberia and flies to Australia for the southern summer, arriving in August and leaving in March. In NSW, it is most frequently recorded at Kooragang Island (Hunter River estuary), with occasional records elsewhere along the coast, and inland. Records in western NSW indicate that a regular inland passage is used by the species, as it may occur around any of the large lakes in the western areas during summer, when the muddy shores are exposed. The species has been recorded within the Murray-Darling Basin, on the western slopes of the Northern Tablelands and in the far north-western corner of the state.	BioNet 1 record	Low Not associated with PCT 3150.

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
					sites refer to the BAM Stage 3 Operational Manual.			
<i>Lophoictinia isura</i> Square-tailed Kite	V,P		Dual Ecosystem; Species breeding	Sept - Jan	Habitat assessment to detect breeding site/nest tree Area search < 1 ha = 20 minutes	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland. Is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage. Appears to occupy large hunting ranges of more than 100km ² . Breeding is from July to Feb, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.	BioNet 34 records PCT 3150 PCT 3586	Low No suitable habitat recorded during surveys
<i>Melithreptus gularis gularis</i> Black-chinned Honeyeater (eastern subspecies)	V		Ecosystem	N/A	No survey comments. Unit of measure: Area	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (<i>Eucalyptus sideroxylon</i>), White Box (<i>E. albens</i>), Inland Grey Box (<i>E. microcarpa</i>), Yellow Box (<i>E. melliodora</i>), Blakely's Red Gum (<i>E. blakelyi</i>) and Forest Red Gum (<i>E. tereticornis</i>). Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river sheoaks (nesting habitat) and tea-trees. Two or three eggs are laid and both parents and occasionally helpers feed the young.	BioNet 1 record	Low Not associated with PCT 3150.
<i>Neophema pulchella</i> Turquoise Parrot	V,P		Ecosystem	N/A	The species is allocated to full ecosystem credit species given that hollows are now on the credit profile, therefore likely to capture suitable breeding habitat for the species (highly mobile and breeding habitat unpredictable). Some experts suggested the species may be more common than originally thought and/or increasing in number. Unit of measure: Area	Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Usually seen in pairs or small, possibly family, groups and have also been reported in flocks of up to thirty individuals. Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter. Forages quietly and may be quite tolerant of disturbance. However, if flushed it will fly to a nearby tree and then return to the ground to browse as soon as the danger has passed. Nests in tree hollows, logs or posts, from August to Dec. It lays four or five white, rounded eggs on a nest of decayed wood dust.	BioNet 1 record	Low Not associated with PCT 3150.

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
<i>Nettapus coromandelianus</i> Cotton Pygmy-Goose	E		Species	All year	Waterbodies - Deep permanent fresh waters on floodplains with floating and submergent vegetation are habitat constraints. Survey anytime although temporary wetland habitat should be surveyed in summer/early autumn after summer rains and deep permanent wetlands at end of dry season e.g. August to October when depending on the year many temporary wetlands have dried out. It is easy to overlook as it frequently occurs singly and discretely amongst floating vegetation.	The Cotton Pygmy-Goose is a small surface-feeding duck with a goose-like bill. The male has a white head, neck and underparts, dark glossy green upperparts and a narrow dark breast band. Females are duskier and have a dark stripe through the eye and a white eyebrow. Although once found from north Queensland to the Hunter River in NSW, the Cotton Pygmy-Goose is now only a rare visitor to NSW. Uncommon in Queensland. Freshwater lakes, lagoons, swamps and dams, particularly those vegetated with waterlilies and other floating and submerged aquatic vegetation. The Cotton Pygmy-goose uses tall standing dead trees with hollows located close to water for roosting and breeding. Nesting occurs between November and April. Goslings remain with the female until approximately six months old. Birds may move according to local feed supply.	PCT 3150 PCT 3586	Low Not recorded previously in the locality on BioNet.
<i>Ninox connivens</i> Barking Owl	V,P,3		Dual Ecosystem Foraging only Species Breeding	May - Dec	Habitat assessment to detect suitable hollow bearing trees >20 cm diameter. Look for signs of breeding (a) presence of male and female OR (b) calling to each other (duetting) OR (c) find nest Minimum 2 nights stagwatching/call playback	Inhabits woodland and open forest, ling fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to ly breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey on these fertile soils. Roost In shaded portions of tree canopies, ling tall midstorey trees with dense foliage such as Acacia and Casuarina species. During nesting season, the male perches in a nearby tree overlooking the hollow entrance. Preferentially hunts small arboreal mammals such as Squirrel Gliders and Ringtail Possums, but when loss of tree hollows decreases these prey populations the owl becomes more reliant on birds, invertebrates and terrestrial mammals such as rodents and rabbits. Can catch bats and moths on the wing, but typically hunts by sallying from a tall perch.	BioNet 9 records PCT 3150 PCT 3586	Moderate Assumed present

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
						Requires very large permanent territories in most habitats due to sparse prey densities. Monogamous pairs hunt over as much as 6000 hectares, with 2000 hectares being more typical in NSW habitats. Calls at all time of year, but strongest response in March-June. Avoid early nesting (July-Sept) when surveys pull the female off eggs on cold nights.		
<i>Ninox strenua</i> Powerful Owl	V,P		Dual Ecosystem Species	May - Aug	Habitat assessment to detect suitable hollow bearing trees >20 cm diameter. Look for signs of breeding (a) presence of male and female OR (b) calling to each other (duetting) OR (c) find nest Minimum 2 nights stagwatching as this species does not respond well to call playback	The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine <i>Syncarpia glomulifera</i>, Black She-oak <i>Allocasuarina littoralis</i>, Blackwood <i>Acacia melanoxylon</i>, Rough-barked Apple <i>Angophora floribunda</i>, Cherry Ballart <i>Exocarpus cupressiformis</i> and a number of eucalypt species. The main prey items are medium-sized arboreal marsupials, particularly the Greater Glider, Common Ringtail Possum and Sugar Glider. There may be marked regional differences in the prey taken by Powerful Owls. For example in southern NSW, Ringtail Possum make up the bulk of prey in the lowland or coastal habitat. At higher elevations, such as the tableland forests, the Greater Glider may constitute almost all of the prey for a pair of Powerful Owls. Flying foxes are important prey in some areas; birds comprise about 10-50% of the diet depending on the availability of preferred mammals. As most prey species require hollows and a shrub layer, these are important habitat components for the owl. Pairs of Powerful Owls demonstrate high fidelity to a large territory, the size of which varies with habitat quality and thus prey densities. In good habitats a mere 400 can support a pair; where hollow trees and prey have been depleted the owls need up to 4000 ha. Powerful Owls nest in large tree hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old. While the female and young are in the nest hollow the male Powerful Owl	BioNet240 records PCT 3150 PCT 3586	Moderate Assumed present

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
						roosts nearby (10-200 m) guarding them, often choosing a dense "grove" of trees that provide concealment from other birds that harass him. Powerful Owls are monogamous and mate for life. Nesting occurs from late autumn to mid-winter, but is slightly earlier in north-eastern NSW (late summer - mid autumn). Clutches consist of two dull white eggs and incubation lasts approximately 38 days. Identifiable all year.		
<i>Pandion cristatus</i> Eastern Osprey	V,P,3	M	Dual Ecosystem Foraging only Species Breeding	April - Nov	Habitat assessment to detect stick nests in trees > 15 m or artificial structures within 100 m of a floodplain for nesting. Area search < 1 ha = 20 minutes	Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. Breed from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	BioNet 115 records PCT 3150 PCT 3586	Low No suitable habitat recorded during surveys
<i>Pachyptila turtur subantarctica</i> Fairy Prion (southern)		V	N/A	N/A	N/A	The fairy prion (southern) breeds on Macquarie Island and a number of other subantarctic islands outside of Australia. There are 80 to 250 breeding pairs in Australia and a global population of 80 000. In Australia, breeding is recorded on two rock stacks off Macquarie Island and on the nearby Bishop and Clerk Island. The population may have been larger prior to the arrival of black rats on Macquarie Island. The subspecies digs burrows among rocks or low vegetation in which to nest. Burrows may be dug below mat forming herbs. Feeds by plucking food from the ocean surface. Some individuals may migrate towards New Zealand and southern Australia in winter. The other subspecies (<i>P. t. turtur</i>) breeds on New Zealand offshore islands in Bass Strait and the Falkland Islands. That subspecies has a population of several million pairs. Threats to the fairy prion (southern) include is the accidental introduction of rats or other vertebrate predators to Macquarie Island.	PMST	Low Not recorded previously in the locality on BioNet and not associated with PCT 3150.

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
<i>Petroica boodang</i> Scarlet Robin	V,P		Ecosystem	N/A	No survey comments. Unit of measure: Area	The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat. In autumn and winter, the Scarlet Robin joins mixed flocks of other small insectivorous birds which forage through dry forests and woodlands.	PCT 3150 PCT 3586	Low Not recorded previously in the locality on BioNet.
<i>Petroica phoenicea</i> Flame Robin	V	-	Ecosystem	N/A	Breeding and non-breeding habitat is very different, key should be protecting breeding habitat. The species will occupy smaller patches outside breeding season. Paddock trees are used for roosting and foraging. Unit of measure: Area	The Flame Robin is endemic to south eastern Australia, and ranges from near the Queensland border to south east South Australia and also in Tasmania. In NSW, it breeds in upland areas and in winter, many birds move to the inland slopes and plains. It is likely that there are two separate populations in NSW, one in the Northern Tablelands, and another ranging from the Central to Southern Tablelands. Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys. The groundlayer of the breeding habitat is dominated by native grasses and the shrub layer may be either sparse or dense. Occasionally occurs in temperate rainforest, and also in herbfields, heathlands, shrublands and sedgeland at high altitudes. In winter, birds migrate to drier more open habitats in the lowlands (i.e. valleys below the ranges, and to the western slopes and plains). Often occurs in recently burnt areas; however, habitat becomes unsuitable as vegetation closes up following regeneration. In winter lives in dry forests, open woodlands and in pastures and native grasslands, with or without scattered	PCT 3150 PCT 3586	Low Not recorded previously in the locality on BioNet.

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
						trees, occasionally seen in heathland or other shrublands in coastal areas. Birds forage from low perches, from which they sally or pounce onto small invertebrates which they take from the ground or off tree trunks, logs and other coarse woody debris. Flying insects are often taken in the air and sometimes glean for invertebrates from foliage and bark. In their autumn and winter habitats, birds often sally from fence-posts or thistles and other prominent perches in open habitats. Occur singly, in pairs, or in flocks of up to 40 birds or more; in the non-breeding season they will join up with other insectivorous birds in mixed feeding flocks. Breeds in spring to late summer. Nests are often near the ground and are built in sheltered sites, such as shallow cavities in trees, stumps or banks. Builds an open cup nest made of plant materials and spider webs. Eggs are oval in shape and are pale bluish- or greenish-white and marked with brownish blotches; clutch size is three or four eggs.		
<i>Ptilinopus magnificus</i> Wompoo Fruit-Dove	V.P		Ecosystem	All year	Area search < 1 ha = 20 minutes at dawn or dusk	Occurs along the coast and coastal ranges from the Hunter River in NSW to Cape York Peninsula. It is rare south of Coffs Harbour. Three subspecies are recognised, with the most southerly in NSW and south-eastern Queensland. It used to occur in the Illawarra, though there are no recent records. Occurs in, or near rainforest, low elevation moist eucalypt forest and brush box forests and feeds on a diverse range of tree and vine fruits and is locally nomadic - following ripening fruit. Thought to be an effective medium to long-distance vector for seed dispersal. It feeds alone, or in loose flocks at any height in the canopy.	BioNet 1 record	Low Not associated with PCT 3150.

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
						The nest is a typical pigeon nest - a flimsy platform of sticks on a thin branch or a palm frond, often over water, usually 3 - 10 m above the ground. Breeds in spring and early summer; a single white egg is laid. Most often seen in mature forests, but also found in remnant and regenerating rainforest.		
<i>Ptilinopus regina</i> Rose-crowned Fruit-Dove	V,P		Ecosystem	N/A	No survey comments. Unit of measure: Area	Rose-crowned Fruit-doves occur mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful. They are shy pigeons, not easy to see amongst the foliage, and are more often heard than seen. They feed entirely on fruit from vines, shrubs, large trees and palms, and are thought to be locally nomadic as they follow the ripening of fruits. Some populations are migratory in response to food availability - numbers in north-east NSW increase during spring and summer then decline in April or May.	PCT 3150	Low Not recorded previously in the locality on BioNet.
<i>Ptilinopus superbus</i> Superb Fruit-Dove	V,P		Ecosystem	N/A	No survey comments. Unit of measure: Area	Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees. Part of the population is migratory or nomadic. There are records of single birds flying into lighted windows and lighthouses, indicating that birds travel at night. At least some of the population, particularly young birds, moves south through Sydney, especially in autumn. Breeding takes place from September to January. The nest is a structure of fine interlocked forked twigs, giving a stronger structure than its flimsy appearance would suggest, and is usually 5-30 metres up in rainforest and rainforest edge tree and shrub species. The male incubates the single egg by day, the female incubates at night. Identifiable all year.	BioNet 1 record PCT 3150	Moderate Assumed present
<i>Pycnoptilus floccosus</i>		V	N/A			Pilotbirds are endemic to south-east Australia. Upland Pilotbirds occur above 600 m in the Brindabella Ranges in the Australian Capital Territory, and in the Snowy	PMST	Low

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
Pilotbird						Mountains in New South Wales and north-east Victoria (Higgins & Peter 2002; Loyn et al. 2021). Lowland Pilotbirds occur in forests from the Blue Mountains west of Newcastle, around the wetter forests of eastern Australia, to Dandenong near Melbourne (Higgins & Peter 2002; Loyn et al. 2021). Habitat critical to the survival of the Pilotbird includes: • wet sclerophyll forests in temperate zones in moist gullies with dense undergrowth (Higgins & Peter 2002), and • dry sclerophyll forests and woodlands occupying dry slopes and ridges (Higgins & Peter 2002).		Not recorded previously in the locality on BioNet and not associated with PCT 3150.
<i>Thalassarche cauta steadi</i> White-capped Albatross	P	V	EEC Marine	N/A	No survey comment	This species breeds on a number of islands in New Zealand waters. Virtually the entire population nests in the Auckland Islands, comprising between 75,000 and 117,000 breeding pairs. A small number of pairs nest on Bollons Island in the Antipodes Islands and occasionally on The Forty-Fours in the Chatham Islands. After breeding most birds remain in Australasian waters with some adults migrating across the Indian Ocean to seas off South Africa and Namibia. In NSW waters it is probably frequently overlooked due to the difficulties of separating it from the Shy Albatross. However, it appears to be a regular visitor principally occurring between March and December.	PMST	Low Not recorded previously in the locality on BioNet and not associated with PCT 3150.
<i>Turnix maculosus</i> Red-backed Button-quail	V,P		Species	All year	Nocturnal surveys to flush birds from habitat should be used however identification is difficult and may require photos or handling individuals to distinguish from other more common species. Also important to note that call surveys including playback and songmeters not known to be effective as not known whether it responds, in what months it mostly calls, identification from button-quail species.	Over their Australian range, Red-backed Button-quail inhabit grasslands, open and savannah woodlands with grassy ground layer, pastures and crops of warm temperate areas, typically only in regions subject to annual summer rainfall greater than 400 mm. In NSW, said to occur in grasslands, heath and crops. Said to prefer sites close to water, especially when breeding. The species has been observed associated with the following grasses (in various vegetation formations): speargrass <i>Heteropogon</i> , Blady Grass <i>Imperata cylindrica</i> , Triodia, Sorghum, and Buffel Grass <i>Cenchrus ciliaris</i> . Observations of populations in other parts of its range suggest the species prefers sites near water, including	BioNet 2 records	Low Not associated with PCT 3150.

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
					Unit of measure: Area	grasslands and sedgelands near creeks, swamps and springs, and wetlands. Red-backed Button-quail usually breed in dense grass near water, and nests are made in a shallow depression sparsely lined with grass and ground litter. The timing of breeding is not well known. In NSW, clutches recorded October to mid-Feb, but elsewhere in Australia, clutches recorded from late Nov to as late as May-June. It appears only the male incubates the clutch and tends the young, which are precocial. Red-backed Button-quail are nocturnal and crepuscular in their activity, and forage on the ground. They eat seeds and insects, but little is known of their diet.		
<i>Tyto novaehollandiae</i> Masked Owl	V,P		Dual Ecosystem Species	May - Aug	Habitat assessment to detect suitable hollow bearing trees >20 cm diameter. Look for signs of breeding (a) presence of male and female OR (b) calling to each other (duetting) OR (c) find nest Minimum 2 nights stagwatching/call playback	Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats. Pairs have a large home-range of 500 to 1000 hectares. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting. Identifiable all year.	BioNet 8 records PCT 3150 PCT 3586	Moderate Assumed present
<i>Tyto tenebricosa</i> Sooty Owl	V,P,3		Dual Ecosystem Species	April - Aug	Habitat assessment to detect suitable hollow bearing trees >20 cm diameter. Look for signs of breeding (a) presence of male and female OR (b) calling to each other (duetting) OR (c) find nest Minimum 2 nights stagwatching/call playback	Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. Roosts by day in the hollow of a tall forest tree or in heavy vegetation; hunts by night for small ground mammals or tree-dwelling mammals such as the Common Ringtail Possum (<i>Pseudocheirus peregrinus</i>) or Sugar Glider (<i>Petaurus breviceps</i>). Nests in very large tree-hollows.	BioNet 14 records	Low Not associated with PCT 3150.
<i>Mammal</i>								

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
<i>Cercartetus nanus</i> Eastern Pygmy-possum	V,P		Species	Oct - March	Species is very difficult to detect, especially via spotlighting. Baited camera traps (minimum 14 nights)	Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable. Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum (<i>Pseudocheirus peregrinus</i>) dreys or thickets of vegetation, (e.g. grass-tree skirts); nest-building appears to be restricted to breeding females; tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks.Young can be born whenever food sources are available, however most births occur between late spring and early autumn.Agile climbers, but can be caught on the ground in traps, pitfalls or postholes; generally nocturnal. Frequently spends time in torpor especially in winter, with body curled, ears folded and internal temperature close to the surroundings.	BioNet 65 records PCT 3150	Moderate Assumed present
<i>Chalinolobus dwyeri</i> Large-eared Pied Bat	V,P	V	Species	Nov - Jan	Habitat assessment to determine presence of roosting habitat (i.e. cliffs, rocky areas containing caves, overhangs or crevices, mines or tunnels) or within 2 km of them are habitat constraints for this species. Survey techniques: • Har trap or mist net (4 nights x 4 hours/night) • Acoustic detection (4 nights x 4 hours/night) • Radio tracking/roost search	Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (<i>Petrochelidon ariel</i>), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from Nov through to January in roof domes in sandstone caves and overhangs. They remain loyal to the same cave over many years. Found in well-timbered areas containing gullies. The relatively short, broad wing combined with the low weight per unit area of wing indicates manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy. Likely to hibernate through the coolest months.	BioNet 10 records PMST PCT 3150	Moderate Assumed present

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
						It is uncertain whether mating occurs early in winter or in spring.		
<i>Dasyurus maculatus</i> Spotted-tailed Quoll	V,P	E	Ecosystem	All year	Baited camera traps (minimum 14 nights) Cage trapping should be limited to Dec to Oct. Post breeding months (Sept to Nov) where females have dependent young should be avoided.	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites. Mostly nocturnal, although will hunt during the day; spends most of the time on the ground, although also an excellent climber and will hunt possums and gliders in tree hollows and prey on roosting birds. Use communal 'latrine sites', often on flat rocks among boulder fields, rocky cliff-faces or along rocky stream beds or banks. Such sites may be visited by multiple individuals and can be recognised by the accumulation of the sometimes characteristic 'twisty-shaped' faeces deposited by animals. A generalist predator with a preference for medium-sized (500g-5kg) mammals. Consumes a variety of prey, including gliders, possums, small wallabies, rats, birds, bandicoots, rabbits, reptiles and insects. Also eats carrion and takes domestic fowl. Females occupy home ranges up to about 750 hectares and males up to 3500 hectares. Are known to traverse their home ranges along densely vegetated creeklines. Average litter size is five; both sexes mature at about one year of age. Life expectancy in the wild is about 3-4 years.	BioNet 19 records PMST PCT 3150 PCT 3586	Moderate Assumed present
<i>Falsistrellus tasmaniensis</i> Eastern False Pipistrelle	V,P		Ecosystem	Oct-mar	Acoustic detection (4 nights x 4 hours/night)	Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. Hunts beetles, moths, weevils and other flying insects above or just below the tree canopy. Hibernates in winter. Females are pregnant in late spring to early summer. Identifiable from mid spring to mid autumn.	BioNet 14 records PCT 3150 PCT 3586	Moderate Assumed present
<i>Macropus parma</i> Parma Wallaby	V		Species	All year	No survey comments. Unit of measure: Area	Preferred habitat is moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest.	BioNet 2 records	Moderate

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
						Typically feed at night on grasses and herbs in more open eucalypt forest and the edges of nearby grassy areas. During the day they shelter in dense cover.	PCT 3150 PCT 3586	Assumed present
<i>Micronomus norfolkensis</i> Eastern Coastal Free tailed Bat	V,P		Ecosystem	Oct-Mar	Acoustic detection (4 nights x 4 hours/night)	Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures. Usually solitary but also recorded roosting communally, probably insectivorous.	BioNet 18 records PCT 3150 PCT 3586	Moderate Assumed present
<i>Miniopterus australis</i> Little Bentwing-bat	V,P		Dual Ecosystem Foraging only Species Breeding	Dec - Feb	Habitat assessment for suitable roosting habitat (cave/mine/tunnel etc) is a habitat constraint for this species. One harp trap per cave/mine/tunnel (4 nights x 4 hours/night)	Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. They often share roosting sites with the Common Bentwing-bat and, in winter, the two species may form mixed clusters. In NSW the largest maternity colony is in close association with a large maternity colony of Eastern Bentwing-bats (<i>Miniopterus schreibersii</i>) and appears to depend on the large colony to provide the high temperatures needed to rear its young. Maternity colonies form in spring and birthing occurs in early summer. Males and juveniles disperse in summer. Only five nursery sites /maternity colonies are known in Australia. Identifiable Mid spring to mid-autumn	BioNet 75 records PCT 3150 PCT 3586	Moderate Assumed present
<i>Miniopterus orianae oceanensis</i> Large Bentwing-bat	V,P		Dual Ecosystem Foraging only	Dec - Feb	Habitat assessment for suitable roosting habitat (cave/mine/tunnel etc) is a habitat constraint for this species.	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. Maternity caves have very specific temperature and humidity regimes. At other times of the year, populations disperse within about 300 km range of maternity caves. Cold caves	BioNet 48 records PCT 3150 PCT 3586	Moderate Assumed present

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
			Species Breeding		One harp trap per cave/mine/tunnel (4 nights x 4 hours/night)	are used for hibernation in southern Australia. Breeding or roosting colonies can number from 100 to 150,000 individuals. Hunt in forested areas, catching moths and other flying insects above the treetops. Hibernate from June to August		
<i>Myotis Macropus</i> Southern Myotis	V		Species	Oct - March	Presence of waterbodies with permanent pools/stretches 3m or wider, including rivers, large creeks, billabongs, lagoons, estuaries, dams and other waterbodies, on or within 200m of the site are habitat constraints or this species. Survey techniques: • Har trap or mist net (4 nights x 4 hours/night) • Acoustic detection (4 nights x 4 hours/night) • Roost search (30 min per structure)a	Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface. In NSW females have one young each year usually in Nov or Dec. Identifiable from October to March	BioNet 18 records PCT 3150 PCT 3586	Low No suitable habitat recorded during survey
<i>Petauroides volans</i> Southern Greater Glider	E	E	Species	All year	No survey comments. Tracks, scats and scratches And Spotlightling And Baited camera traps (minimum 14 nights) Or Elliot traps (max 4 nights) Unit of measure: Area	They are locally common in wet and damp sclerophyll forest on the ranges and coastal plains from near Mossman ne Queensland to Daylesford, Victoria. The require large tree hollows for shelter.	BioNet 6 records PMST PCT 3150 PCT 3586	Moderate Assumed present
<i>Petaurus australis</i>	V	V	Ecosystem	N/A	No survey comments. Tracks, scats and scratches	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed	BioNet 14 records	Moderate

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
Yellow-bellied Glider					And Spotlightling And Camera traps Baited camera traps (minimum 14 nights) Or Elliot traps (max 4 nights) Or Call playback Unit of measure: Area	coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south. Feed primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein. Extract sap by incising (or biting into) the trunks and branches of favoured food trees, often leaving a distinctive 'V'-shaped scar. Live in small family groups of two - six individuals and are nocturnal. Den, often in family groups, in hollows of large trees. Very mobile and occupy large home ranges between 20 to 85 ha to encompass dispersed and seasonally variable food resources.	PMST PCT 3150 PCT 3586	Assumed present
<i>Petaurus norfolcensis</i> Squirrel Glider	V,P		Species	All year Mar-Aug	Survey year round but sites with bipinnate acacia, autumn winter flowering trees and shrubs such as Eucalyptus robusta and Banksia sp (integrifolia etc) should be subject to a more retracted survey period of between March-August. Relies on large old trees with hollows for breeding and nesting. These trees are also critical for movement and typically need to be closely-connected (i.e. no more than 50 m apart).. Tracks, scats and scratches And Spotlightling And Camera traps Baited camera traps (minimum 14 nights) Or Elliot traps (max 4 nights)	Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey. Live in family groups of a single adult male one or more adult females and offspring. Require abundant tree hollows for refuge and nest sites. Diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein.	BioNet 5 records PCT 3150 PCT 3586	Moderate Assumed present

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
					Or Call playback Unit of measure: Area			
<i>Phascolarctos cinereus</i> Koala	E	E	Species	All year	Presence of one koala use feed tree Parallel field traverses: 40 metres apart in open vegetation, 20 m apart in dense vegetation Survey techniques: - Spot assessment: no rain, 3 SAT sites - Spotlighting: no rain, 1 x 200 m transect, 2 nights Passive acoustic (Sep-Dec) 1 recording unit/5 ha for 7 nights.	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Inactive for most of the day, feeding and moving mostly at night. Spend most of their time in trees, but will descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size. Generally solitary, but have complex social hierarchies based on a dominant male with a territory overlapping several females and subordinate males on the periphery. Females breed at two years of age and produce one young per year.	BioNet 12 records PMST PCT 3150 PCT 3586	Moderate Preferred feed tree <i>E. punctata</i> covers 10% of the canopy in PCT 3586.
<i>Phoniscus papuensis</i> Golden-tipped Bat	V,P		Ecosystem	N/A	No survey comments. Unit of measure: Area	Found in rainforest and adjacent wet and dry sclerophyll forest up to 1000m. Also recorded in tall open forest, Casuarina-dominated riparian forest and coastal Melaleuca forests. Bats will fly up to two kilometres from roosts to forage in rainforest and sclerophyll forest on mid and upper-slopes. Roost mainly in rainforest gullies on small first- and second-order streams in usually abandoned hanging Yellow-throated Scrubwren and Brown Gerygone nests modified with an access hole on the underside. Bats may also roost under thick moss on tree trunks, in tree hollows, dense foliage and epiphytes. Bats will use multiple roost and change roosts regularly. Bats roost individually or in small colonies which can contain up to approximately 20 bats of both males and females or just a single sex. Maternity roosts may occur away from water sources with one maternity roost found 450m upslope of the nearest water course in a broken bough.	PCT 3150 PCT 3586	Low Not recorded previously in the locality on BioNet.

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
						Specialist feeder on small web-building spiders. There is one breeding cycle per year. Most active in warmer months October to March. Not active in winter or wet/windy/cold weather.		
<i>Potorous tridactylus tridactylus</i> Northern long-nosed Potoroo	V,P	V	Species	All year	Presence of dense shrub layer or alternatively high canopy cover exceeding 70% (i.e. to capture populations inhabiting wet sclerophyll and rainforest) is a habitat constrain for this species. Easier to locate in spring but with suitable survey effort and using appropriate techniques (such as camera trapping) it should be detectable all year round. Baited camera traps (minimum 14 nights)	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature. The fruit-bodies of hypogeous (underground-fruiting) fungi are a large component of the diet of the Long-nosed Potoroo. They also eat roots, tubers, insects and their larvae and other soft-bodied animals in the soil. Often digs small holes in the ground in a similar way to bandicoots. Mainly nocturnal, hiding by day in dense vegetation - however, during the winter months animals may forage during daylight hours. Individuals are mainly solitary, non-territorial and have home range sizes ranging between 2-5 ha. Breeding peaks typically occur in late winter to early summer and a single young is born per litter. Adults are capable of two reproductive bouts per annum.	BioNet 3 records PMST PCT 3150	Moderate Assumed present
<i>Pseudomys novaehollandiae</i> New Holland Mouse	P	V	Ecosystem	N/A	No survey comments. Unit of measure: Area	Known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes It is a social animal, living predominantly in burrows shared with other individuals Distribution is patchy in time and space, with peaks in abundance during early to mid stages of vegetation succession typically induced by fire	PMST	Low Not recorded previously in the locality on BioNet and not associated with PCT 3150.
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	V,P	V	Dual Ecosystem Foraging only	October - Dec	Habitat assessment for breeding camps (3 days (one per month), 2 hours / day.	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	BioNet 417 records PMST PCT 3150 PCT 3586	Moderate foraging No roosting camps recorded during surveys

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
			Species Breeding			Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young. Annual mating commences in January and conception occurs in April or May; a single young is born in October or Nov. Site fidelity to camps is high; some camps have been used for over a century. Can travel up to 50 km from the camp to forage; commuting distances are more often <20 km. Feed on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines. Also forage in cultivated gardens and fruit crops.		
<i>Saccolaimus flaviventris</i> Yellow-bellied Sheath-tail-bat	V,P		Ecosystem	Oct-Mar	Acoustic detection (4 nights x 4 hours/night)	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory. Breeding has been recorded from Dec to mid-March, when a single young is born. Seasonal movements are unknown; there is speculation about a migration to southern Australia in late summer and autumn.	BioNet 5 records PCT 3150	Moderate Assumed present
<i>Scoteanax rueppellii</i> Greater Broad-nosed Bat	V,P		Ecosystem	Oct-Mar	Acoustic detection (4 nights x 4 hours/night)	Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings. Forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m. Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and	BioNet 24 records PCT 3150 PCT 3586	Moderate Assumed present

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
						other large, slow-flying insects; this species has been known to eat other bat species. Little is known of its reproductive cycle, however a single young is born in January; prior to birth, females congregate at maternity sites located in suitable trees, where they appear to exclude males during the birth and raising of the single young. Identifiable mid spring to mid autumn		
<i>Vespadelus trouhoni</i> Eastern Cave Bat	V,P		Species	Nov - Jan	Habitat assessment to determine presence of roosting habitat (i.e. cliffs, rocky areas containing caves, overhangs or crevices, mines or tunnels) within 2 km is a habitat constraint for this species. Survey techniques within 100m of breeding habitat: • Har trap or mist net (4 nights x 4 hours/night) • Roost search • Acoustic detection (4 nights x 4 hours/night) Radio tracking/roost search	Very little is known about the biology of this uncommon species. A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. Occasionally found along cliff-lines in wet eucalypt forest and rainforest. Little is understood of its feeding or breeding requirements or behaviour.	BioNet 25 records PCT 3150 PCT 3586	Moderate Assumed present
<i>Amphibians</i>								
<i>Heleioporus australiacus</i> Giant Burrowing Frog	V	V	Species	Sept - May	Aural-visual surveys - 960 minutes/500 m transect repeated over 8 surveys. in areas of native vegetation located within 300 metres of suitable breeding habitat within a weed of heavy rainfall >50 mm in 24 hrs, >100 mm over 3 days) Or Tadpole searches Feb to May for 10 minutes /50m ² of water surface area repeated over 8 surveys, conducted at night.	The Giant Burrowing Frog is distributed in south eastern NSW and Victoria, and appears to exist as two distinct populations: a northern population largely confined to the sandstone geology of the Sydney Basin and extending as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria. Habitat and ecology Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based.	BioNet 12 records PMST PCT 3150 PCT 3586	Low No suitable habitat recorded during surveys

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
					Survey methods: Aural-visual surveys or tadpole searches. Aural-visual searches are completed as transects running through areas of native vegetation located within 300 metres of suitable breeding habitat. These are completed within a week of heavy rainfall (e.g. >50 millimetres in 24 hours, >100 millimetres over three days). Tadpole searches are completed within areas of identified suitable breeding waterbodies, surveying at night when tadpoles are most active. Acoustic detection is not likely to be effective due to the very limited and unpredictable calling by males (Penman et al. 2005a; Recsei 1997). Potential habitat: Suitable breeding habitat consists of ephemeral flowing streams that have permanent pools, or in upland swamps, and are located within native vegetation. Most typically breeding occurs in streams with a bed width of up to five metres (e.g. 2nd order and 3rd order streams) and upland swamps located on suitable geologies. Non-breeding habitat is native vegetation adjacent to the breeding sites. Non-breeding habitat is any area of PCT on the subject land that is located within 300 metres of suitable breeding habitat as individuals can be expected to migrate up to 300 metres from breeding habitat to establish	Spends more than 95% of its time in non-breeding habitat in areas up to 300 m from breeding sites. Whilst in non-breeding habitat it burrows below the soil surface or in the leaf litter. Individual frogs occupy a series of burrow sites, some of which are used repeatedly. The home ranges of both sexes appear to be non-overlapping suggesting exclusivity of non-breeding habitat. Home ranges are approximately 0.04 ha in size. Individuals move into the breeding site either immediately before or following heavy rain and occupy these sites for up to 10 days. Most individuals will not attempt to breed every year. The Giant Burrowing Frog has a generalist diet and studies to date indicate that they eat mainly invertebrates including ants, beetles, cockroaches, spiders, centipedes and scorpions. When breeding, frogs will call from open spaces, under vegetation or rocks or from within burrows in the creek bank. Males show strong territoriality at breeding sites. This species breeds mainly in autumn, but has been recorded calling throughout the year. Egg masses are foamy with an average of approximately 500-800 eggs and are laid in burrows or under vegetation in small pools. After rains, tadpoles are washed into larger pools where they complete their development in ponds or ponded areas of the creekline. Tadpole development ranges from around 12 weeks duration to up to 12 months with late developing tadpoles overwintering and completing development when warmer temperatures return. Breeding habitat of this species is generally soaks or pools within first or second order streams. They are also commonly recorded from 'hanging swamp' seepage lines and where small pools form from the collected water. This frog is a slow growing and long-lived species, living up to 10 years of age, possibly longer.		

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
					territories of essential non-breeding habitat. Species polygon: The species polygon boundary should align with suitable aquatic habitats linked directly to the record and a buffer, incorporating the PCTs with which the species is associated, of 300 metres radius from the top of bank.. Unit of measure: Area			
<i>Litoria aurea</i> Green and Golden Bell Frog	E1,P	V	Species	Nov - March	Presence of semi permanent/ephemeral wet areas, swamps and waterbodies - within 1 km of these habitats is a habitat constraint for this species. Breeding/ non-breeding shelter habitat consists of any waterbody with emergent aquatic vegetation and without the plague minnow (<i>Gambusia holbrooki</i>), Foraging habitat and migratory habitat are areas of native and non-native vegetation. Survey techniques: - Aural-visual surveys (500 m transection, 480 mins over 4 days) - Acoustic recorder 14 days - Tadpole search (10 mins/50m² of surface area)	Formerly distributed from the NSW north coast near Brunswick Heads, southwards along the NSW coast to Victoria where it extends into east Gippsland. Records from west to Bathurst, Tumut and the ACT region. Since 1990 there have been approximately 50 recorded locations in NSW, most of which are small, coastal, or near coastal populations. These locations occur over the species' former range, however they are widely separated and isolated. Large populations in NSW are located around the metropolitan areas of Sydney, Shoalhaven and mid north coast (one an island population). There is only one known population on the NSW Southern Tablelands. Habitat and ecology Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (<i>Typha</i> spp.) or spikerushes (<i>Eleocharis</i> spp.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (<i>Gambusia holbrooki</i>), have a grassy area nearby and diurnal sheltering sites available. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas. The species is active by day and usually breeds in summer when conditions are warm and wet.	BioNet 2 records PMST PCT 3150 PCT 3586	Low No suitable habitat recorded during surveys

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
						Males call while floating in water and females produce a raft of eggs that initially float before settling to the bottom, often amongst vegetation. Tadpoles feed on algae and other plant-matter; adults eat mainly insects, but also other frogs. Preyed upon by various wading birds and snakes.		
<i>Litoria brevipalmata</i> Green-thighed Frog	V		Species	Sept - April	Presence of semi-permanent/ephemeral wet areas/swamps/waterbodies is a habitat constraint of this species. Aural - visual surveys 240 minutes/500 m transect, repeated 2 times after flooding rains in suitable breeding habitat And Tadpole search - for 10 minutes /50m² of water surface area repeated over 2 surveys, after flooding rains. Survey methods: A combination of aural-visual surveys and tadpole searches are completed within or around the edges of potential breeding habitat. An aural-visual survey should be used when the frogs are expected to be calling; this is to be followed by a search of the breeding site for tadpoles and metamorphosing froglets approximately 30 to 60 days later (Lemckert et al. 2006). The calling period for this species is very short, usually lasting one or two nights during or immediately after (<24 hours) flooding, but with some ongoing precipitation. Flooding typically	Isolated localities along the coast and ranges from just north of Wollongong to south-east Queensland. Green-thighed Frogs occur in a range of habitats from rainforest and moist eucalypt forest to dry eucalypt forest and heath, typically in areas where surface water gathers after rain. It prefers wetter forests in the south of its range, but extends into drier forests in northern NSW and southern Queensland. Breeding occurs following heavy rainfall from spring to autumn, with larger temporary pools and flooded areas preferred. Frogs may aggregate around breeding sites and eggs are laid in loose clumps among waterplants, including water weeds. The larvae are free swimming. The frogs are thought to forage in leaf-litter.	PCT 3150	Low Not recorded previously in the locality on BioNet.

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
					occurs as a result of heavy rainfall (>50 mm in 24 hrs), but smaller combined rainfall events may inundate the site. The breeding site must be flooded at the time of the survey. If a breeding site has previously been flooded (within three months), frogs will not attempt a second breeding event. This typically leads to only one breeding event occurring within the breeding season. The species occurs in a range of habitats from rainforest and moist eucalypt forest to dry eucalypt forest and heath, typically in areas where surface water gathers after rain. It prefers wetter forests in the south of its range but extends into drier forests in northern New South Wales and southern Queensland. Surveys should target larger depressions or flooding swamp areas (>5 metres X 10 metres in diameter), usually identifiable by flood tolerant vegetation (Lemckert et al. 2006). The call of the green-thighed frog is similar to that of rocket frogs (e.g. <i>Litoria latopalmata</i>) that can breed in the same habitats. Individuals heard will need to be checked to ensure correct identification. Potential habitat: Suitable breeding habitat is any semi-permanent or ephemeral waterbody of >25 square metres			

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
					in surface area located within native vegetation or immediately adjacent to or within 10 metres of native vegetation. Non-breeding habitat is native vegetation adjacent to the breeding habitat. Unit of measure: Area			
<i>Mixophyes balbus</i> Stuttering Frog	E1,P,2	V	Species	Sept - March	Aural - visual surveys 480 minutes/500 m transect, repeated 4 times in suitable breeding habitat Or Acoustic recorder - 154 recorder days over 14 days in suitable breeding habitat. Survey methods: Aural-visual or acoustic recorder surveys undertaken along transects in suitable breeding habitat, along identified streams with permanent pools. Suitable streams are those of first to even fourth order, depending on the location. The species often calls below cover (masking eyeshine), but responds readily to call playbacks, which should be included in surveys during the breeding season. Potential habitat: The species is found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Suitable breeding habitat consists of permanent or ephemeral flowing streams with permanent pools located	Stuttering Frogs occur along the east coast of Australia from southern Queensland to north-eastern Victoria. Considered to have disappeared from Victoria and to have undergone considerable range contraction in NSW, particularly in south-east NSW. It is the only Mixophyes species that occurs in south-east NSW and in recent surveys it has only been recorded at three locations south of Sydney. The Dorrigo region, in north-east NSW, appears to be a stronghold for this species. Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor. Feed on insects and smaller frogs. Breed in streams during summer after heavy rain. Eggs are laid on rock shelves or shallow riffles in small, flowing streams. As the tadpoles grow they move to deep permanent pools and take approximately 12 months to metamorphose.	PMST	Low Not recorded previously in the locality on BioNet and not associated with PCT 3150.

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
					within areas of listed suitable native vegetation (PCTs). Non-breeding habitat is native vegetation located within 500 metres of a breeding site; the species is known to move long distances from breeding sites. Species polygon: The species polygon boundary should align with aquatic habitats linked directly to the record and a buffer, incorporating the PCTs with which the species is associated, of 500 metres radius from the top of bank. Unit of measure: Area			
<i>Mixophyes iteratus</i> Giant Barred Frog	E1,P2	E	Species	Sept - March	Aural - visual surveys October to March 480 minutes/500 m transect, repeated 4 times in suitable breeding habitat. Survey methods: Aural-visual surveys are completed within areas of potential breeding habitat. The species does not call regularly, therefore aural surveys alone are not recommended but can be used as part of an aural-visual survey if undertaken during the breeding season; however, they are readily detected by eyeshine when active. Potential habitat: The species occurs along freshwater streams with permanent or semi-permanent water, generally (but not always) at lower elevation. It may occasionally occupy large open bodies of water (e.g. ponds and dams) in the riparian zone.	The Giant Barred Frog is distributed along the coast and ranges from Eumundi in south-east Queensland to Warrimoo in the Blue Mountains. Declines appear to have occurred at the margins of the species' range, with no recent records south of the Hawkesbury River and disappearances from a number of streams in QLD. Northern NSW, particularly the Coffs Harbour-Dorrigo area, is a stronghold. Giant Barred Frogs are found along freshwater streams with permanent or semi-permanent water, generally (but not always) at lower elevation. Moist riparian habitats such as rainforest or wet sclerophyll forest are favoured for the deep leaf litter that they provide for shelter and foraging, as well as open perching sites on the forest floor. However, Giant Barred Frogs will also sometimes occur in other riparian habitats, such as those in drier forest or degraded riparian remnants, and even occasionally around dams. Breeding takes place from late spring to summer. Once eggs are laid and fertilised in the water, the female kicks them out of the water where they stick onto a suitable bank (e.g. overhanging or steeply sloped). Hatchlings drop or wriggle into the water. Tadpoles grow to about	PMST PCT 3150 PCT 3586	Low Not recorded previously in the locality on BioNet.

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
					Moist riparian habitats are favoured for the deep leaf litter, used for shelter and foraging, as well as open perching sites on the forest floor. The species will use streams with a fringe of vegetation in otherwise cleared lands. Males seem to confine most activities to the riparian zone. Suitable breeding habitat consists of large (>4 metres wide) permanent and semi-permanent flowing streams located on the subject land. Eggs are laid on undercut banks above large slow-moving or still pools or areas of water (Knowles et al. 2014), with breeding occurring after periods of rainfall when streams have receded post flooding. Non-breeding habitat is any suitable vegetation (native or non-native) adjacent to identified breeding habitat. Species polygon: The species polygon boundary should align with aquatic habitats linked directly to the record and a buffer, incorporating the PCTs with which the species is associated, of 50 metres radius from the top of bank. Unit of measure: Area	11cm and it may take up to 14 months between egg laying and the completion of metamorphosis. Although generally found within about 20m of the stream, outside the breeding season, the Giant Barred Frog may disperse away from the stream (e.g. 50m or further). It is a generalist feeder, with large insects, snails, spiders and frogs included in its diet.		
<i>Pseudophryne australis</i> Red-crowned Toadlet	V		Species	All year	Aural - visual surveys 480 minutes/500 m transect, repeated 4 times in suitable breeding habitat.	The Red-crowned Toadlet has a restricted distribution. It is confined to the Sydney Basin, from Pokolbin in the north, the Nowra area to the south, and west to Mt Victoria in the Blue Mountains.	BioNet 194 records PCT 3586	Low No suitable habitat

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
					Surveys should not be conducted if three significant rain events (>50 millimetres of rain in 24 hours) have occurred in the previous two months, nor during periods of heavy rainfall. Call playback involving loud sounds to which the male responds can be undertaken any time of the year, if there has been sufficient recent rainfall to stimulate activity. Surveys should not be conducted if three significant rain events (>50 millimetres of rain in 24 hours) have occurred in the previous two months, nor during periods of heavy rainfall. The use of acoustic recorders is not recommended as the calls of the red-crowned toadlet are relatively soft and difficult to distinguish from species of the same genus. Calling can occur during the day, and especially so in the cooler months. Surveys should be conducted in daylight hours if a reference site indicates that calling is occurring at that time. Potential habitat: The species is found only on Triassic sandstones, and within that area, it uses areas of heathland and woodland. Suitable breeding habitat consists of ephemeral streams or pools located within areas of native vegetation on Triassic sandstones. Non-breeding habitat is native vegetation	Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. Shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter. Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters. Red-crowned Toadlets have not been recorded breeding in waters that are even mildly polluted or with a pH outside the range 5.5 to 6.5. Eggs are laid in moist leaf litter, from where they are washed by heavy rain; a large proportion of the development of the tadpoles takes place in the egg. Disperses outside the breeding period, when they are found under rocks and logs on sandstone ridges and forage amongst leaf-litter. Red-crowned Toadlets are quite a localised species that appear to be largely restricted to the immediate vicinity of suitable breeding habitat. Red-crowned Toadlets are usually found as small colonies scattered along ridges coinciding with the positions of suitable refuges near breeding sites. Due to this tendency for discrete populations to concentrate at particular sites, a relatively small localised disturbance may have a significant impact on a local population if it occurs on a favoured breeding or refuge site.		recorded during surveys

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
					within 100 metres of suitable breeding habitat. Species polygon: The species polygon boundary should align with aquatic habitats linked directly to the record and a buffer, incorporating the PCTs with which the species is associated, of 100 metres radius from the top of bank. Unit of measure: Area			
<i>Reptiles</i>								
<i>Caretta caretta</i> Loggerhead Turtle	E1,P	E	Species	Dec - April	This species has no terrestrial habitat that could require assessment under the BAM (Threatened reptiles – Biodiversity Assessment Method survey guide) - NB. this advice is inconsistent with the habitat constraints listed in the TBDC. Unit of measure: Area	Loggerhead Turtles are ocean-dwellers, foraging in deeper water for fish, jellyfish and bottom-dwelling animals. The female comes ashore to lay her eggs in a hole dug on the beach in tropical regions during the warmer months. Identifiable all year but lay eggs on beaches during summer.	BioNet 4 records PMST	Low No suitable habitat.
<i>Chelonia mydas</i> Green Turtle	V,P	V	Species	Dec - April	Survey 500 m of beach/50 ha of suitable habitat (i.e. Elevated sand dunes located above the water table and high tide mark), over 4 replicate surveys. Unit of measure: Area	Ocean-dwelling species spending most of its life at sea. Carnivorous when young but as adults they feed only on marine plant material. Eggs laid in holes dug in beaches throughout their range. Scattered nesting records along the NSW coast. Identifiable: Can be opportunistic; breeding period when they leave the water to breed; when they occur in estuaries particularly during warmer months of the year	PMST	Low No suitable habitat.
<i>Dermochelys coriacea</i> Leatherback Turtle	E1,P	E	Species	Dec - April	This species has no terrestrial habitat that could require assessment under the BAM (Threatened reptiles – Biodiversity Assessment Method survey guide) - NB. this advice is	Occurs in inshore and offshore marine waters. Rarely breeds in Australia, with the nearest regular nesting sites being the Solomon Islands and Malayan Archipelago. Occasional breeding records from NSW coast, including between Ballina and Lennox Head in northern NSW.	BioNet 1 record PMST	Low No suitable habitat.

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
					inconsistent with the habitat constraints listed in the TBDC. Unit of measure: Area	Number of sightings in southern waters suggest species actively seeks temperate feeding grounds, rather than occurring only as stray vagrants. Feed on jellyfish. Identifiable all year but lay eggs on beaches during summer.		
<i>Eretmochelys imbricata</i> Hawksbill Turtle	P	V	EEC Marine	N/A	No survey notes	Major nesting of Hawksbill Turtles in Australia occurs at Varanus Island and Rosemary Island in Western Australia, and in the northern Great Barrier Reef and Torres Strait, Queensland. Hawksbill Turtles spend their first five to ten years drifting on ocean currents. During this pelagic (ocean-going) phase, they are often found in association with rafts of Sargassum (a floating marine plant that is also carried by currents). Once Hawksbill Turtles reach 30 to 40 cm curved carapace length, they settle and forage in tropical tidal and sub-tidal coral and rocky reef habitat. They primarily feed on sponges and algae (Whiting 2000a). They have also been found, though less frequently, within seagrass habitats of coastal waters, as well as the deeper habitats of trawl fisheries. Hawksbill Turtles have been seen in temperate regions as far south as northern NSW.	PMST	Low No suitable habitat.
<i>Natator depressus</i> Flatback Turtle	P	V	N/A	N/A	No survey notes	The Flatback Turtle is found only in the tropical waters of northern Australia, Papua New Guinea and Irian Jaya and is one of only two species of sea turtle without a global distribution. Nesting is confined to Australia and four genetic stocks are recognised: eastern Queensland, Torres Strait, Northern Territory and Western Australia. Post-hatchling and juvenile Flatback Turtles do not have wide dispersal phase. Adults inhabit soft bottom habitat over the continental shelf of northern Australia, extending into Papua New Guinea and Irian Jaya. Turtles feed in turbid, shallow inshore waters north of latitude 25° S in depths from less than 10 m to depths of over 40 m (Robins 1995). Nesting habitat includes sandy beaches in the tropics and subtropics.	PMST	Low No suitable habitat.

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
<i>Varanus rosenbergi</i> Rosenberg's Goanna	V		Ecosystem	N/A	No survey comments. Unit of measure: Area	Found in heath, open forest and woodland. Associated with termites, the mounds of which this species nests in; termite mounds are a critical habitat component. Individuals require large areas of habitat. Feeds on carrion, birds, eggs, reptiles and small mammals. Shelters in hollow logs, rock crevices and in burrows, which they may dig for themselves, or they may use other species' burrows, such as rabbit warrens. Runs along the ground when pursued (as opposed to the Lace Monitor, which climbs trees). Lays up to 14 eggs in a termite mound; the hatchlings dig themselves out of the mounds. Generally slow moving; on the tablelands likely only to be seen on the hottest days. Detectable only in warm to hot weather.	PCT 3150 PCT 3586	Low Not recorded previously in the locality on BioNet.
<i>Invertebrates</i>								
<i>Petalura gigantea</i> Giant Dragonfly	E1		Species	Dec - Jan	Requires surveying within the swamp. Distances that the species disperses to breed are dependent on the elevation of the terrian around the swamp, and are more likely to disperse further if the terrian surrounding the swamps is flat (low elevation). Unit of measure: Area	Live in permanent swamps and bogs with some free water and open vegetation. Adults emerge from late October and are short-lived, surviving for one summer after emergence. Adults spend most of their time settled on low vegetation on or adjacent to the swamp. They hunt for flying insects over the swamp and along its margins. Adults fly over the swamp and along its margins hunting for flying insects. Males sometimes congregate waiting for females to mate with. Females lay eggs into moss, under other soft ground layer vegetation, and into moist litter and humic soils, often associated with groundwater seepage areas within appropriate swamp and bog habitats. The species does not utilise areas of standing water wetland, although it may utilise suitable boggy areas adjacent to open water wetlands. Larvae dig long branching burrows under the swamp. Larvae are slow growing and the larval stage may last 10 years or more. It is thought that larvae leave their burrows at night and feed on insects and other invertebrates on the surface and also use underwater entrances to hunt for food in the aquatic vegetation.	BioNet 1 record	Low Not associated with PCT 3150.
<i>Migratory species</i>								
<i>Actitis hypoleucos</i>	P	C,J,K	N/A	N/A	No survey comment	Found along all coastlines of Australia and in many areas inland, the Common Sandpiper is widespread in small numbers. The population when in Australia is	BioNet 9 records	Low

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
Common Sandpiper						concentrated in northern and western Australia. The Common Sandpiper mainly breeds in parts of Europe and Asia, and occasionally Africa. The population that migrates to Australia breeds in the Russian far east. European breeding birds rarely remain in Europe during the non-breeding period, with individuals moving to Africa and Asia. The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow, and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags.		Not associated with PCT 3150.
<i>Ardena pacificus</i> Wedge-tailed Shearwater	P	J	N/A	N/A	N/A	The Wedge-tailed Shearwater is a pelagic, marine bird known from tropical and subtropical waters. The Wedge-tailed Shearwater breeds on the east and west coasts of Australia and on off-shore islands. The species is common in the Indian Ocean, the Coral Sea and the Tasman Sea.	BioNet 1 record	Low Not associated with PCT 3150.
<i>Ardena tenuirostris</i> Short-tailed Shearwater	P	J,K	n/a	n/a	n/a	Short-tailed Shearwater breeds on the east and west coasts of Australia and on off-shore islands. Breeds from October-April in a sparse of grass, leaves in burrows 0.5-2m long, usually under tussocks, typically in island colonys. Migrates from May-August to North Pacific (Pizzey, 2006).	BioNet 11 records	Low Not associated with PCT 3150.
<i>Calidris acuminata</i> Sharp-tailed Sandpiper	P	C,J,K	N/A	N/A	No survey comment	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. They are widespread in most regions of New South Wales (NSW) and Victoria, especially in coastal areas, but they are sparse in the south-central Western Plain and east Lower Western Regions of NSW, and north-east and north-central Victoria. The Sharp-tailed Sandpiper breeds in northern Siberia, from the delta of the Lena River, east to Chaun	PMST	Low Not recorded previously in the locality on BioNet and not associated with PCT 3150.

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
						Gulf and east of the Kolyma River delta. In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, salt pans and hypersaline salt lakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgeland and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have dried out, moving back during the wet season. They may be attracted to mats of algae and water weed either floating or washed up around terrestrial wetlands, and coastal areas with much beachcast seaweed. Sometimes they occur on rocky shores and rarely on exposed reefs		
<i>Calidris canutus</i> Red Knot	P	C,J,K	N/A	N/A	No survey comment	The Red Knot is common in all the main suitable habitats around the coast of but is less numerous in south-west Australia than elsewhere. Very large numbers are regularly recorded in north-west Australia, with 80 Mile Beach and Roebuck Bay being particular strongholds. The only places it is not found in significant numbers are the northern part of the Great Australian Bight in South Australia and Western Australia, and along much of the NSW coast, where wader habitat is rather scarce. The Red Knot breeds in North America, Russia, north-west and east Greenland, north Alaska. In Australasia the Red Knot mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. They are occasionally seen on terrestrial saline wetlands near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks, but rarely use freshwater swamps. They rarely use inland lakes or swamps	PMST	Low Not recorded previously in the locality on BioNet and not associated with PCT 3150.

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
<i>Cuculus optatus</i> Oriental Cuckoo	P	C,J,K	N/A	N/A	No survey comment	Breeds from eastern European Russia east through Siberia to Kamchatka, south to Kazakhstan, the Altai, Mongolia and northern China. Also in Korea and Japan. Winters from southeast Asia to Australia. Vagrant to New Zealand, western Alaska and western Europe. Common in its breeding range. Found in forests, mainly coniferous and mixed-coniferous. In Sichuan up to 4500m, in the Altai region lower than Common Cuckoo, usually below 1000m. Feeds on insects, mainly caterpillars	BioNet 1 record	Low Not associated with PCT 3150.
<i>Hydroprogne caspia</i> Caspian Tern	P		N/A	N/A		Breeds occurs in North America, Africa and Eurasia. Within Australia, the Caspian Tern has a widespread occurrence and can be found in both coastal and inland habitat. In NSW it is widespread east of the Great Divide, mainly in coastal regions, and also in the Riverina and Lower and Upper Western Regions, with occasional records elsewhere The Caspian Tern is mostly found in sheltered coastal embayments (harbours, lagoons, inlets, bays, estuaries and river deltas) and those with sandy or muddy margins are preferred. They also occur on near-coastal or inland terrestrial wetlands that are either fresh or saline, especially lakes (including ephemeral lakes), waterholes, reservoirs, rivers and creeks. They also use artificial wetlands, including reservoirs, sewage ponds and saltworks. In offshore areas the species prefers sheltered situations, particularly near islands, and is rarely seen beyond reefs. Large numbers may shelter along the coast, behind coastal sand-dunes or coastal lakes during rough weather, and have been recorded inland after storms.	BioNet 57 records	Low Not associated with PCT 3150.
<i>Limosa lapponica</i> Bar-tailed Godwit, Nunivak	P	C,J,K	N/A	N/A	No survey comment	The Bar-tailed Godwit has been recorded in the coastal areas of all Australian states. It is widespread in the Torres Strait and along the east and south-east coasts of Queensland, NSW and Victoria, including the offshore islands. The Bar-tailed Godwit breeds in the north of Scandinavia, Russia and north-west Alaska.	BioNet 121 records PMST	Low Not associated with PCT 3150.

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
						The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh. It has been sighted in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. It is rarely found on inland wetlands or in areas of short grass, such as farmland, paddocks and airstrips.		
<i>Numenius madagascariensis</i> Eastern Curlew	P	CE,C,J,K	N/A	N/A	No survey comment	It generally occupies coastal lakes, inlets, bays and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats and sometimes saltmarsh of sheltered coasts. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets It forages in or at the edge of shallow water, occasionally on exposed algal mats or waterweed, or on banks of beach-cast seagrass or seaweed. It roosts on sandy spits and islets, especially on dry beach sand near the high-water mark, and among coastal vegetation including low saltmarsh or mangroves. The Eastern Curlew is carnivorous, mainly eating crustaceans (including crabs, shrimps and prawns), small molluscs, as well as some insects. The birds may delay breeding until three to four years of age. Within Australia, immature birds, which do not migrate, move northward in winter. Identifiable from September to March.	BioNet 136 records PMST	Low Not associated with PCT 3150.
<i>Numenius phaeopus</i> Whimbrel	P	C,J,K	N/A	N/A	No survey comment	The Whimbrel is a regular migrant to Australia and New Zealand, with a primarily coastal distribution. There are also scattered inland records of Whimbrels in all regions. It is found in all states but is more common in the north. The Whimbrel breeds in north and west Alaska. The Whimbrel generally forages on intertidal mudflats, along the muddy banks of estuaries and in coastal	BioNet 52 records	Low Not associated with PCT 3150.

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
						lagoons, either in open unvegetated areas or among mangroves. They sometimes forage on sandy beaches or among rocks. It has occasionally been sighted feeding on exposed coral or rocky reefs and rock platforms. It is known to probe holes and crevices among rubble and on reef flats, but not on reef crests.		
<i>Pluvialis squatarola</i> Grey Plover	P	C,J,K	N/A	N/A	No survey comment	Grey Plovers breed in northern Siberia. During the non-breeding season, the species is widespread on the coasts of North and South America, western and southern Europe, Africa, western, southern, south-eastern and eastern Asia, and Australia. In non-breeding grounds in Australia, Grey Plovers occur almost entirely in coastal areas, where they usually inhabit sheltered embayments, estuaries and lagoons with mudflats and sandflats, and occasionally on rocky coasts with wave-cut platforms or reef-flats, or on reefs within muddy lagoons. They also occur around terrestrial wetlands such as near-coastal lakes and swamps, or salt-lakes.	BioNet 6 records	Low Not associated with PCT 3150.
<i>Sterna hirundo</i> Common Tern	P	C,J,K	N/A	N/A	No survey comment	This species breeds in North America and Eurasia. In Australia, Common Terns are mainly found along the eastern coast, where they are widespread and common from south-eastern Queensland to eastern Victoria though less often recorded south of Port Hacking in NSW. Common Terns are marine, pelagic and coastal. In Australia, they are recorded in all marine zones, but are commonly observed in near-coastal waters, both on ocean beaches, platforms and headlands and in sheltered waters, such as bays, harbours and estuaries with muddy, sandy or rocky shores. However, off Wollongong, NSW, Common Terns were recorded in all marine zones but generally recorded in offshore and pelagic waters, 11–55 km from shore. Occasionally they are recorded in coastal and near-coastal wetlands, either saline or freshwater, including lagoons, rivers, lakes, swamps and saltworks. Sometimes they occur in mangroves or saltmarsh and, in bad weather, in coastal sand-dunes or coastal embayments.	BioNet 6 records	Low Not associated with PCT 3150.
<i>Thalasseus bergii</i> Crested Tern	P	J	N/A	N/A	No survey comment	Occur Coasts of Africa, southern Asia and Australasia. Breed in colonies on small offshore islands. Usually a strictly coastal species, there are occasional records in the	BioNet 54 records	Low Not associated with PCT 3150.

Scientific Name	State status	Comm status	Credit Species	Survey period	Survey technique	Distribution and habitat	Source	Likelihood of occurrence
						arid interior of Australia, where birds are blown by passing tropical cyclones.		
<i>Tringa brevipes</i> Grey-tailed Tattler	P	C,J,K	N/A	N/A	No survey comment	Within Australia, the Grey-tailed Tattler has a primarily northern coastal distribution and is found in most coastal regions. In NSW the Grey-tailed Tattler is distributed along most of the coast from the Queensland border, south to Tilba Lake. It is more heavily distributed along coastal regions north of Sydney. The species breeds in north Siberia; they usually place their nests in shallow depressions, often on a stony riverbed and occasionally in deserted nests in trees. The Grey-tailed Tattler usually forages in shallow water, on hard intertidal substrates, such as reefs and rock platforms, in rock pools and among rocks and coral rubble, over which water may surge. It has also been recorded foraging on exposed intertidal mudflats, especially with mangroves and possibly seagrass nearby. Occasionally it forages on intertidal sandflats, around banks of seaweed or protruding rocks or lumps of coral Identifiable from September to April.	BioNet 2 records	Low Not associated with PCT 3150.
<i>Tringa stagnatilis</i> Marsh Sandpiper	P	C,J,K	N/A	N/A	No survey comment	The Marsh Sandpiper is found on coastal and inland wetlands throughout Australia. It is recorded in all regions of NSW but especially the central and south coasts and (inland) on the western slopes of Great Divide and western plains. The Marsh Sandpiper breeds from eastern Europe to eastern Siberia. The Marsh Sandpiper lives in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, salt pans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks. They are recorded less often at reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes. In north Australia they prefer intertidal mudflats. Identifiable from September – March.	BioNet 1 record	Low Not associated with PCT 3150.

14. Appendix C: Plot-based field data sheets

BAM Site – Field Survey Form

Sheet 1 of 4

Date		22/08/2025		Survey Name		Zone ID		Recorders	
				KariongHill Slope works				K. McQueen	
Zone		Datum		Plot ID		1		Plot Dimensions	
MGA zone 56		GDA 2020						20x20	
Easting		Northing		IBRA region		Sydney Basin (Pittwater sub-region)		Midline bearing from 0 m	
342992.24		6300074.85						270	
Vegetation Class				North Coast Wet Sclerophyll Forests					
Formation				Wet Sclerophyll Forest (shrubby sub-formation)					
Plant Community Type				PCT 3150 Hunter Coast Ranges Turpentine Wet Forest					
				EEC? No					

Record easting and northing at 0 m on midline.

BAM Attribute (400 m ² plot)		Sum values
Count of Native Richness	Trees	6
	Shrubs	5
	Grasses etc	2
	Forbs	1
	Ferns	5
	Other	6
Sum of cover of native vascular plants by growth form group	Trees	56
	Shrubs	37
	Grasses etc	3.3
	Forbs	0.2
	Ferns	9.8
	Other	13.8
High Threat Weed cover		4.1

BAM Attribute (1,000m ² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80+ cm	2	2
50-79 cm	6	
30-49 cm	5	
20-29 cm	5	
10-19 cm	8	
5-9 cm	4	
Length of logs (m)	1	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when ≥10. For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

Bam Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	100	99	98	100	90	0	0	0	0	0	0	0	0	0	0	0	1	2	0	10
Average of 5 subplots	97.4					0					0					2.6				

400m ² plot		Survey name	Plot Id	Recorders
Date	22/08/2025	Kariong Hill Slope works	1	K McQueen

GF Code	Top 3 native species in each growth form group. Full species name mandatory. All other native and exotic species – full species name where practicable	N, E or THE	Cover	Abun	Strat
	<i>Lantana camara</i>	HTE-M	4	25	M
	<i>Sida rhombifolia</i>	E	0.1	30	L
E	<i>Adiantum aethiopicum</i>	N	0.1	15	I
E	<i>Asplenium australasicum</i>	N	1.5	2	I
E	<i>Blechnum cartilagineum</i>	N	3	100	I
E	<i>Calochlaena dubia</i>	N	5	75	I
E	<i>Doodia aspera</i>	N	0.2	15	L
F	<i>Dianella caerulea</i>	N	0.2	6	L
G	<i>Entolasia stricta</i>	N	0.3	80	L
L	<i>Cissus hypoglauca</i>	N	3	30	M
L	<i>Gynochthodes jasminoides</i>	N	0.5	10	L
L	<i>Hibbertia dentata</i>	N	0.1	2	L
L	<i>Smilax australis</i>	N	5	28	M
L	<i>Stephania japonica</i>	N	0.2	15	L
P	<i>Livistona australis</i>	N	5	4	U
R	<i>Lomandra longifolia</i>	N	3	4	L
S	<i>Backhousia myrtifolia</i>	N	2.5	4	M
S	<i>Eupomatia laurina</i>	N	30	25	M
S	<i>Rhodamnia rubescens</i>	N	0.1	1	L
S	<i>Synoum glandulosum</i>	N	4	4	M
S	<i>Wilkiea huegeliana</i>	N	0.4	3	M
T	<i>Acmena smithii</i>	N	1	1	M
T	<i>Allocasuarina torulosa</i>	N	1	5	U
T	<i>Angophora floribunda</i>	N	13	3	U
T	<i>Eucalyptus saligna</i>	N	15	3	U
T	<i>Notelaea longifolia</i>	N	1	2	M
T	<i>Syncarpia glomulifera</i>	N	25	15	U

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); **Note:** 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

N=Native, E=Exotic, HTE=High Threat Exotic, M=Manageable, NM=Not Manageable

BAM Site – Field Survey Form

Sheet 3 of 4

Date		22/08/25		Survey Name		Zone ID		Recorders	
				Kariang Hill Slope stabilisation		1		K McQueen	
Zone 56		Datum		Plot ID		GDA 2020		Plot Dimensions	
								20 x 50	
Easting 342585		Northing 6299499		IBRA region		Wyong		Midline bearing from 0 m	
								270	
Vegetation Formation				Dry Sclerophyll Forests (Shrubby sub-formation);					
Vegetation Class				Sydney Coastal Dry Sclerophyll Forests					
Plant Community Type				PCT 3586 Northern Sydney Scribbly Gum Woodland					
				EEC?_No					

Record easting and northing at 0 m on midline.

BAM Attribute (400 m ² plot)		Sum values
Count of Native Richness	Trees	9
	Shrubs	7
	Grasses etc	2
	Forbs	1
	Ferns	1
	Other	6
Sum of cover of native vascular plants by growth form group	Trees	50.5
	Shrubs	7.9
	Grasses etc	5
	Forbs	0.2
	Ferns	0.5
	Other	20.6
High Threat Weed cover		13

BAM Attribute (1,000m ² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80+ cm	3	3
50-79 cm	5	1
30-49 cm	15	
20-29 cm	12	
10-19 cm	18	
5-9 cm	2	
Length of logs (m)	1.5	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when ≥ 10. For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

Bam Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	98	95	100	60	75	2	5	0	0	0	0	0	0	0	0	0	0	0	40	25
Average of 5 subplots	85.6					1.4					0					13				

400m ² plot		Survey name	Plot Id	Recorders
Date	22/08/25	Kariong Hill Slope stabilisation	2	K McQueen

GF Code	Top 3 native species in each growth form group. Full species name mandatory. All other native and exotic species – full species name where practicable	N, E or THE	Cover	Abun	strat
	<i>Lantana camara</i>	HTE-M	3	30	M
	<i>Senna pendula</i>	HTE-M	0.1	1	M
E	<i>Dodonaea triquetra</i>	N	1	6	M
L	<i>Parsonsia straminea</i>	N	2	20	L
L	<i>Smilax glycyphylla</i>	N	5	10	M
L	<i>Cissus hypoglauca</i>	N	0.5	10	M
L	<i>Stephania japonica</i>	N	0.1	1	L
S	<i>Acacia ulicifolia</i>	N	0.2	6	M
S	<i>Boronia ledifolia</i>	N	4	10	M
S	<i>Grevillea buxifolia</i>	N	0.5	3	m
S	<i>Grevillea sericea</i>	N	0.5	3	M
S	<i>Leptospermum polyanthum</i>	N	0.5	2	M
S	<i>Homalanthus populifolius</i>	N	0.2	2	m
S	<i>Pittosporum undulatum</i>	N	2	2	M
T	<i>Allocasuarina littoralis</i>	N	0.5	2	U
T	<i>Banksia serrata</i>	N	1	1	U
T	<i>Corymbia eximia</i>	N	10	3	U
T	<i>Corymbia gummifera</i>	N	20	8	u
T	<i>Eucalyptus acmenioides</i>	N	8	3	u
T	<i>Eucalyptus punctata</i>	N	10	5	u
T	<i>Allocasuarina torulosa</i>	N	1	2	u
T	<i>Eucalyptus siderophloia</i>	N	5	1	u
T	<i>Glochidion ferdinandi</i>	N	5	3	u
V	<i>Lepidosperma laterale</i>	N	5	80	L
V	<i>Gahnia clarkei</i>	N	8	15	M
E	<i>Hypolepis muelleri</i>	N	0.5	25	L
G	<i>Lomandra longifolia</i>	N	1	5	I
G	<i>Entolasia stricta</i>	N	2	100	I
F	<i>Dianella caerulea</i>	N	0.1	2	L

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); **Note:** 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

N=Native, E=Exotic, HTE=High Threat Exotic, M=Manageable, NM=Not Manageable

15. Appendix D: Tests of Significance (BC Act)

A test of significance (ToS) for 31 threatened species is provided below. These species are listed under the BC Act and were either recorded during surveys or were assumed present within the proposal footprint as they have a moderate likelihood of occurrence but were not adequately surveyed. Assessments have been completed in accordance with section 7.3 of the BC Act following the [Threatened Species Test of Significance Guidelines \(nsw.gov.au\) \(OEH 2018\)](https://www.nsw.gov.au/oeht/2018). Information used in the assessment is taken from the species profile and or the TBDC tab on the BioNet website.

1. Scrub Turpentine *Rhodamnia rubescens* CE (BC Act), CE (EPBC Act)

The following 31 threatened species were assumed to be present as surveys were either inadequate (due to site access limitations or survey timing) or conducted outside of the required survey months or the proposal footprint was on the important habitat map for a particular species:

2. Tranquility Mintbush *Prostanthera askania* E (BC Act), E (EPBC Act)
3. Magenta Lilly Pilly *Syzygium paniculatum* E (BC Act), V (EPBC Act)
4. Dusky Woodswallow *Artamus cyanopterus cyanopterus* V (BC Act)
5. Bush Stone-curlew *Burhinus grallarius* E (BC Act)
6. Gang-gang Cockatoo *Callocephalon fimbriatum* V (BC Act)
7. South-eastern Glossy Black-Cockatoo *Calyptorhynchus lathami* V (BC Act)
8. Brown Treecreeper (eastern subspecies) *Climacteris picumnus victoriae* V (BC Act)
9. Varied Sittella *Daphoenositta chrysoptera* V (BC Act)
10. Little Lorikeet *Glossopsitta pusilla* V (BC Act)
11. Swift Parrot *Lathamus discolor* E (BC Act), CE (EPBC Act)
12. Barking Owl *Ninox connivens* V (BC Act)
13. Powerful Owl *Ninox strenua* V (BC Act)
14. Masked Owl *Tyto novaehollandiae* V (BC Act)
15. Eastern Pygmy-possum *Cercartetus nanus* V (BC Act)
16. Large-eared Pied Bat *Chalinolobus dwyeri* V (BC Act), V (EPBC Act)
17. Spotted-tailed Quoll *Dasyurus maculatus* V (BC Act), E (EPBC Act)
18. Eastern False Pipistrelle *Falsistrellus tasmaniensis* V (BC Act)
19. Parma Wallaby *Macropus parma* V (BC Act)
20. Eastern Coastal Free tailed Bat *Micronomus norfolkensis* V (BC Act)
21. Little Bentwing-bat *Miniopterus australis* V (BC Act)
22. Large Bentwing-bat *Miniopterus orianae oceanensis* V (BC Act)
23. Southern Greater Glider *Petauroides volans* E (BC Act), E (EPBC Act)
24. Yellow-bellied Glider *Petaurus australis* V (BC Act), V (EPBC Act)
25. Squirrel Glider *Petaurus norfolcensis* V (BC Act)
26. Koala *Phascolarctos cinereus* E (BC Act)
27. Northern long-nosed Potoroo *Potorous tridactylus tridactylus* V (BC Act), V (EPBC Act)
28. Grey-headed Flying-fox *Pteropus poliocephalus* V (BC Act), V (EPBC Act)
29. Yellow-bellied Sheath-tail-bat *Saccolaimus flaviventris* V (BC Act)
30. Greater Broad-nosed Bat *Scoteanax rueppellii* V (BC Act)

31. Eastern Cave Bat *Vespadelus troughtoni* V (BC Act)

- a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

Scrub Turpentine *Rhodamnia rubescens*

Scrub Turpentine is a small tree or shrub to 25 m high with reddish/brown, fissured bark. Young stems densely covered in fine hairs. Leaves 5–10 cm long, 2–5 cm wide, upper surface green and sparsely hairy, lower surface paler and sparsely to densely hairy. Leaves strongly 3-veined from base with moderately dense, translucent oil dots. Petiole 4–9 mm long. Inflorescences 1–3 per axil, usually 3-flowered with petals 4–6 mm diam. and white. Fruit globose, 5–8 mm diam., red turning black.

This species occurs in coastal districts north from Batemans Bay in New South Wales, approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Populations of *Rhodamnia rubescens* typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m a.s.l. in areas with rainfall of 1,000–1,600 mm. It is found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. This species is characterised as highly to extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.

Three individual *Rhodamnia rubescens* were recorded within the proposal footprint during targeted surveys but all three were located near the southern boundary (Figure 3-1). There are 29 individual *Rhodamnia rubescens* recorded on the BioNet immediately downslope of the proposal footprint, and a total of 432 records in the locality (Figure 2-4). The proposal would therefore require the removal of 9% of the nearby population that has been identified, and 0.6% of the population in the locality. There is 33.5 ha of suitable habitat (i.e. PCT 3150, PCT 3230, PCT3238, PCT 3029, PCT 3593) in the LAA for this species as mapped on the State Vegetation type map (Figure 1-4). The proposal would result in the removal of 1% of potential habitat for this species in the LAA, and as such, it is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction. As the three individuals occur near the southern boundary, mitigation measures have been included to retain some or all these individuals if possible.

Tranquility Mintbush *Prostanthera askania*

An erect but spreading and sometimes scrambling, openly-branched shrub that grows from 1 – 3 metres high. The branches and leaves are strongly aromatic and densely covered with long, spreading hairs. Leaves are ovate (12 – 25 mm) long, dull dusty green in colour, with deep incisions forming lobe-like teeth, which are directed forwards. Flowers are pale mauve to mauve.

This species occurs over a very restricted geographic range (of less than 12 km) in the upper reaches of creeks that flow into Tuggerah Lake or Brisbane Water within the Wyong and Gosford local government areas. Eight populations are known from the catchments of Ourimbah Creek, Narara Creek, Dog Trap Gully, Chittaway Creek and Berkeley Creek. A further two populations are known from the Erina Creek–Fires Creek catchment. The species occurs adjacent to, but not immediately in, drainage lines on flat to moderately steep slopes formed on Narrabeen sandstone and alluvial soils derived from it.

Tranquility Mintbush is found in moist sclerophyll forest and warm temperate rainforest communities, and the ecotone between them. These communities are generally tall forests with a mesic understorey; Sydney Blue Gum *Eucalyptus saligna* and Turpentine *Syncarpia glomulifera* are usually present, though canopy species present can be highly variable.

The species is likely to be fire-sensitive given the moist forest habitats it occupies, however, its fire ecology is currently unknown. It may be a colonising species that takes advantage of increased light following natural canopy-cover disturbance. May be out competed by invading weed species such as Lantana.

It appears in some locations to propagate vegetatively by ‘stem-layering’ where prostrate branches take root where they remain in contact with the soil. This characteristic and the species’ tendency at many sites to form dense clumps make accurate counting of individual plants within populations difficult. Flowering usually occurs in spring; however, it is known that the timing of both flowering and fruiting can be variable. Tranquility Mintbush is most easily identifiable when in flower between September to December, if conditions are favourable.

This species was assumed to be present in the proposal footprint as surveys were conducted outside of the required survey period. There are two records of this species in the locality on BioNet, located on the other side of the M1 Motorway. The proposal footprint does include species typically associated with this species (i.e. Sydney Blue Gum *Eucalyptus saligna* and Turpentine *Syncarpia glomulifera*), however, given the lack of records in the locality, it is unlikely that the proposal footprint contains a local population. As the proposal requires relatively minor clearing (0.36 ha) it is considered unlikely to have an

adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Magenta Lilly Pilly *Syzygium paniculatum*

The Magenta Lilly Pilly is a small to medium sized rainforest tree that grows to 8 m tall. The bark is flaky, and the leaves are shiny, dark-green above and paler underneath. Leaves can be up to 10 cm long. Plants produce white flower-clusters at the end of each branch, between November and February. The petals are small and are accompanied by prominent long stamens. The deep magenta fruits, which may be spherical or egg-shaped, mature in May, and contain a single seed.

The Magenta Lilly Pilly is found only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the Central Coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.

There were two *Acmena smithii* recorded in the proposal footprint which can be difficult to distinguish from *S. paniculatum* without fruit. Therefore, this species was assumed to be present in the proposal footprint as surveys were conducted outside of the required (fruiting) survey period. There are 13 records of this species in the locality on BioNet. The proposal footprint would result in the removal of 0.36 ha of potential habitat for this species. As the proposal requires relatively minor clearing (0.36 ha) and suitable habitat for this species remains in the LAA, the proposal is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Dusky woodswallow *Artamus cyanopterus cyanopterus*

Dusky woodswallows are widespread in eastern, southern and southwestern Australia. The species occurs throughout most of New South Wales, but is sparsely scattered in, or largely absent from, much of the upper western region. Most breeding activity occurs on the western slopes of the Great Dividing Range.

Dusky woodswallows primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and groundcover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland.

This species primarily eats invertebrates, mainly insects, which are captured whilst hovering or sallying above the canopy or over water. Also frequently hovers, sallies and pounces under the canopy, primarily over leaf litter and dead timber. Also occasionally take nectar, fruit and seed.

Depending on location and local climatic conditions (primarily temperature and rainfall), the dusky woodswallow can be resident year-round or migratory. In NSW, after breeding, birds migrate to the north of the state and to southeastern Queensland, while Tasmanian birds migrate to southeastern NSW after breeding. Migrants generally depart between March and May, heading south to breed again in spring. There is some evidence of site fidelity for breeding. Although dusky woodswallows generally breed as solitary pairs or occasionally in small flocks, large flocks may form around abundant food sources in winter. Large flocks may also form before migration, which is often undertaken with other species.

This species nest is an open, cup-shape, made of twigs, grass, fibrous rootlets and occasionally casuarina needles, and may be lined with grass, rootlets or infrequently horsehair, occasionally unlined. Nest sites vary greatly, but generally occur in shrubs or low trees, living or dead, horizontal or upright forks in branches, spouts, hollow stumps or logs, behind loose bark or in a hollow in the top of a wooden fence post. Nest sites may be exposed or well concealed by foliage.

This species was assumed to be present in the proposal footprint as targeted bird surveys were not conducted. The proposal footprint does not provide breeding or nesting habitat for this species, as it mostly breeds on the western slopes of the Great Dividing Range. The proposal footprint provides only sub-optimal foraging habitat as it is close to the busy Central Coast Highway, and there are only six records of this species on BioNet in the locality, which indicates it is not a frequent visitor to the locality. As the proposal requires relatively minor clearing (0.36 ha) and it will not impact breeding habitat, it is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Bush Stone-curlew *Burhinus grallarius*

The Bush Stone-curlew stands about 55 cm tall. It has a grey to light brown back, marked with black blotches, and a streaked rump. It has buff and white underparts with dark streaks, and a black band that runs from near its eye down its neck. This species has large, bright yellow eyes and a hunch-shouldered stance on long spindly legs. When disturbed it lies flat on the ground, with its head and neck outstretched. Its call is a loud eerie wailing "wee-loo", mostly heard at night.

The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however and in the south-east it is either rare or extinct throughout its former range. The Bush Stone-curlew inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber and is largely nocturnal, being especially active on moonlit nights. It feeds on insects and small vertebrates, such as frogs, lizards and snakes, and nest on the ground in a scrape or small bare patch. Two eggs are laid in spring and early summer.

This species was assumed to be present in the proposal footprint as targeted bird surveys were not conducted. There are 162 records of this species in the locality on BioNet, however all are from around the Kincumber Broadwater, or close to the entrance of Brisbane Water. There are no records of this species nearby to the proposal footprint, and the proposal footprint provides sub-optimal habitat as it does not contain a grassy understory. As the proposal requires relatively minor clearing (0.36 ha) and it will not impact important or known habitat for this species, it is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Gang-gang Cockatoo *Callocephalon fimbriatum*

Gang-gang Cockatoos are one of the more distinctive and charismatic members of Australia's avifauna. These birds are primarily slate-grey, with the males easily identified by their scarlet head and wispy crest, while females have a grey head and crest and feathers edged with salmon pink on the underbelly. They range in length from 32 to 37 cm, with a wingspan of 62 to 76 cm. The call has been likened to a creaking gate or cork being pulled from a bottle.

The Gang-gang Cockatoo is distributed from southern Victoria through south- and central-eastern New South Wales. In New South Wales, the Gang-gang Cockatoo is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. It occurs regularly in the Australian Capital Territory. It is rare at the extremities of its range, with isolated records known from as far north as Coffs Harbour and as far west as Mudgee.

In spring and summer, the Gang-gang Cockatoo is generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. The Gang-gang Cockatoo may also occur in sub-alpine Snow Gum (*Eucalyptus pauciflora*) woodland and occasionally in temperate rainforests and favours old growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are 10 cm in diameter or larger and at least 9 m above the ground in eucalypts.

This species was assumed to be present in the proposal footprint as targeted bird surveys were not conducted. There are 6 records of this species in the locality on BioNet, which suggests that they are not regular visitors to the locality. There are no records of this species nearby to the proposal footprint and the proposal footprint is unlikely to provide nesting habitat for this species as while there were several hollows of suitable diameter for this species, all the hollows occur along the busy Central Coast Highway, and as such, are not ideal for nesting. As the proposal requires relatively minor clearing of potential foraging habitat only (0.36 ha) and it will not impact important or known nesting habitat for this species, it is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

South-eastern Glossy Black-Cockatoo *Calyptorhynchus lathami*

The Glossy Black-Cockatoo is a small brown-black cockatoo with a massive, bulbous bill and a short crest. Males have a prominent red tail panel, while that of females is yellow to orange-red. The coloured tail panel is barred black in juvenile birds, with the extent of barring decreasing with age. The female usually has irregular pale-yellow markings on the head and neck, and may have yellow flecks on the underparts and underwing. They are usually seen in pairs or small groups feeding quietly in sheoaks.

The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. An isolated population exists on Kangaroo Island, South Australia.

The Glossy Black-Cockatoo inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (*Allocasuarina littoralis*) and Forest Sheoak (*A. torulosa*) are important foods. Inland populations feed on a wide range of sheoaks, including Drooping Sheoak, *Allocasuarina diminuta*, and *A. gymnothera*. Belah is also utilised and may be a critical food source for some populations. In the Riverina, birds are associated with hills and rocky rises supporting Drooping Sheoak, but also recorded in open woodlands dominated by Belah (*Casuarina cristata*).

The Glossy Black-Cockatoo feeds almost exclusively on the seeds of several species of she-oak (*Casuarina* and *Allocasuarina* species), shredding the cones with the massive bill. This species is dependent on large hollow-bearing eucalypts for nest sites. A single egg is laid between March and May.

This species was assumed to be present in the proposal footprint as targeted bird surveys were not conducted and *Allocaeusuarina torulosa* were recorded in the proposal footprint. There are 42 records of this species in the locality on BioNet, some nearby to the proposal footprint. The proposal footprint is unlikely to provide nesting habitat for this species as while there were several hollows of suitable diameter for this species, all the hollows occur along the busy Central Coast Highway, and as such, are not ideal for nesting. As the proposal requires relatively minor clearing of potential foraging habitat only (0.36 ha) and it will not impact important or known nesting habitat for this species, it is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Brown Treecreeper (eastern subspecies) *Climacteris picumnus victoriae*

The Brown Treecreeper, Australia's largest treecreeper, is a grey-brown bird with black streaking on the lower breast and belly and black bars on the undertail. Pale buff bands across the flight feathers are obvious in flight. The face is pale, with a dark line through the eye, and a dark crown. Individuals are active, noisy and conspicuous, and give a loud 'pink' call, often repeated in contact, and sometimes given in a series of 5 - 10 descending notes. This species breeds from July to Feb across its range.

The Brown Treecreeper is endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. It is less commonly found on coastal plains and ranges. The western boundary of the range of *Climacteris picumnus victoriae* runs approximately through Corowa, Wagga Wagga, Temora, Forbes, Dubbo and Inverell and along this line the subspecies intergrades with the arid zone subspecies of Brown Treecreeper *Climacteris picumnus picumnus* which then occupies the remaining parts of the state. The eastern subspecies lives in eastern NSW in eucalypt woodlands through central NSW and in coastal areas with drier open woodlands such as the Snowy River Valley, Cumberland Plains, Hunter Valley and parts of the Richmond and Clarence Valleys.

The population density of this subspecies has been greatly reduced over much of its range, with major declines recorded in central NSW and the northern and southern tablelands. Declines have occurred in remnant vegetation fragments smaller than 300 hectares, that have been isolated or fragmented for more than 50 years.

The brown Treecreeper (eastern subspecies) is found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (*Eucalyptus camaldulensis*) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains.

This species is sedentary, considered to be resident in many locations throughout its range; present in all seasons or year-round at many sites; territorial year-round, though some birds may disperse locally after breeding. It is gregarious and usually observed in pairs or small groups of 8 to 12 birds; terrestrial and arboreal with a diet comprised 80% of ants; other invertebrates and nectar from Mugga Ironbark (*Eucalyptus sideroxylon*) and paperbarks make up the remaining percentage. Hollows in standing dead or live trees and tree stumps are essential for nesting. The species breeds in pairs or co-operatively in territories which range in size from 1.1 to 10.7 ha (mean = 4.4 ha). Each group is composed of a breeding pair with retained male offspring and, rarely, retained female offspring. Often in pairs or cooperatively breeding groups of two to five birds.

This species was assumed to be present in the proposal footprint as targeted bird surveys were not conducted. The proposal footprint provides sub-optimal habitat for this species as it is not a dry open woodland nor does it include Box-Gum species. There is only one record of this species in the locality on BioNet, suggesting that it is not a regular visitor to the locality. As the proposal requires relatively minor clearing (0.36 ha) and it will not impact known or important habitat for this species, it is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Varied Sittella *Daphoenositta chrysoptera*

The Varied Sittella is a small (10 cm) songbird with a sharp, slightly upturned bill, short tail, barred undertail, and yellow eyes and feet. In flight the orange wing-bar and white rump are prominent. In NSW most individuals have a grey head and are streaked with dark brown, but in the extreme north-east they have a white head, and in the extreme south-west a black cap. Varied Sittellas are more active and acrobatic among branches than the larger treecreepers. They fly into the heads of trees, typically working their way down branches and trunk with constant motion.

The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. The Varied Sittella's population size in NSW is uncertain but is believed to have undergone a moderate reduction over the past several decades.

It inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland, and generation length is estimated to be 5 years.

The Varied Sittella feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy, and builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, often re-using the same fork or tree in successive years.

This species was assumed to be present in the proposal footprint as targeted bird surveys were not conducted. There are 21 records of this species in the locality on BioNet, the nearest 3 km to the west of the proposal footprint. As this species is fairly sedentary in its habitat, and there are no records within or nearby to the proposal footprint, then the proposal footprint is unlikely to be used by this species. As the proposal requires relatively minor clearing (0.36 ha) and it will not impact known or important habitat for this species, it is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Little Lorikeet *Glossopsitta pusilla*

The Little Lorikeet is a small (16-19 cm; 40 g) bright green parrot, with a red face surrounding its black bill and extending to the eye. The undertail is olive-yellow with a partly concealed red base, and the underwing coverts are bright green. The call in flight is a shrill and rolling screech: 'zit-zit' or 'zzet'. Although difficult to observe while foraging high in treetops, a flock's constantly chattering contact calls give it away. Flight is fast, direct and through or above the canopy.

The Little Lorikeet is distributed widely across the coastal and Great Divide regions of eastern Australia from Cape York to South Australia. NSW provides a large portion of the species' core habitat, with lorikeets found westward as far as Dubbo and Albury. Nomadic movements are common, influenced by season and food availability, although some areas retain residents for much of the year and 'locally nomadic' movements are suspected of breeding pairs.

The Little Lorikeet forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species. They feed mostly on nectar and pollen, occasionally on native fruits such as mistletoe, and only rarely in orchards. The Little Lorikeet is gregarious, travelling and feeding in small flocks (<10), though often with other lorikeets and roosts in treetops, often distant from feeding areas. Flocks numbering hundreds are still occasionally observed and may have been the norm in past centuries.

Nests are made in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts. Entrance is small (3 cm) and usually high above the ground (2–15 m). These nest sites are often used repeatedly for decades, suggesting that preferred sites are limited. Riparian trees are often chosen, including species like Allocasuarina. Nesting season extends from May to September. In years when flowering is prolific, Little Lorikeet pairs can breed twice, producing 3-4 young per attempt. The survival rate of fledglings is unknown.

This species was assumed to be present in the proposal footprint as targeted bird surveys were not conducted. There are 25 records of this species in the locality on BioNet, some nearby to the proposal footprint. The proposal footprint is unlikely to provide nesting habitat for this species as while there were several hollows of suitable diameter for this species, all the hollows occur along the busy Central Coast Highway, and as such, are not ideal for nesting. As the proposal requires relatively minor clearing of potential foraging habitat only (0.36 ha) and it will not impact important or known nesting habitat for this species, it is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Swift Parrot *Lathamus discolor*

The Swift Parrot is small parrot about 25 cm long. It is bright green with red around the bill, throat and forehead. The red on its throat is edged with yellow. Its crown is blue-purple. There are bright red patches under the wings. One of most distinctive features from a distance is its long (12 cm), thin tail, which is dark red. This distinguishes it from the similar lorikeets, with which it often flies and feeds. Can also be recognised by its flute-like chirruping or metallic "kik-kik-kik" call.

The Swift Parrot breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW this species mostly occurs on the coast and south west slopes.

The Swift Parrot migrates to the Australian south-east mainland between March and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*, as well as lerp infested trees include Inland Grey Box *E. microcarpa*, Grey Box *E. moluccana* and Blackbutt *E. pilularis*. Following winter they return to Tasmania where they breed from September to January, nesting in old trees with hollows and feeding in forests dominated by Tasmanian Blue Gum *Eucalyptus globulus*, and are identifiable from March to September.

This species was assumed to be present in the proposal footprint as the proposal footprint is mapped as 'important habitat' (BOAMS) for this species. There are 9 records of this species in the locality on BioNet, the nearest one 3 km to the west from 2016. The proposal footprint does not provide nesting habitat for this species as this species breeds in Tasmania and arrives on the Central Coast (in some years) to forage in winter flowering species however none of the favoured winter feed trees were identified in the proposal footprint. As the proposal requires relatively minor clearing of sub-optimal foraging habitat (0.36 ha) and it will not impact breeding habitat for this species, it is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Barking Owl *Ninox connivens*

The Barking Owl is medium-sized owl (42 cm, 650 g), smaller than the similar Powerful Owl and larger than the Southern Boobook. It has bright yellow eyes and no facial-disc. Upperparts are brown or greyish-brown, and the white breast is vertically streaked with brown. The large talons are yellow. Males are typically larger than their mate and have a more square crown. The quick, dog-like 'wook-wook' territorial call is diagnostic, but the yapping of foxes and dogs is sometimes attributed to this species. Pairs of birds perform call-and-answer duets, the male's tone being the deeper, which often rise to an excited rapid pitch. It also has a high-pitched tremulous scream that has earned it the name 'screaming-woman bird'.

The Barking Owl is found throughout continental Australia except for the central arid regions. Although common in parts of northern Australia, the species has declined greatly in southern Australia and now occurs in a wide but sparse distribution in NSW. Core populations exist on the western slopes and plains (especially the Pilliga) and in some northeast coastal and escarpment forests. Many populations have crashed as woodland on fertile soils was cleared, leaving linear riparian strips of remnant trees as the last inhabitable areas. Sometimes extend their home range into urban areas, hunting birds in garden trees and insects attracted to streetlights.

This species inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey on these fertile soils. They roost in shaded portions of tree canopies, including tall midstorey trees with dense foliage such as Acacia and Casuarina species. During nesting season, the male perches in a nearby tree overlooking the hollow entrance.

The Barking Owl preferentially hunts small arboreal mammals such as Squirrel Gliders and Ringtail Possums, but when loss of tree hollows decreases these prey populations the owl becomes more reliant on birds, invertebrates and terrestrial mammals such as rodents and rabbits. Can catch bats and moths on the wing, but typically hunts by sallying from a tall perch.

It requires very large permanent territories in most habitats due to sparse prey densities. Monogamous pairs hunt over as much as 6000 hectares, with 2000 hectares being more typical in NSW habitats. Two or three eggs are laid in hollows of large, old trees. Living eucalypts are preferred though dead trees are also used. Nest sites are used repeatedly over years by a pair, but they may switch sites if disturbed by predators (e.g. goannas). Nesting occurs during mid-winter and spring but is variable between pairs and among years. As a rule of thumb, laying occurs during August and fledging in November. The female incubates for 5 weeks, roosts outside the hollow when chicks are 4 weeks old, then fledging occurs 2-3 weeks later. Young are dependent for several months.

Territorial pairs respond strongly to recordings of Barking Owl calls from up to 6 km away, though humans rarely hear this response farther than 1.5 km. Because disturbance reduces the pair's foraging time, and can pull the female off her eggs even on cold nights, recordings should not be broadcast unnecessarily nor during the nesting season. The Barking Owl calls at all time of year, but strongest response in March-June. Avoid early nesting (July-Sept) when surveys pull the female off eggs on cold nights.

This species was assumed to be present in the proposal footprint as targeted nocturnal owl surveys were not conducted, and hollows > 20 cm diameter were recorded in the proposal footprint. There are 9 records of this species in the locality on BioNet, all from the other side of Brisbane Water, at least 6 km to the east. The proposal footprint is unlikely to provide nesting habitat for this species as while there were several hollows of suitable diameter for this species, none of the hollows appeared to have suitable depth, and all occur along the busy Central Coast Highway, and as such, are not ideal for nesting. As there are no nearby records and the proposal requires relatively minor clearing of potential foraging habitat (0.36 ha) and is unlikely to impact important or known nesting habitat for this species, the proposal is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction. Mitigation measures have been provided to minimise the risk of direct impacts to this species during construction of the proposal.

Powerful Owl *Ninox strenua*

The Powerful Owl is the largest owl in Australasia. It is a typical hawk-owl, with large yellow eyes and no facial-disc. Adults reach 60 cm in length, have a wingspan of up to 140 cm and weigh up to 1.45 kilograms. Males are larger than females. The upper parts of the Powerful Owl are dark, greyish-brown with indistinct off-white bars. The underparts are whitish with

dark greyish-brown V-shaped markings. Juvenile Powerful Owls have a white crown and underparts that contrasts with its small, dark streaks and dark eye patches. The call of this species may be heard at any time of the year, but it is more vocal during the autumn breeding season. It has a slow, deep and resonant double hoot, with the female's being higher pitched and expressing an upward inflection on the second note.

The Powerful Owl is endemic to eastern and south-eastern Australia, mainly on the coastal side of the Great Dividing Range from Mackay to south-western Victoria. In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered records on the western slopes and plains suggesting occupancy prior to land clearing. Now it low densities throughout most of its eastern range, rare along the Murray River and former inland populations may never recover.

The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine *Syncarpia glomulifera*, Black She-oak *Allocasuarina littoralis*, Blackwood *Acacia melanoxylon*, Rough-barked Apple *Angophora floribunda*, Cherry Ballart *Exocarpus cupressiformis* and a number of eucalypt species.

The main prey items are medium-sized arboreal marsupials, particularly the Greater Glider, Common Ringtail Possum and Sugar Glider. There may be marked regional differences in the prey taken by Powerful Owls. For example in southern NSW, Ringtail Possum make up the bulk of prey in the lowland or coastal habitat. At higher elevations, such as the tableland forests, the Greater Glider may constitute almost all of the prey for a pair of Powerful Owls. Flying foxes are important prey in some areas; birds comprise about 10-50% of the diet depending on the availability of preferred mammals. As most prey species require hollows and a shrub layer, these are important habitat components for the owl.

Pairs of Powerful Owls demonstrate high fidelity to a large territory, the size of which varies with habitat quality and thus prey densities. In good habitats a mere 400 can support a pair; where hollow trees and prey have been depleted the owls need up to 4000 ha. Powerful Owls nest in large tree hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old. While the female and young are in the nest hollow the male Powerful Owl roosts nearby (10-200 m) guarding them, often choosing a dense "grove" of trees that provide concealment from other birds that harass him.

Powerful Owls are monogamous and mate for life. Nesting occurs from late autumn to mid-winter, but is slightly earlier in north-eastern NSW (late summer - mid autumn). Clutches consist of two dull white eggs and incubation lasts approximately 38 days. This species is identifiable all year.

This species was assumed to be present in the proposal footprint as targeted nocturnal owl surveys were not conducted, and hollows > 20 cm diameter were recorded in the proposal footprint. There are 240 records of this species in the locality on BioNet, two records from 2023 are only 300 m to the south of the proposal footprint. The proposal footprint is unlikely to provide nesting habitat for this species as while there were several hollows of suitable diameter for this species, none of the hollows appeared to have suitable depth, and all occur along the busy Central Coast Highway, and as such, are not ideal for nesting. Due to the proximity of nearby records, it is assumed that the hollows within the proposal footprint provide potential nesting habitat for this species. Mitigation measures have been provided to minimise the risk of direct impacts to this species during construction of the proposal. The proposal is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Masked Owl *Tyto novaehollandiae*

A medium-sized owl to 40 - 50 cm long, with dark eyes set in a prominent flat, heart-shaped facial disc that is encircled by a dark border. The feet are large and powerful, with fully feathered legs down to the toes. The owl exists in several colour forms, with wide variation in plumage. The upperparts are grey to dark brown with buff to rufous mottling and fine, pale spots. The wings and tail are well barred. The underparts are white to rufous-brown with variable dark spotting. The palest birds have a white face with a brown patch around each eye; the darkest birds have a chestnut face. The dark form of the Masked Owl is much browner than the Sooty Owl *Tyto tenebricosa*.

This species lives in dry eucalypt forests and woodlands from sea level to 1100 m and is a forest owl, but often hunts along the edges of forests, including roadsides. Their habitat extends from the coast where it is most abundant to the western plains. Overall records for this species fall within approximately 90% of NSW, excluding the most arid north-western corner. There is no seasonal variation in its distribution.

The typical diet consists of tree-dwelling and ground mammals, especially rats. Pairs have a large home-range of 500 to 1000 hectares, and they roost and breed in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.

This species was assumed to be present in the proposal footprint as targeted nocturnal owl surveys were not conducted, and hollows > 20 cm diameter were recorded in the proposal footprint. There are 8 records of this species in the locality on BioNet, the nearest record approximately 1.3 km to the northwest. The proposal footprint is unlikely to provide nesting

habitat for this species as while there were several hollows of suitable diameter for this species, none of the hollows appeared to have suitable depth, and all occur along the busy Central Coast Highway, and as such, are not ideal for nesting. As there are no nearby records and the proposal requires relatively minor clearing of potential foraging habitat (0.36 ha) and is unlikely to impact important or known nesting habitat for this species, the proposal is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction. Mitigation measures have been provided to minimise the risk of direct impacts to this species during construction of the proposal.

Eastern Pygmy-possum *Cercartetus nanus*

The Eastern Pygmy-possum is found in south-eastern Australia, from southern Queensland to eastern South Australia and in Tasmania. In NSW it extends from the coast inland as far as the Pilliga, Dubbo, Parkes and Wagga Wagga on the western slopes. They are found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. They may occupy small patches of vegetation in fragmented landscapes and although the species prefers habitat with a rich shrub understory, they are known to occur in grassy woodlands and the presence of Eucalypts alone is sufficient to support populations in low densities.

The feed largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable. They also feeds on insects throughout the year; this feed source may be more important in habitats where flowers are less abundant such as wet forests.

They shelter in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum (*Pseudocheirus peregrinus*) dreys or thickets of vegetation, (e.g. grass-tree skirts); nest-building appears to be restricted to breeding females; tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks.

Appear to be mainly solitary and use several nests, with males having non-exclusive home-ranges of about 0.68 hectares and females about 0.35 hectares. Young can be born whenever food sources are available, however most births occur between late spring and early autumn. They are agile climbers, but can be caught on the ground in traps, pitfalls or postholes; generally nocturnal. They frequently spend time in torpor especially in winter, with body curled, ears folded and internal temperature close to the surroundings.

This species was assumed to be present in the proposal footprint as targeted surveys were not conducted. There are 65 records of this species in the locality on BioNet, including many records within 2 km of the proposal footprint. This species is difficult to detect, even with targeted survey or during pre-clearing surveys. The proposal footprint provides suitable nesting, denning and sheltering habitat in hollows, stumps and dense vegetation, along with potential foraging habitat for this species. The proposal construction works would be undertaken at night, which would reduce the potential impacts on this species as it is nocturnal and more able to avoid direct impacts from clearing works. Due to the proximity of nearby records, it is assumed that the hollows within the proposal footprint provide potential nesting habitat for this species. The proposal is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction. Mitigation measures have been provided to minimise the risk of direct impacts to this species during construction of the proposal.

Large-eared Pied Bat *Chalinolobus dwyeri*

The Large-eared Pied Bat is a small to medium-sized bat with long, prominent ears and glossy black fur. The lower body has broad white fringes running under the wings and tail-membrane, meeting in a V-shape in the pubic area. This species is one of the wattled bats, with small lobes of skin between the ears and corner of the mouth.

Found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. There are scattered records from the New England Tablelands and North West Slopes. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. They remain loyal to the same cave over many years.

They are found in well-timbered areas containing gullies and are likely to hibernate through the coolest months. The relatively short, broad wing combined with the low weight per unit area of wing indicates manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy. It is uncertain whether mating occurs early in winter or in spring. They are most active warm months October to March. Not active in winter or wet/windy/cold weather.

This species was assumed to be present in the proposal footprint as targeted surveys were not conducted for microbats and habitat assessment determined that while there was no potential roosting habitat within the proposal footprint, there

was potential roosting habitat for this species within 2 km of the proposal footprint (i.e. cliffs, rocky area containing caves). There are 10 records of this species in the locality on BioNet, the nearest being 1.3 km to the west recorded in 2023. The proposal footprint provides potential foraging habitat for this species however it is unlikely to provide roosting habitat as although it is steep and crevices were present in the retaining rock walls, there were no caves, cliffs, tunnels or mines suitable for roosting. As the proposal would impact a relatively small area of potential foraging habitat (0.36 ha), the proposal is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Spotted-tailed Quoll *Dasyurus maculatus*

The Spotted-tailed Quoll is about the size of a domestic cat, from which it differs most obviously in its shorter legs and pointed face. The average weight of an adult male is about 3500 grams and an adult female about 2000 grams. It has rich-rust to dark-brown fur above, with irregular white spots on the back and tail, and a pale belly. The spotted tail distinguishes it from all other Australian mammals, including other quoll species. However, the spots may be indistinct on juvenile animals.

The range of the Spotted-tailed Quoll has contracted considerably since European settlement. It is now found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania. Only in Tasmania is it still considered relatively common.

They are recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites. This species is mostly nocturnal, although will hunt during the day; spends most of the time on the ground, although also an excellent climber and will hunt possums and gliders in tree hollows and prey on roosting birds.

They use communal 'latrine sites', often on flat rocks among boulder fields, rocky cliff-faces or along rocky stream beds or banks. Such sites may be visited by multiple individuals and can be recognised by the accumulation of the sometimes characteristic 'twisty-shaped' faeces deposited by animals.

The Spotted-tailed Quoll is a generalist predator with a preference for medium-sized (500g-5kg) mammals. Consumes a variety of prey, including gliders, possums, small wallabies, rats, birds, bandicoots, rabbits, reptiles and insects. Also eats carrion and takes domestic fowl. Females occupy home ranges up to about 750 hectares and males up to 3500 hectares. Are known to traverse their home ranges along densely vegetated creeklines. Average litter size is five; both sexes mature at about one year of age. Life expectancy in the wild is about 3-4 years.

This species was assumed to be present in the proposal footprint as targeted surveys were not conducted. There are 19 records of this species in the locality on BioNet, the nearest record 2 km to the west from 2019. The proposal footprint provides suitable nesting and denning habitat in hollows, along with potential foraging habitat for this species. The proposal construction works would be undertaken at night, which would reduce the potential impacts on this species as it is nocturnal and more able to avoid direct impacts from clearing works. Due to the proximity of nearby records, it is assumed that the hollows within the proposal footprint provide potential nesting habitat for this species. The proposal is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction. Mitigation measures have been provided to minimise the risk of direct impacts to this species during construction of the proposal.

Eastern False Pipistrelle *Falsistrellus tasmaniensis*

The Eastern False Pipistrelle is relatively large with a head-body length of about 65 mm. It weighs up to 28 grams. It is dark to reddish-brown above and paler grey on its underside. It has long slender ears set well back on the head and some sparse hair on the nose.

The Eastern False Pipistrelle is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania. This species prefers moist habitats, with trees taller than 20 m. They generally roost in eucalypt hollows but has also been found under loose bark on trees or in buildings, and hunt beetles, moths, weevils and other flying insects above or just below the tree canopy.

The Eastern False Pipistrelle hibernates in winter, and females are pregnant in late spring to early summer. They are identifiable from mid spring – mid autumn.

This species was assumed to be present in the proposal footprint as targeted surveys were not conducted for microbats and suitable roosting habitat was identified in the proposal footprint (i.e. hollows). There are 14 records of this species in the locality on BioNet, the nearest being 2.2 km to the west recorded in 2020. The proposal footprint provides potential foraging and roosting habitat for this species. The proposal construction works would be undertaken at night, which would reduce the potential impacts on this species as it is nocturnal and would not be roosting during works, and therefore more able to avoid direct impacts from clearing works. As the proposal would impact a relatively small area of potential foraging

habitat (0.36 ha), and suitable foraging and roosting habitat would be retained nearby, the proposal is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Parma Wallaby *Macropus parma*

The Parma Wallaby is a small wallaby, with a head and body length up to 52 cm. Fur is a uniform greyish-brown on the back and shoulders with a dark stripe along the spine ending mid-back. It has a white stripe on the cheek and upper lip and a white belly. When hopping, remains close to the ground in an almost horizontal position with the forearms tucked tightly against the body, and the tail curved upwards in a shallow U-shape.

Once occurred from north-eastern NSW to the Bega area in the southeast. Their range is now confined to the coast and ranges of central and northern NSW from the Gosford district to the Queensland border. Preferred habitat is moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest. The Parma Wallaby typically feed at night on grasses and herbs in more open eucalypt forest and the edges of nearby grassy areas, and during the day they shelter in dense cover.

This species was assumed to be present in the proposal footprint as targeted surveys were not conducted. There are 2 records of this species in the locality on BioNet from 2015 on the other side of the M1 motorway which is a barrier to movement, suggesting that the locality is not regularly used by this species. The proposal footprint therefore provides infrequent, but potential foraging habitat for this species. As the proposal would impact a relatively small area of potential foraging habitat only, the proposal is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Eastern Coastal Freetail-bat *Micronomus norfolkensis*

The Eastern Freetail-bat is found along the east coast from south Queensland to southern NSW where it occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. They roost mainly in tree hollows but will also roost under bark or in man-made structures. They are usually solitary but have also been recorded roosting communally. The species is most likely to be insectivorous.

This species was recorded using ultrasonic detection (Appendix A) on each of the five nights of survey however as the proposal requires relatively minor clearing of suitable habitat for this species (0.145 ha) and only one hollow bearing tree for potential roosting, the proposal is unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

This species was assumed to be present in the proposal footprint as targeted surveys were not conducted for microbats and suitable roosting habitat was identified in the proposal footprint (i.e. hollows). There are 18 records of this species in the locality on BioNet, the nearest being 1.2 km to the northeast recorded in 2018. The proposal footprint provides potential foraging and roosting habitat for this species. The proposal construction works would be undertaken at night, which would reduce the potential impacts on this species as it is nocturnal and would not be roosting during works, and therefore more able to avoid direct impacts from clearing works. As the proposal would impact a relatively small area of potential foraging habitat (0.36 ha), and suitable foraging and roosting habitat would be retained nearby, the proposal is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Little Bentwing Bat *Miniopterus australis*

Little Bentwing-bats are distributed along the East coast and ranges of Australia from Cape York in Queensland to Wollongong in NSW where it inhabits moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. It is generally found in well-timbered areas.

Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. They often share roosting sites with the Large bentwing-bat and, in winter, the two species may form mixed clusters. In NSW the largest maternity colony is in close association with a large maternity colony of Large Bentwing-bats and appears to depend on the large colony to provide the high temperatures needed to rear its young. Maternity colonies form in spring and birthing occurs in early summer. Males and juveniles disperse in summer. Only five nursery sites /maternity colonies are known in Australia. The species is identifiable Mid spring to mid-autumn around maternity colonies.

This species was assumed to be present in the proposal footprint as targeted surveys were not conducted for microbats and suitable roosting habitat was identified in the proposal footprint (i.e. culverts). There are 75 records of this species in the locality on BioNet, many within 2 km of the proposal footprint. Thus, the proposal footprint provides potential foraging and roosting habitat for this species. As the proposal would impact a relatively small area of potential foraging habitat (0.36 ha), and suitable foraging and roosting habitat would be retained nearby, the proposal is considered unlikely to have an

adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction. Mitigation measures have been provided to minimise the risk of direct impacts to this species during construction of the proposal.

Large Bentwing-bat *Miniopterus orianae oceanensis*

Large Bentwing-bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but they also use derelict mines, storm-water tunnels, buildings and other man-made structures. They form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. Maternity caves have very specific temperature and humidity regimes. At other times of the year, populations disperse within about 300 km range of maternity caves. Cold caves are used for hibernation in southern Australia. Breeding or roosting colonies can number from 100 to 150,000 individuals. They hunt in forested areas, catching moths and other flying insects above the tree tops and hibernate from June to August.

This species was assumed to be present in the proposal footprint as targeted surveys were not conducted for microbats and suitable roosting habitat was identified in the proposal footprint (i.e. culverts). There are 48 records of this species in the locality on BioNet, many within 2 km of the proposal footprint. Thus, the proposal footprint provides potential foraging and roosting habitat for this species. As the proposal would impact a relatively small area of potential foraging habitat (0.36 ha), and suitable foraging and roosting habitat would be retained nearby, the proposal is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction. Mitigation measures have been provided to minimise the risk of direct impacts to this species during construction of the proposal.

Southern Greater Glider *Petauroides volans*

The Southern Greater Glider occurs in eastern Australia, in eucalypt forests and woodlands, where it has a broad distribution from around Proserpine in Queensland, south through NSW and the Australian Capital Territory into Victoria. They feed exclusively on eucalypt leaves, buds, flowers and mistletoe, and are very loyal to their territory. This species shelters during the day in tree hollows and will use up to 18 hollows in their home range. Recorded using hollows with a minimum diameter of 8 cm. They occupy a relatively small home range with an average size of 1 to 3 ha. The Southern Greater Glider gives birth to a single young in late autumn or early winter which remains in the pouch for approximately 4 months and is independent at 9 months of age. They are usually solitary, though mated pairs and offspring will share a den during the breeding season and until the young are independent. This species can glide up to a horizontal distance of 100m including changes of direction of as much as 90 degrees.

This species was assumed to be present in the proposal footprint as targeted surveys were not conducted. There are six records of this species in the locality on BioNet, however all records are to the east of Brisbane Water, at least 9 km from the proposal footprint. Given the absence of nearby records, the proposal footprint is unlikely to provide important nesting, denning or foraging habitat. As such, the proposal is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction. The proposal construction works would be undertaken at night, which would reduce the potential impacts on this species as it is nocturnal and more able to avoid direct impacts from clearing works. Mitigation measures have been provided to minimise the risk of direct impacts to this species during construction of the proposal.

Yellow-bellied Glider *Petaurus australis*

The Yellow-bellied Glider is a large, active, sociable and vocal glider. Adults weigh 450 - 700 grams, have a head and body length of about 30 cm and a large bushy tail that is about 45 cm long. It has grey to brown fur above with a cream to yellow belly, which is paler in young animals. The dark stripe down the back is characteristic of the group. It has a large gliding membrane that extends from the wrist to the ankle. It has a loud, distinctive call, beginning with a high-pitched shriek and subsiding into a throaty rattle.

The Yellow-bellied Glider is found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria. They occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south.

This species feeds primarily on plant and insect exudates, including nectar, sap, honeydew and manna with pollen and insects providing protein. They extract sap by incising (or biting into) the trunks and branches of favoured food trees, often leaving a distinctive 'V'-shaped scar. The Yellow-bellied Glider lives in small family groups of two - six individuals and are nocturnal, often found in dens or large tree hollows. They are very mobile and occupy large home ranges between 20 to 85 ha to encompass dispersed and seasonally variable food resources.

This species was assumed to be present in the proposal footprint as targeted surveys were not conducted. There are 14 records of this species in the locality on BioNet, the nearest record is 5.6 km to the northeast recorded in 2024. Given the absence of nearby records, the proposal footprint is unlikely to provide important nesting, denning or foraging habitat. As such, the proposal is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction. The proposal construction works would be undertaken at night, which would reduce the potential impacts on this species as it is nocturnal and more able to avoid direct impacts from clearing works. Mitigation measures have been provided to minimise the risk of direct impacts to this species during construction of the proposal.

Squirrel Glider *Petaurus norfolcensis*

The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria. It inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. It prefers mixed species stands with a shrub or Acacia midstorey. They live in family groups of a single adult male one or more adult females and offspring and require abundant tree hollows for refuge and nest sites. Diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein.

This species was assumed to be present in the proposal footprint as targeted surveys were not conducted. There are five records of this species in the locality on BioNet, the nearest record is 6.3 km to the northeast recorded in 2016. Given the absence of nearby records, the proposal footprint is unlikely to provide important nesting, denning or foraging habitat. As such, the proposal is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction. The proposal construction works would be undertaken at night, which would reduce the potential impacts on this species as it is nocturnal and more able to avoid direct impacts from clearing works. Mitigation measures have been provided to minimise the risk of direct impacts to this species during construction of the proposal.

Koala *Phascolarctos cinereus*

The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In New South Wales, koala populations are found on the central and north coasts, southern highlands, southern and northern tablelands, Blue Mountains, southern coastal forests, with some smaller populations on the plains west of the Great Dividing Range.

They inhabit eucalypt woodlands and forests and feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. They are inactive for most of the day, feeding and moving mostly at night. Koalas spend most of their time in trees, but will descend and traverse open ground to move between trees. Their home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size. They are generally solitary, but have complex social hierarchies based on a dominant male with a territory overlapping several females and sub-ordinate males on the periphery. Females breed at two years of age and produce one young per year.

This species was assumed to be present in the proposal footprint as targeted surveys were not conducted. There are 12 records of this species in the locality on BioNet, the nearest record is 1.9 km to the northeast recorded in 2024. Habitat assessment identified a preferred feed tree (Grey Gum *Eucalyptus punctata*) covering approximately 10% of the canopy in PCT 3586. The proposal does not require vegetation clearing in PCT 3586, on trimming of branches that overhang the road. As such, the impacts of the proposal on potential habitat for this species would be negligible and the proposal is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Northern long-nosed Potoroo *Potorous tridactylus tridactylus*

Adult long-nosed potoroos weigh up to 1.6 kg (740 - 1640 grams) and have a head and body length of about 360 mm and a tail length between 200 - 260 mm. Its fur is greyish-brown above and light grey below. It is distinguished from the slightly larger, but very similar long-footed potoroo in a number of subtle ways including its shorter tail (less than 250 mm long) and smaller hind-foot (shorter than its head). Also, unlike the long-footed potoroo the long-nosed potoroo lacks a leathery pad on the sole of its foot, just behind the inner toe (a hallucal pad).

The long-nosed potoroo is found on the south-eastern coast of Australia, from Queensland to eastern Victoria and Tasmania, including some of the Bass Strait islands. There are geographically isolated populations in western Victoria. In NSW it is generally restricted to coastal heaths and forests east of the Great Dividing Range, with an annual rainfall exceeding 760 mm.

This species inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature. The fruit-bodies of hypogeous (underground-fruited) fungi are a large component of the diet of the Long-nosed Potoroo. They also eat roots, tubers, insects and their larvae and other soft-bodied animals in the soil. They often dig small holes in the ground in a similar way to bandicoots.

The long-nosed potoroo is mainly nocturnal, hiding by day in dense vegetation - however, during the winter months animals may forage during daylight hours. Individuals are mainly solitary, non-territorial and have home range sizes ranging between 2-5 ha. Breeding peaks typically occur in late winter to early summer and a single young is born per litter. Adults are capable of two reproductive bouts per annum.

This species was assumed to be present in the proposal footprint as targeted surveys were not conducted. There are three records of this species in the locality on BioNet, the nearest 2.9 km to the southeast recorded in 2021, suggesting that the locality is not regularly used by this species. The proposal footprint therefore provides infrequent, but potential foraging habitat for this species. As the proposal would impact a relatively small area of potential foraging habitat only, the proposal is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Grey-headed Flying-fox *Pteropus poliocephalus* (foraging only)

The Grey-headed Flying-fox is the largest Australian bat, with a head and body length of 23 - 29 cm. It has dark grey fur on the body, lighter grey fur on the head and a russet collar encircling the neck. The wing membranes are black and the wingspan can be up to 1 m. It can be distinguished from other flying-foxes by the leg fur, which extends to the ankle.

Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations. They occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young.

Annual mating commences in January and conception occurs in April or May; a single young is born in October or November. For the Grey-headed Flying-fox, site fidelity to camps is high; some camps have been used for over a century. They can travel up to 50 km from the camp to forage; commuting distances are more often less than 20 km. This species feeds on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines. They also forage in cultivated gardens and fruit crops.

This species was assumed to be present in the proposal footprint as nocturnal surveys were not conducted, hence it is assumed that there is potential foraging habitat. The nearest roost camp is at Wingello Creek, Gosford, to the east of the proposal footprint. There are 417 records of this species in the locality on BioNet. The proposal footprint provides suboptimal foraging habitat only for this species given its proximity to the busy highway. As the proposal requires relatively minor clearing of sub-optimal foraging habitat (0.36 ha) and breeding habitat would not be impacted, the proposal is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*

The Yellow-bellied Sheathtail-bat is a very distinctive, large, insectivorous bat up to 87 mm long. It has long, narrow wings, a glossy, jet-black back, and a white to yellow belly extending to the shoulders and just behind the ear. Characteristically, it has a flattened head and a sharply-pointed muzzle. The tail is covered with an extremely elastic sheath that allows variation in the tail-membrane area. Males have a prominent throat pouch; females have a patch of bare skin in the same place.

The Yellow-bellied Sheathtail-bat is a wide-ranging species found across northern and eastern Australia. In the most southerly part of its range - most of Victoria, south-western NSW and adjacent South Australia - it is a rare visitor in late summer and autumn. There are scattered records of this species across the New England Tablelands and North West Slopes.

This species roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, they fly high and fast over the forest canopy, but lower in more open country.

The Yellow-bellied Sheathtail-bat forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory. Breeding has been recorded from December to mid-March, when a single young is born. Seasonal movements are unknown; there is speculation about a migration to southern Australia in late summer and autumn.

This species was assumed to be present in the proposal footprint as targeted surveys were not conducted for microbats and suitable roosting habitat was identified in the proposal footprint (i.e. hollows). There are five records of this species in

the locality on BioNet, the nearest being 5 km to the south recorded in 2023. Thus the proposal footprint provides potential foraging and roosting habitat for this species. The proposal construction works would be undertaken at night, which would reduce the potential impacts on this species as it is nocturnal and would not be roosting during works, and therefore more able to avoid direct impacts from clearing works. As the proposal would impact a relatively small area of potential foraging habitat (0.36 ha), and suitable foraging and roosting habitat would be retained nearby, the proposal is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Greater Broad-nosed Bat *Scoteanax rueppellii*

The Greater Broad-nosed Bat is a large powerful bat, up to 95 mm long, with a broad head and a short square muzzle. It is dark reddish-brown to mid-brown above and slightly paler below. It is distinguished from other broad-nosed bats by its greater size. While similar to the Eastern False Pipistrelle *Falsistrellus tasmaniensis*, it differs by having only two (not four) upper incisors.

The Greater Broad-nosed Bat is found mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. In NSW it is widespread on the New England Tablelands, however, does not occur at altitudes above 500 m.

This species utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings.

The Greater Broad-nosed Bat forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m. Open woodland habitat and dry open forest suits the direct flight of this species as it searches for beetles and other large, slow-flying insects; this species has been known to eat other bat species.

Little is known of its reproductive cycle, however a single young is born in January; prior to birth, females congregate at maternity sites located in suitable trees, where they appear to exclude males during the birth and raising of the single young. The Greater Broad-nosed Bat is identifiable mid spring to mid autumn.

This species was assumed to be present in the proposal footprint as targeted surveys were not conducted for microbats and suitable roosting habitat was identified in the proposal footprint (i.e. hollows). There are 24 records of this species in the locality on BioNet, the nearest being 1.5 km to the southwest recorded in 2022. Thus, the proposal footprint provides potential foraging and roosting habitat for this species. The proposal construction works would be undertaken at night, which would reduce the potential impacts on this species as it is nocturnal and would not be roosting during works, and therefore more able to avoid direct impacts from clearing works. As the proposal would impact a relatively small area of potential foraging habitat (0.36 ha), and suitable foraging and roosting habitat would be retained nearby, the proposal is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

Eastern Cave Bat *Vespadelus trougtoni*

The Eastern Cave Bat is found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. The western limit appears to be the Warrumbungle Range, and there is a single record from southern NSW, east of the ACT. Very little is known about the biology of this uncommon species. It is a cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. Occasionally found along cliff-lines in wet eucalypt forest and rainforest. Little is understood of its feeding or breeding requirements or behaviour.

This species was assumed to be present in the proposal footprint as targeted surveys were not conducted for microbats and habitat assessment determined that while there was no potential roosting habitat within the proposal footprint, there was potential roosting habitat for this species within 2 km of the proposal footprint (i.e. caves). There are 25 records of this species in the locality on BioNet, the nearest being 1.6 km to the south recorded in 2022. The proposal footprint provides potential foraging habitat for this species however it is unlikely to provide roosting habitat as there were no caves. As the proposal would impact a relatively small area of potential foraging habitat (0.36 ha), the proposal is considered unlikely to have an adverse effect on the life cycle of this species such that a viable local population of the species is likely to be placed at risk of extinction.

b) *In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*

i. *Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*

ii.	<i>is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction</i>
N/A	
c)	<i>In relation to the habitat of a threatened species or ecological community:</i>
i.	<i>The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and</i>
ii.	<i>Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and</i>
iii.	<i>The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.</i>
I.	The proposal requires clearing of up to 0.36 ha of native vegetation (PCT 3150) and minor tree trimming to PCT 3586 where branches hang over the road.
II.	The area of habitat is along the Central Coast Highway, between the highway and industrial land use areas. The width of the bushland at this point is approximately 34 m. The proposed clearing would reduce the width to approximately 16 m of the already narrow vegetation corridor in this area, however it would not result in fragmentation or isolation of habitat.
III.	The proposal requires removal of many mature trees along the edge of the highway, including eight hollow bearing trees with 20 hollows of varying size. These hollows provide potential habitat for 15 threatened species assumed to be present in the proposal footprint (i.e. Gang-gang Cockatoo, South-eastern Glossy Black-Cockatoo, Little Lorikeet, Barking Owl, Powerful Owl, Masked Owl, Eastern Pygmy-possum, Spotted-tailed Quoll, Eastern False Pipistrelle, Eastern Coastal Free tailed Bat, Southern Greater Glider, Yellow-bellied Glider, Squirrel Glider, Yellow-bellied Sheath-tail-bat, Greater Broad-nosed Bat). While the hollows are of suitable diameter for these hollow dependant species, it is noted that the presence of the busy highway may reduce the utilisation rate of these hollows. There are also two culverts in the proposal footprint which provide potential roosting habitat for threatened microbats (i.e. Little Bentwing-bat and Large Bentwing-bat). There are however other hollow bearing trees and culverts nearby in the adjoining habitat that would not be impacted and would continue to provide habitat for these threatened species. The habitat is considered to be of moderate importance to the long-term survival of these threatened species in the locality.
d)	<i>Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).</i>
The proposal footprint does not contain a declared area of outstanding biodiversity value	
e)	<i>Whether the proposed development or activity is part of a key threatening process or is likely to increase the impact of a key threatening process.</i>
The proposal is part of, or may contribute to, the following key threatening processes:	
1. Clearing of native vegetation	
Clearing, as defined by the determination, refers to the destruction of a sufficient proportion of one or more strata (layers) within a stand or stands of native vegetation. There are numerous impacts because of clearing native vegetation, including:	
• Destruction of habitat causing a loss of biological diversity, and may result in total extinction of species or loss of local genotypes • Fragmentation of populations resulting in limited gene flow between small isolated populations, reduced potential to adapt to environmental change and loss or severe modification of the interactions between species • Riparian zone degradation, such as bank erosion leading to sedimentation that affects aquatic communities • Disturbed habitat which may permit the establishment and spread of exotic species which may displace native species • Loss of leaf litter, removing habitat for a wide variety of vertebrates and invertebrates.	
The clearing is unlikely to cause the loss of biological diversity as there is extensive, similarly diverse native vegetation adjoining the proposal footprint that would be retained. The clearing is along a road edge so would not result in further fragmentation although it would reduce the existing narrow corridor from 34 m wide to 16 m wide. The clearing does not include riparian vegetation. 0.36 ha of leaf litter would be lost and associated habitat for vertebrates and invertebrates. There is minimal weed invasion (4%), mainly along the highway edge and the loss of many large trees may contribute to the spread of weeds into remaining strip of bushland through edge effects.	
2. Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae	

Exotic disease-causing rusts (basidiomycete fungi of the order Pucciniales, formerly known as the order Uredinales), are known to constitute a major threat to native Australian plants of the Myrtaceae family. One variant is referred to as 'Myrtle Rust'. Wild native plants of New South Wales that have previously been infected by *U. rangellii* and that were recorded in the proposal footprint include: *Backhousia myrtifolia* (Grey Myrtle, Ironwood), *Eucalyptus deanei* (Mountain Blue Gum), *Rhodamnia rubescens* (Scrub Turpentine) and *Syncarpia glomulifera* (Turpentine).

One Scrub Turpentine within the proposal footprint showed signs of Myrtle rust (Photo 3-5). It is possible that other species within the proposal footprint also had Myrtle Rust however it was difficult to see the leaves of these species from the ground.

The proposal is unlikely to cause the introduction of this exotic rust fungi as it is already present in the proposal footprint however it may lead to further establishment of this exotic rust fungi.

3. Invasion, establishment and spread of Lantana (*Lantana camara* L. sens. lat)

Approximately 4% *Lantana camara* cover was recorded in the BAM plot within PCT 3150. The loss of many large trees may contribute to the spread of this weed into the remaining strip of bushland through edge effects and increased.

4. Loss of hollow-bearing trees

The Loss of Hollow-bearing Trees is listed as a key threatening process as:

- (a) it adversely affects threatened species, populations or ecological communities, or
- (b) could cause species, populations or ecological communities that are not threatened to become threatened.

The proposal requires the removal of eight hollow bearing trees with approximately 20 hollows (recorded from the ground). These hollows provide potential habitat for up to 15 hollow dependent threatened species assumed to be present in the proposal footprint. Mature and old hollow-bearing trees offer other valuable resources. Mature trees provide more flowers, nectar, fruit and seeds than younger trees, and a complex substrate that supplies diverse habitats for invertebrate populations. When hollow-bearing trees collapse or shed limbs they also provide hollow logs that serve as important foraging substrates and shelter sites.

Conclusion

The proposal footprint is assumed to provide habitat for 31 threatened flora and fauna species and as such, the proposal would impact 0.36 ha of potential habitat for these species. The proposal would result in removal of three individual Scrub Turpentine *Rhodamnia rubescens* recorded in the proposal footprint. The proposal would reduce the existing thin strip of wildlife corridor from 34 m to 16 m however it would not result in fragmentation or isolation of habitat. The proposal requires removal of many mature trees along the edge of the highway, including eight mature hollow bearing trees with 20 hollows of varying size. These hollows provide potential habitat for 15 threatened species assumed to be present in the proposal footprint (i.e. Gang-gang Cockatoo, South-eastern Glossy Black-Cockatoo, Little Lorikeet, Barking Owl, Powerful Owl, Masked Owl, Eastern Pygmy-possum, Spotted-tailed Quoll, Eastern False Pipistrelle, Eastern Coastal Free tailed Bat, Southern Greater Glider, Yellow-bellied Glider, Squirrel Glider, Yellow-bellied Sheathtail-bat and Greater Broad-nosed Bat). While the hollows are of suitable diameter for these hollow dependant species, it is noted that the presence of the adjoining Central Coast Highway may reduce the utilisation rate of these hollows. There are also two culverts in the proposal footprint which provide potential roosting habitat for threatened microbats (i.e. Little Bentwing-bat and Large Bentwing-bat).

There is potential for harm to hollow dependent fauna occupying a hollow at the time of clearing, and potential to harm microbats utilising the culverts during culvert remediation works.

In addition, the proposal would contribute to four key threatening processes, including clearing of native vegetation, the establishment of Myrtle Rust (which was observed on Scrub Turpentine *Rhodamnia rubescens* within the proposal footprint), the loss of hollow bearing trees and the spread of *Lantana camara*.

Despite the many negative environmental outcomes of the proposal, it is considered unlikely to have a significant impact on the long-term survival of a local population of a threatened species as the extent of clearing is relatively small (0.36 ha) and there is similar adjoining habitat, including hollow bearing trees and culverts, that would not be impacted and would continue to provide habitat for these threatened species. Mitigation measures have been provided to minimise direct impacts of the proposal on any threatened species considered likely to occur within the proposal footprint.

16. Appendix E: Assessments of significance (EPBC Act)

A search of the EPBC Protected Matters Search Tool was completed for an area within 10 km of the proposal footprint on 23/06/25. A summary of results from database searches are provided in Table 3-8 (section 3).

No MNES were identified within the proposal footprint or study area.

Of the listed threatened and migratory species, ten were considered to have potential habitat and were assumed to be present due to inadequate survey (i.e. surveys conducted outside of the required survey period or not in accordance with relevant guidelines due to safety and access issues). These species are summarised below:

1. Scrub Turpentine *Rhodamnia rubescens* CE (EPBC Act)
2. Tranquility Mintbush *Prostanthera askania* E (EPBC Act)
3. Magenta Lilly Pilly *Syzygium paniculatum* V (EPBC Act)
4. Swift Parrot *Lathamus discolor* CE (EPBC Act)
5. Large-eared Pied Bat *Chalinolobus dwyeri* V (EPBC Act)
6. Koala *Phascolarctos cinereus* E (EPBC Act)
7. Spotted-tailed Quoll *Dasyurus maculatus* E (EPBC Act)
8. Southern Greater Glider *Petauroides volans* E (EPBC Act)
9. Grey-headed Flying-fox *Pteropus poliocephalus* (foraging only) V (BC Act), V (EPBC Act)
10. Yellow-bellied Glider *Petaurus australis* V (EPBC Act)
11. Northern long-nosed Potoroo *Potorous tridactylus tridactylus* V (EPBC Act)

The following assessment has been completed in accordance with the [Significant Impact Guidelines 1.1 - Matters of National Environmental Significance \(Commonwealth of Australia 2013a\)](#). Species information was obtained from the Species Profile and Threats (SPRAT) database (DCCEEW) and references therein.

Critically endangered and endangered species

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

- lead to a long-term decrease in the size of a population
- reduce the area of occupancy of the species
- fragment an existing population into two or more populations
- adversely affect habitat critical to the survival of a species
- disrupt the breeding cycle of a population
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat
- introduce disease that may cause the species to decline, or
- interfere with the recovery of the species.

A 'population of a species' is defined under the EPBC Act as an occurrence of the species in a particular area. In relation to critically endangered, endangered or vulnerable threatened species, occurrences include but are not limited to:

- a geographically distinct regional population, or collection of local populations, or

- a population, or collection of local populations, that occurs within a particular bioregion

1. Scrub Turpentine *Rhodamnia rubescens* CE (BC Act), CE (EPBC Act)

Rhodamnia rubescens is known to occur from coastal districts of NSW north from Batemans Bay to Bundaberg in Queensland. The distribution of *Rhodamnia rubescens* occasionally extends inland onto the escarpment up to 600 m a.s.l. in areas with rainfall of 1,000-1,600 mm. There are 2,740 records associated with the name *Rhodamnia rubescens* in Australia in the Atlas of Living Australia.

Rhodamnia rubescens commonly occurs in all rain forest subforms except cool temperate rainforest. The species occupies a range of volcanically derived and sedimentary soils and is a common pioneer species in eucalypt forests. Populations and individuals of *Rhodamnia rubescens* are often found in wet sclerophyll associations in rainforest transition zones (including open forest of *Eucalyptus tereticornis* and *E. bosistoana* in the Sydney region) and creekside riparian associations.

Rhodamnia rubescens flowers from late winter through spring, with a peak in October and fruits appear in December in the Sydney region. The species is able to resprout from rootstock after fire and produce suckers which may develop into thickets. The species is characterised as a common understory tree. The habitat of *Rhodamnia rubescens* is likely to include the following vegetation classes: Subtropical Rainforests, Northern Warm Temperate Rainforests, Littoral Rainforest, North Coast Wet Sclerophyll Forests, Northern Hinterland WSF, Northern Escarpment WSF, Southern Lowland WSF, and probably the northern patches of South Coast WSF and Southern Escarpment WSF, and perhaps easterly patches of Northern Tableland WSF. It may also occur as a pioneer in adjacent areas of dry sclerophyll and grassy woodland associations.

Three individual *Rhodamnia rubescens* were recorded within the proposal footprint during targeted surveys but all three were located near the southern boundary (Figure 3-1).

As such, the proposal footprint may support a 'population of a species' and the impacts of the proposal are considered further in the following assessment:

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

lead to a long-term decrease in the size of a population

The proposal would potentially impact 0.36 ha of habitat and remove 3 individuals of this species. The remaining 'population of the species' (additional 29 recorded individuals) occurs downslope and would not be impacted by the proposal. Thus, the proposal is unlikely to lead to a long-term decrease in the size of a population.

reduce the area of occupancy of the species

The proposal would reduce the area of occupancy of the species by 0.36 ha, however there is 33.5 ha of suitable habitat (i.e. PCT 3150, PCT 3230, PCT3238, PCT 3029, PCT 3593) in the LAA for this species as mapped on the State Vegetation type map (Figure 1-4). Thus, given the available habitat in the locality, this is not considered to be a significant reduction in area.

fragment an existing population into two or more populations

While the proposal would reduce the wildlife corridor from 34 m to 16 m, it would not result in fragmentation of an existing population.

adversely affect habitat critical to the survival of a species

The proposal footprint has not been identified as habitat critical to the survival of this species.

disrupt the breeding cycle of a population

The proposal would impact 3 individual plants, however given that most of the population is outside of the proposal footprint, the proposal is unlikely to disrupt the breeding cycle of the population.

modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The proposal would remove 0.36 ha of habitat for this species, however given it is a relatively small area, it is unlikely to result in the decline of the population.

result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

The proposal footprint already contains *Lantana camara*. There is potential for the proposal to result in an increase in exotic invasion in the thin strip of bushland that would be retained. Mitigation measures have been included to reduce the spread of weeds.

introduce disease that may cause the species to decline, or

Myrtle Rust was identified on one individual *Rhodamnia rubescens* within the proposal footprint. As such, the proposal has the potential to spread this fungus into adjoining bushland, including nearby *Rhodamnia rubescens*.

interfere with the recovery of the species.

There is currently no recovery plan for *Rhodamnia rubescens*.

2. Tranquility Mintbush *Prostanthera askania*

Prostanthera askania is an erect but spreading and sometimes scrambling, openly branched shrub that grows from 1-3 metres high (Conn 1997). It often forms dense clumps and shows a tendency at some sites to propagate vegetatively. Observations of plants often in canopy gaps or adjacent to tracks and of regeneration following fire suggests that *Prostanthera askania* may be a colonising species that takes advantage of increased light following natural canopy-cover disturbance within the moist forest and rainforest habitats in which it occurs.

Prostanthera askania is endemic to the Gosford – Wyong area of the Central Coast region of NSW. It is found primarily on the rolling hills, foot-slopes and valley flats of the Erina Hills physiographic region. It usually occurs on the lower areas of undulating to moderately steep slopes of the colluvial Watagan and erosional Erina soil landscapes. However, the species has also been found on ridge tops where moister forest types carry across the ridge. The breeding system of *P. askania* is not understood and it is not known whether *P. askania* is exclusively capable of self-pollination.

This species was assumed to be present as targeted surveys were not conducted during the required survey period. There are two records of this species in the locality on BioNet, located on the other side of the M1 Motorway. The proposal footprint does include species typically associated with this species (i.e. Sydney Blue Gum *Eucalyptus saligna* and Turpentine *Syncarpia glomulifera*), however, given the lack of records in the locality, it is unlikely that the proposal footprint contains a local population. As such, the proposal footprint does not support a 'population of a species' as there have been no records of this species on or near to the proposal footprint and therefore it does not support a geographically distinct regional population or a population that occurs within a bioregion. No further assessment of impact to this species is required.

3. Swift Parrot *Lathamus discolor*

The Swift Parrot breeds mostly on the east and south-east coast of Tasmania during summer and migrates to mainland Australia in autumn. During winter the species disperses across forests and woodlands, foraging on nectar and lerps mainly in Victoria and New South Wales. Within these habitats, Swift Parrots preferentially forage in large, mature trees. The area occupied during the breeding season varies between years, depending on food availability, but is typically less than 500 km².

The Swift Parrot occurs as a single, panmictic migratory population. In 2010, the Action Plan for Australian Birds suggested there were approximately 2,000 mature individuals in the wild but has declined since and was estimated to be 750 mature individuals in 2020.

The proposal footprint was on the BOAMS 'important habitat map' for this species and as such, it was assumed to have potential habitat in the proposal footprint. However the proposal footprint does not provide nesting habitat for this species as this species breeds in Tasmania and it does not provide foraging habitat for this species when it arrives on the Central Coast to forage in winter as none of the favoured winter feed trees were identified in the proposal footprint. As such, the proposal footprint does not support a 'population of a species' as there have been no records of this species on or near to the proposal footprint and therefore it does not support a geographically distinct regional population or a population that occurs within a bioregion. No further assessment of impact to this species is required.

4. Koala *Phascolarctos cinereus*

Koalas in New South Wales occur from the northern border with Queensland. The northern NSW distribution includes the Mulga Lands, Darling Riverine Plains, Brigalow Belt South, Nandewar, New England Tablelands, and South East Queensland (NSW Section) bioregions. Koalas also occur within the eastern coastline bioregions of the NSW North Coast, Sydney Basin and South East Corner at the border with Victoria. Their western distribution extends into the South-Eastern Highlands, NSW South Western Slopes, Cobar Penplain, Riverina, and Murray Darling Depression bioregions. Koalas occupy a wide range of habitats. The majority of koalas in New South Wales are found in forests and subhumid woodlands on the central and north coast, and to the west across the Western Plains and slopes, within Pilliga forest, low woodland and forested areas. Low-density populations also occur west of the Great Dividing Range in semi-arid environments.

In 2012, the mean population estimates for koalas within bioregions indicated that the highest numbers of individuals occurred in the bioregions of South Brigalow and Nandewar (11,133), NSW North Coast (8,367) and the Sydney Basin (5,667).

For an individual koala, these resources include access to sufficient quality food and shelter trees to meet their daily energetic requirements and reproductive needs, and a place to avoid predators. This includes forests or woodlands, road-side and rail vegetation and paddock trees, safe intervening ground matrix for travelling between trees and patches to forage and shelter and reproduce and access to vegetated corridors or paddock trees to facilitate movement between patches. These resources fall within individual koala's home ranges and allow for interaction with adjacent individuals. A population of koalas requires a sufficient total amount of resources within their habitat of adequate quality to support a viable biological population where mortality, survival, and recruitment are balanced or recruitment increasing to optimal carrying capacity and within the bounds of natural fluctuations. Crucial habitat elements include patches and corridors for gene flow.

This species was assumed to be present as targeted surveys were not conducted. There are 12 records of Koala in the locality on BioNet, the nearest record was 1.6 km to the north east recorded in 2024. Habitat assessment recorded one preferred feed tree within the proposal footprint (Grey Gum *Eucalyptus punctata*). Grey Gum was recorded to cover approximately 10% of the canopy of PCT 3586. No clearing is required in this PCT, only tree trimming where branches overhang the road. As there is low abundance of preferred feed trees and there are significant road barriers to movement around the proposal footprint, the proposal footprint is unlikely to provide important habitat for this species. As such, the proposal footprint does not support a 'population of a species' as there have been no records of this species on or near to the proposal footprint and therefore it does not support a geographically distinct regional population or a population that occurs within a bioregion. No further assessment of impact to this species is required.

5. Spotted-tailed Quoll *Dasyurus maculatus*

The Spotted-tailed Quoll is widely but patchily distributed in eastern Australia, occurring from north-eastern Queensland to Tasmania. The Spotted-tailed Quoll is a primarily forest-dependent species that occupies a wide range of habitat types, although all appear to be characterised by relatively high and predictable seasonal rainfall. Recorded den sites include rock crevices, hollow logs, hollow tree buttresses, tree hollows, windrows, clumps of vegetation, caves and boulder tumbles, under buildings and underground burrows.

This species was assumed to be present as targeted surveys were not conducted. There are 19 records of this species in the locality on BioNet, the nearest record 2 km to the west from 2019. The proposal footprint provides suitable nesting and denning habitat in hollows, along with potential foraging habitat for this species. Due to the proximity of nearby records, it is assumed that the hollows within the proposal footprint provide potential nesting habitat for this species. As such, the proposal footprint may support a 'population of a species' and the impacts of the proposal are considered further in the following assessment:

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

lead to a long-term decrease in the size of a population

The proposal would potentially impact 0.36 ha of habitat, which is only a small portion of the habitat available to this species in the locality. As such, it is unlikely to lead to a long-term decrease in the size of the population.

reduce the area of occupancy of the species

The proposal would reduce the area of occupancy of the species by 0.36 ha, however given the available habitat in the locality, this is not considered to be a significant reduction in area.

fragment an existing population into two or more populations

While the proposal would reduce the wildlife corridor from 34 m to 16 m, it would not result in fragmentation of an existing population.

adversely affect habitat critical to the survival of a species

Targeted surveys were not undertaken within the proposal footprint, so the extent of the population of this species in the proposal footprint is not known, however given that it is a small area near a busy highway, it is unlikely to constitute habitat critical to the survival of this species.

disrupt the breeding cycle of a population

The proposal would impact potential nesting habitat for this species, however given it is a relatively small area, it is unlikely to disrupt the breeding cycle of the population.

modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The proposal would remove 0.36 ha of habitat for this species, however given it is a relatively small area, it is unlikely to result in the decline of the population.

result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat

The proposal is unlikely to result in the establishment of an invasive species that is harmful to Spotted-tailed Quolls.

introduce disease that may cause the species to decline, or

The proposal is unlikely to introduce disease that is harmful to Spotted-tailed Quolls.

interfere with the recovery of the species.

The recovery objectives for the Spotted-tailed Quoll include:

1. Determine the distribution and status of Spotted-tailed Quoll populations throughout the range, and identify key threats and implement threat abatement management practices.
2. Investigate key aspects of the biology and ecology of the Spotted-tailed Quoll to acquire targeted information to aid recovery.
3. Reduce the rate of habitat loss and fragmentation on private land.
4. Evaluate and manage the risk posed by silvicultural practices.
5. Determine and manage the threat posed by introduced predators (foxes, cats, wild dogs) and of predator control practices on Spotted-tailed Quoll populations.
6. Determine and manage the impact of fire regimes on Spotted-tailed Quoll populations.
7. Reduce deliberate killings of Spotted-tailed Quolls.
8. Reduce the frequency of Spotted-tailed Quoll road mortality.
9. Assess the threat Cane Toads pose to Spotted-tailed Quolls and develop threat abatement actions if necessary.
10. Determine the likely impact of climate change on Spotted-tailed Quoll populations.
11. Increase community awareness of the Spotted-tailed Quoll and involvement in the Recovery Program.

The proposal is not inconsistent with any of the recovery objectives.

6. Southern Greater Glider *Petauroides volans*

The greater glider is restricted to eastern Australia, from the Windsor Tableland in north Queensland to central Victoria, with an elevational range from sea level to 1200m a.s.l. An isolated inland subpopulation occurs in the Gregory Range west of Townsville, and another in the Einasleigh Uplands.

The greater glider is an arboreal marsupial, largely restricted to eucalypt forests and woodlands. It is primarily folivorous, with a diet mostly comprising eucalypt leaves, and occasionally flowers. It is found in highest abundance in taller, montane, moist eucalypt forests, with relatively old trees and abundant hollows. The distribution may be patchy even in suitable habitat. The greater glider favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species.

This species was assumed to be present in the proposal footprint as targeted surveys were not conducted. There are six records of this species in the locality on BioNet, however all records are to the east of Brisbane Water, at least 9 km from the proposal footprint. Given the absence of nearby records, the proposal footprint is unlikely to provide important nesting, denning or foraging habitat. As such, the proposal footprint does not support a 'population of a species' as there have been no records of this species on or near to the proposal footprint and therefore it does not support a geographically distinct regional population or a population that occurs within a bioregion. No further assessment of impact to this species is required

Vulnerable species

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- lead to a long-term decrease in the size of an important population of a species
- reduce the area of occupancy of an important population
- fragment an existing important population into two or more populations • adversely affect habitat critical to the survival of a species
- disrupt the breeding cycle of an important population
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
- introduce disease that may cause the species to decline, or
- interfere substantially with the recovery of the species.

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

7. Magenta Lilly Pilly *Syzygium paniculatum*

Based upon available information, the known total population of Magenta Lilly Pilly is estimated to be approximately 1200 plants that are distributed along a 400 kilometre stretch of coastal NSW between Upper Lansdowne in the north to Conjola National Park in the south. The species occurs naturally in locations including the Jervis, Sydney Cataract, Pittwater and Wyong subregions of the Sydney Basin Bioregion.

Magenta Lilly Pilly has been reported to occur on sandy soil or stabilised sand dunes in coastal areas (Hyland 1983), in littoral rainforest on sand or subtropical rainforest on sandy soil derived from sandstone (Floyd 2008), in littoral or subtropical rainforest on sandy soils or stabilised Quaternary sand dunes (Quinn et al 1995), or in subtropical and littoral rainforest on sandy soils or stabilized dunes near the sea (Wilson 2002). The species has been recorded growing mainly on flat to gently sloping sites on floodplains, creek banks, perched sand dunes, in swales of hind dunes, and on old dunal ridges. It has also been less commonly recorded on steep sites in gullies, such as in Bouddi National Park and at Green Point Foreshore Reserve.

There was one *Acmena smithii* recorded in the proposal footprint which can be difficult to distinguish from *S. paniculatum* without fruit. Therefore, one individual *S. paniculatum* was assumed to be present in the proposal footprint as surveys were conducted outside of the required (fruiting) survey period. There are 13 records of this species in the locality on BioNet. There are no past records within or nearby to the proposal footprint, and the proposal footprint provides only sub-optimal habitat for this species as it does not consist of flat floodplain, creek banks or perched sand dunes. As such, the assumed population within the proposal footprint is not considered to be an 'important population' as it does not constitute a key source population for breeding or dispersal, is not a population necessary for maintaining genetic diversity, and is not a population that is near the limit of the species range. As such, no further assessment is required.

8. Large-eared Pied Bat *Chalinolobus dwyeri*

The distribution of the large-eared pied bat is discontinuous and ranges from Shoalwater Bay in Queensland through to Ulladulla in New South Wales. The species has been found roosting in caves, overhangs, abandoned mine tunnels and disused fairy martin nests. No evidence exists of the large-eared pied bat roosting in tree hollows. The large-eared pied bat is dependent on the presence of diurnal roosts for shelter. Roosts are utilised during the day and also at night when not feeding, as well as for the raising of young.

This species was assumed to be present in the proposal footprint as targeted surveys were not conducted for microbats and habitat assessment determined that while there was no potential roosting habitat within the proposal footprint, there was potential roosting habitat for this species within 2 km of the proposal footprint (i.e. cliffs, rocky area containing caves). There are 10 records of this species in the locality on BioNet, the nearest being 1.3 km to the west recorded in 2023. The proposal footprint provides potential foraging habitat for this species however it is unlikely to provide roosting or breeding habitat. As such, the assumed population within the proposal footprint is not considered to be an 'important population' as it does not

constitute a key source population for breeding or dispersal, is not a population necessary for maintaining genetic diversity, and is not a population that is near the limit of the species range. As such, no further assessment is required.

9. Yellow-bellied Glider *Petaurus australis*

The yellow-bellied glider (south-eastern) is found at altitudes ranging from sea level to 1400 m above sea level and has a widespread but patchy distribution from south-eastern Queensland to far south-eastern SA. In NSW, it predominantly occurs in forests along the eastern coast, from the NSW-Qld border to the NSW-Vic border.

Key habitat of the yellow-bellied glider includes trees with unknown characteristics for sap feeding. This species' prefer to den in living hollow-bearing trees. Large areas of forest are required to maintain population viability.

This species was assumed to be present in the proposal footprint as targeted surveys were not conducted. There are 14 records of this species in the locality on BioNet, the nearest record is 5.6 km to the northeast recorded in 2024. Given the absence of records within or nearby to the proposal footprint, the proposal footprint is unlikely to provide important nesting, denning or foraging habitat. As such, the assumed population within the proposal footprint is not considered to be an 'important population' as it does not constitute a key source population for breeding or dispersal, is not a population necessary for maintaining genetic diversity, and is not a population that is near the limit of the species range. As such, no further assessment is required.

10. Northern long-nosed Potoroo *Potorous tridactylus tridactylus*

The long-nosed potoroo is found on the south-eastern coast of Australia, from Queensland to eastern Victoria and Tasmania, including some of the Bass Strait islands. There are geographically isolated populations in western Victoria. In NSW it is generally restricted to coastal heaths and forests east of the Great Dividing Range, with an annual rainfall exceeding 760 mm.

This species inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature. The fruit-bodies of hypogeous (underground-fruited) fungi are a large component of the diet of the Long-nosed Potoroo. They also eat roots, tubers, insects and their larvae and other soft-bodied animals in the soil. They often dig small holes in the ground in a similar way to bandicoots.

The long-nosed potoroo is mainly nocturnal, hiding by day in dense vegetation - however, during the winter months animals may forage during daylight hours. Individuals are mainly solitary, non-territorial and have home range sizes ranging between 2-5 ha. Breeding peaks typically occur in late winter to early summer and a single young is born per litter. Adults are capable of two reproductive bouts per annum.

This species was assumed to be present in the proposal footprint as targeted surveys were not conducted. There are three records of this species in the locality on BioNet, suggesting that the locality is not regularly used by this species. The proposal footprint therefore provides infrequent, sub-optimal foraging habitat for this species. As such, the assumed population within the proposal footprint is not considered to be an 'important population' as it does not constitute a key source population for breeding or dispersal, is not a population necessary for maintaining genetic diversity, and is not a population that is near the limit of the species range. As such, no further assessment is required.

12. Grey-headed Flying-fox *Pteropus poliocephalus* (foraging only)

The Grey-headed Flying-fox is Australia's only endemic flying-fox and occurs in the coastal belt from Rockhampton in central Queensland to Melbourne in Victoria. However, only a small proportion of this range is used at any one time, as the species selectively forages where food is available. As a result, patterns of occurrence and relative abundance within its distribution vary widely between seasons and between years. At a local scale, the species is generally present intermittently and irregularly. At a regional scale, broad trends in the distribution of plants with similar flowering and fruiting times support regular annual cycles of migration. Whilst Brisbane, Newcastle, Sydney and Melbourne are occupied continuously, elsewhere, during spring, Grey-headed Flying-foxes are uncommon south of Nowra and widespread in other areas of their range. The species is widespread throughout their range in summer, whilst in autumn it occupies coastal lowlands and is uncommon inland. In winter, the species congregates in coastal lowlands north of the Hunter Valley and is occasionally found on the south coast of NSW (associated with flowering Spotted Gum *Corymbia maculata*) and on the northwest slopes (generally associated with flowering White Box *Eucalyptus albens* or Mugga Ironbark *E. sideroxylon*).

Due to its wide distribution and extensive mobility, annual national counts of the Grey-headed Flying-fox have not taken place since 2005. In 2005, there were estimated to be 674,000 animals.

The Grey-headed Flying-fox requires foraging resources and roosting sites. It is a canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, Melaleuca swamps and Banksia woodlands. It also feeds on commercial fruit crops and on introduced tree species in urban areas. The primary

food source is blossom from Eucalyptus and related genera but in some areas, it also utilises a wide range of rainforest fruits (Eby 1998). None of the vegetation communities used by the Grey-headed Flying-fox produce continuous foraging resources throughout the year. As a result, the species has adopted complex migration traits in response to ephemeral and patchy food resources.

The Grey-headed Flying-fox roosts in aggregations of various sizes on exposed branches. Roost sites are typically located near water, such as lakes, rivers or the coast. Roost vegetation includes rainforest patches, stands of Melaleuca, mangroves and riparian vegetation, but colonies also use highly modified vegetation in urban and suburban areas. The species can maintain fidelity to roost sites for extended periods, although new sites have been colonised.

Mating occurs in early autumn, after which time the larger camps begin to break up, reforming in late spring/early summer, as food resources become more abundant. Males and females segregate in October when females usually give birth. Following six months of gestation, females bear a single young each year. During birthing, the female hangs by the feet with young being born headfirst and subsequently positioned with the mother's wings folded around the young's head. Lactation usually begins in October and continues for three to four months or sometimes longer. Once the young are completely furred, they are left in maternal camps and continue to be nursed until they are independent after around 12 weeks. During this nursery phase, males rejoin the females for courting with pair bonds being formed.

In the wild, as most adult female Grey-headed Flying-foxes conceive one young annually, they have a low maximum rate of population growth for their size. This slow growth rate is further affected by females' tendency to abort or abandon their young in response to environmental stress, such as food shortages or high temperatures. As a result, mass abortions and premature births are known to occur in the wild.

Based on the longevity of captive animals (up to 23 years), their strict breeding season and single birth per year, Australian flying-foxes have evolved in conditions where individuals experience low levels of natural mortality and long survival times in the wild, probably upwards of 15 years. However, since European settlement, flying-fox mortality has increased due to habitat destruction and culling. Post-European settlement, clearing of native vegetation for agriculture and forestry operations has accelerated and has been particularly widespread over the range of the Grey-headed Flying-fox in eastern Australia. The loss of native habitat is assumed to have resulted in the destruction or disturbance of roosting and foraging habitats of the species.

This species was assumed to be present (for foraging habitat only) in the proposal footprint as nocturnal surveys were not undertaken. There are 417 records of this species in the locality on BioNet. The nearest roosting camp is at Wingello Creek, Gosford, approximately 6 km south of the proposal footprint. The proposal footprint does not support an "important" population of Grey-headed Flying Fox as it does not have a roost camp and therefore does not support a key source population for breeding and dispersal, a population necessary for maintaining genetic diversity or a population near the limit of this species range. As such, no further assessment is required.

Summary

In regard to Tranquility Mintbush *Prostanthera askania*, Swift Parrot *Lathamus discolor*, Koala *Phascolarctos cinereus* and Southern Greater Glider *Petauroides volans*, the assumed populations within the proposal footprint do not constitute a 'population' of these species as there have been no records of these species on or near to the proposal footprint and therefore it is unlikely to support a geographically distinct regional population or a population that occurs within a bioregion. No further assessment of impact to these endangered and critically endangered species is required.

In relation to Magenta Lilly Pilly *Syzygium paniculatum*, Large-eared Pied Bat *Chalinolobus dwyeri*, Grey-headed Flying-fox *Pteropus poliocephalus*, Yellow-bellied Glider *Petaurus australis* and Northern long-nosed Potoroo *Potorous tridactylus*, the proposal footprint does not support an 'important population' of these species as it does not constitute a key source population for breeding or dispersal, is not a population necessary for maintaining genetic diversity, and is not a population that is near the limit of the species range. As such, no further assessment of impact to these vulnerably listed threatened species is required.

The proposal footprint may support a 'population of a species' of the endangered Spotted-tailed Quoll *Dasyurus maculatus* and is known to provide habitat to the critically endangered Scrub Turpentine *Rhodamnia rubescens*, however assessment of impact determined that the proposal was unlikely to have a significant impact on these species as the proposal would not lead to a long term decrease in the size of the population, significantly reduce the area of occupancy, fragment an existing population, affect habitat critical to their survival, disrupt the breeding cycle or interfere with the recovery of these species. It would impact 0.36 ha of potential habitat, including nesting and denning habitat for the Spotted-tailed Quoll, however this is a relatively small area and large areas of suitable nearby habitat would remain as habitat for this species. It may also result increased impacts to *Rhodamnia rubescens* from invasive species such as *Lantana camera* and potentially facilitate the further spread of Myrtle Rust into nearby *Rhodamnia rubescens* populations. Mitigation measures have been included to minimise any direct impacts on these species.

As such, the proposal does not require referral to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) for impacts on MNES.

Appendix C: Construction noise assessment

Distanced Based Assessment (Construction Scenario)

Please pick from drop-down list in orange cells

Noise area category		R3
RBL or LA90 Background level (dB(A))	Day	50
	Evening	45
	Night	40
LAeq(15minute) Noise Mangement Level (dB(A))	Day	60
	Day (OOHW)	55
	Evening	50
	Night	45
Scenario		Compound operation
Is there line of sight to receiver?		Yes

Steps for Screening Assessment:

- Schedule noisy works to occur in standard hours where possible or before 11pm and implement Standard Measures.
- Select the representative noise area category. The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
- Select the scenario. If not found in drop-down list, refer to 'Source List' and select a representative scenario with similar plant combination.
- Is there line of sight to receiver? Select the appropriate scenario from the drop down list .

Identify and implement standard mitigation measures where feasible and reasonable. Include any shielding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier and any gaps would compromise the acoustic integrity of the solid barrier.

- Determine if there are any receivers (both residential and non-residential receivers) within the affected distance for each relevant time period . Consider background noise measurements to check assumption in Step #2 if:
(a) there are many affected receivers and the impact duration at any one receiver is more than 3 weeks; or
(b) there are a few affected receivers and the impact duration at any one receiver is more than 6 weeks.
Note that consideration need to be given to the construction staging plan when determining impact duration.
- Identify if there are any receivers within the additional mitigation measures distances and identify feasible and reasonable measures at each receiver
- Where night works are involved, identify sleep disturbance affected distance.
- Document the outcomes of these steps.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project basis. Please contact a Roads and Maritime noise specialist for more information)

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Note that spot check verification of noise levels and individual briefings are not required for projects with less than 3 weeks impact duration

Residential receiver			LAeq(15minute) noise level above background (LA90)												LAeq(15minute) 75 dB(A) or greater (Highly affected)			Sleep disutrbance LAmax 65 dB(A)
Affected distance (m)			5 to 10 dB(A) Noticeable			10 to 20 dB(A) Clearly audible			20 to 30 dB(A) Moderately intrusive			> 30 dB(A) Highly intrusive			Measures			Affected distance (m)
			Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))				
Undeveloped green fields, rural areas with isolated dwellings	Day	115							N	35	70	N, PC, RO	20	75	N, PC, RO	20	75	
	Day (OOHW)	170				N, R1, DR	115	60	N, R1, DR	35	70	N, R1, DR, PC, SN	10	80	N, PC, RO	20	75	
	Evening	250				N, R1, DR	170	55	N, R1, DR	65	65	N, R1, DR, PC, SN	20	75	N, PC, RO	20	75	
	Night	360	N	360	45	N, R2, DR	250	50	N, PC, SN, R2, DR	115	60	AA, N, PC, SN, R2, DR	35	70	N, PC, RO	20	75	85
	Highly Affected	20													N, PC, RO	20	75	
Developed settlements (urban and suburban)	Day	130							N	40	70	N, PC, RO	25	75	N, PC, RO	25	75	
	Day (OOHW)	200				N, R1, DR	130	60	N, R1, DR	40	70	N, R1, DR, PC, SN	15	80	N, PC, RO	20	75	
	Evening	305				N, R1, DR	200	55	N, R1, DR	75	65	N, R1, DR, PC, SN	25	75	N, PC, RO	25	75	
	Night	460	N	460	45	N, R2, DR	305	50	N, PC, SN, R2, DR	130	60	AA, N, PC, SN, R2, DR	40	70	N, PC, RO	25	75	95
	Highly Affected	25													N, PC, RO	25	75	
Propagation across a valley / over water	Day	155							N	50	70	N, PC, RO	25	75	N, PC, RO	25	75	
	Day (OOHW)	250				N, R1, DR	155	60	N, R1, DR	50	70	N, R1, DR, PC, SN	15	80	N, PC, RO	25	75	
	Evening	405				N, R1, DR	250	55	N, R1, DR	90	65	N, R1, DR, PC, SN	25	75	N, PC, RO	25	75	
	Night	630	N	630	45	N, R2, DR	405	50	N, PC, SN, R2, DR	155	60	AA, N, PC, SN, R2, DR	50	70	N, PC, RO	25	75	110
	Highly Affected	25													N, PC, RO	25	75	

Non-residential receiver				LAeq(15minute) noise level above NML									LAeq(15minute) 75 dB(A) or greater (Highly affected)		
Undeveloped green fields, rural areas with isolated dwellings				Standard hours			<10 dB(A)			10 to 20 dB(A)			Measure		
				Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))			
Classroom at schools and other educational institutions				Day	55	170				N	65	65	N, PC, RO	20	75
Hospital wards and operating theatres				Day	65	65							N, PC, RO	20	75
Place of worship				Day	55	170				N	65	65	N, PC, RO	20	75
Active recreation				Day	65	65							N, PC, RO	20	75
Passive recreation				Day	60	115				N	35	70	N, PC, RO	20	75
Industrial premise				Day	75	20							N, PC, RO	20	75
Offices, retail outlets				Day	70	35							N, PC, RO	20	75

			L _{Aeq} (15minute) noise level above NML														
			OOHW			< 5 dB(A)			5 to 15 dB(A)			15 to 25 dB(A)			> 25 dB(A)		
			Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Hospital wards and operating theatres			Evening	65	65				N, R1, DR	35	70	N, R1, DR	11	80	N, R1, DR, PC, SN	4	90
			Night	65	65	N	65	65	N, R2, NR	35	70	N, PC, SN, R2, DR	11	80	AA, N, PC, SN, R2, DR	4	90
Place of worship			Evening	55	170				N, R1, DR	115	60	N, R1, DR	35	70	N, R1, DR, PC, SN	11	80
			Night	55	170	N	170	55	N, R2, NR	115	60	N, PC, SN, R2, DR	35	70	AA, N, PC, SN, R2, DR	11	80
Active recreation			Evening	65	65				N, R1, DR	35	70	N, R1, DR	11	80	N, R1, DR, PC, SN	4	90
Passive recreation			Evening	60	115				N, R1, DR	65	65	N, R1, DR	20	75	N, R1, DR, PC, SN	6	85
Industrial premise			Evening	75	20				N, R1, DR	11	80	N, R1, DR	4	90	N, R1, DR, PC, SN	1	100
			Night	75	20	N	20	75	N, R2, NR	11	80	N, PC, SN, R2, DR	4	90	AA, N, PC, SN, R2, DR	1	100
Offices, retail outlets			Evening	70	35				N, R1, DR	20	75	N, R1, DR	6	85	N, R1, DR, PC, SN	2	95
			Night	70	35	N	35	70	N, R2, NR	20	75	N, PC, SN, R2, DR	6	85	AA, N, PC, SN, R2, DR	2	95

Developed settlements (urban and suburban)	Standard hours			LAeq(15minute) noise level above NML								
				<10 dB(A)			10 to 20 dB(A)			LAeq(15minute) 75 dB(A) or greater (Highly affected)		
	Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Classroom at schools and other educational institutions	Day	55	200				N	75	65	N, PC, RO	25	75
Hospital wards and operating theatres	Day	65	75							N, PC, RO	25	75
Place of worship	Day	55	200				N	75	65	N, PC, RO	25	75
Active recreation	Day	65	75							N, PC, RO	25	75
Passive recreation	Day	60	130				N	40	70	N, PC, RO	25	75
Industrial premise	Day	75	25							N, PC, RO	25	75
Offices, retail outlets	Day	70	40							N, PC, RO	25	75

				LAeq(15minute) noise level above NML											
	OOHW			< 5 dB(A)			5 to 15 dB(A)			15 to 25 dB(A)			> 25 dB(A)		
	Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Hospital wards and operating theatres	Evening	65	75				N, R1, DR	40	70	N, R1, DR	14	80	N, R1, DR, PC, SN	4	90
	Night	65	75	N	75	65	N, R2, NR	40	70	N, PC, SN, R2, DR	14	80	AA, N, PC, SN, R2, DR	4	90
Place of worship	Evening	55	200				N, R1, DR	130	60	N, R1, DR	40	70	N, R1, DR, PC, SN	14	80
	Night	55	200	N	200	55	N, R2, NR	130	60	N, PC, SN, R2, DR	40	70	AA, N, PC, SN, R2, DR	14	80
Active recreation	Evening	65	75				N, R1, DR	40	70	N, R1, DR	14	80	N, R1, DR, PC, SN	4	90
Passive recreation	Evening	60	130				N, R1, DR	75	65	N, R1, DR	25	75	N, R1, DR, PC, SN	8	85
Industrial premise	Evening	75	25				N, R1, DR	14	80	N, R1, DR	4	90	N, R1, DR, PC, SN	1	100
	Night	75	25	N	25	75	N, R2, NR	14	80	N, PC, SN, R2, DR	4	90	AA, N, PC, SN, R2, DR	1	100
Offices, retail outlets	Evening	70	40				N, R1, DR	25	75	N, R1, DR	8	85	N, R1, DR, PC, SN	3	95
	Night	70	40	N	40	70	N, R2, NR	25	75	N, PC, SN, R2, DR	8	85	AA, N, PC, SN, R2, DR	3	95

Non-residential receiver Propagation across a valley / over water				LAeq(15minute) noise level above NML								
	Standard hours			<10 dB(A)			10 to 20 dB(A)			LAeq(15minute) 75 dB(A) or greater (Highly affected)		
	Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Classroom at schools and other educational institutions	Day	55	250				N	75	65	N, PC, RO	25	75
Hospital wards and operating theatres	Day	65	90							N, PC, RO	25	75
Place of worship	Day	55	250				N	75	65	N, PC, RO	25	75
Active recreation	Day	65	90							N, PC, RO	25	75
Passive recreation	Day	60	155				N	40	70	N, PC, RO	25	75
Industrial premise	Day	75	25							N, PC, RO	25	75
Offices, retail outlets	Day	70	50							N, PC, RO	25	75

				LAeq(15minute) noise level above NML											
	OOHW			< 5 dB(A)			5 to 15 dB(A)			15 to 25 dB(A)			> 25 dB(A)		
	Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Hospital wards and operating theatres	Evening	65	90				N, R1, DR	50	70	N, R1, DR	14	80	N, R1, DR, PC, SN	4	90
	Night	65	90	N	90	65	N, R2, NR	50	70	N, PC, SN, R2, DR	14	80	AA, N, PC, SN, R2, DR	4	90
Place of worship	Evening	55	250				N, R1, DR	155	60	N, R1, DR	40	70	N, R1, DR, PC, SN	14	80
	Night	55	250	N	250	55	N, R2, NR	155	60	N, PC, SN, R2, DR	40	70	AA, N, PC, SN, R2, DR	14	80
Active recreation	Evening	65	90				N, R1, DR	50	70	N, R1, DR	14	80	N, R1, DR, PC, SN	4	90
Passive recreation	Evening	60	155				N, R1, DR	90	65	N, R1, DR	25	75	N, R1, DR, PC, SN	8	85
Industrial premise	Evening	75	25				N, R1, DR	15	80	N, R1, DR	4	90	N, R1, DR, PC, SN	1	100
	Night	75	25	N	25	75	N, R2, NR	15	80	N, PC, SN, R2, DR	4	90	AA, N, PC, SN, R2, DR	1	100
Offices, retail outlets	Evening	70	50				N, R1, DR	25	75	N, R1, DR	8	85	N, R1, DR, PC, SN	3	95
	Night	70	50	N	50	70	N, R2, NR	25	75	N, PC, SN, R2, DR	8	85	AA, N, PC, SN, R2, DR	3	95



Transport
for NSW



Distanced Based Assessment (Noisiest Plant)

Steps for Assessment:

- Schedule noisy works to occur in standard hours where possible or before 11pm and implement Standard Measures.
 - Select the representative noise area category. The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
 - Select the noisiest plant. If not found in drop-down list, refer to 'Source List' and select a representative plant with equivalent sound power level.
 - Is there line of sight to receiver? Select the appropriate scenario from the drop-down list. Identify and implement standard mitigation measures where feasible and reasonable. Include any shielding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver?' drop-down list. Solid barriers can be in the form of road cutting, timber lapped and capped fence, shipping container, site office, etc. Substantial solid barriers are barriers greater than 5 metres in height or multiple rows of houses or a sound barrier specifically designed to mitigate construction noise. Please note that vegetation and trees are not considered to be a form of solid barrier and any gaps would compromise the acoustic integrity of the solid barrier.
 - Determine if there are any receivers (both residential and non-residential receivers) within the affected distance for each relevant time period. Consider background LA90 noise measurements to check assumption in Step #2 if:
 - (a) there are many affected receivers and the impact duration at any one receiver is more than 3 weeks; or
 - (b) there are a few affected receivers and the impact duration at any one receiver is more than 6 weeks.Note that consideration needs to be given to the construction staging plan when determining impact duration.
 - Identify if there are any receivers within the additional mitigation measures distances and identify feasible and reasonable measures at each receiver.
 - Where night works are involved, identify sleep disturbance affected distance.
 - Document the outcomes of these steps.
- (Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project basis. Please contact a Transport for NSW noise specialist for more information)

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Note that spot check verification of noise levels and individual briefings are not required for projects with less than 3 weeks impact duration

Please pick from drop-down list in orange cells

Noise area category		R3
RBL or Lase Background level (dB(A))	Day	50
	Evening	45
	Night	40
LAeq(15minute) Noise Management Level (dB(A))	Day	60
	Day (OOHW)	55
	Evening	50
	Night	45
Noisiest plant		Microdrilling Rig (Solimex SM-5)
Is there line of sight to receiver?		Yes

Residential receiver			LAeq(15minute) noise level above background (L _{Aeq})												LAeq(15minute) 75 dB(A) or greater (Highly affected)			Sleep disturbance L _{Amax} 65 dB(A)
			5 to 10 dB(A)			10 to 20 dB(A)			20 to 30 dB(A)			> 30 dB(A)						
			Noticeable			Clearly audible			Moderately intrusive			Highly intrusive						
			Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Affected distance (m)
Undeveloped green fields, rural areas with isolated dwellings	Day	130						N	50	70	N, PC, RO	30	75	N, PC, RO	30	75		
	Day (OOHW)	185					N, R1, DR	130	60	N, R1, DR	50	70	N, R1, DR, PC, SN	25	80	N, PC, RO	30	75
	Evening	270					N, R1, DR	185	55	N, R1, DR	85	65	N, R1, DR, PC, SN	30	75	N, PC, RO	30	75
	Night	390	N	390	45		N, R2, DR	270	50	N, PC, SN, R2, DR	130	60	AA, N, PC, SN, R2, DR	50	70	N, PC, RO	30	75
	Highly Affected	30														N, PC, RO	30	75
Developed settlements (urban and suburban)	Day	145						N	55	70	N, PC, RO	35	75	N, PC, RO	35	75		
	Day (OOHW)	220					N, R1, DR	145	60	N, R1, DR	55	70	N, R1, DR, PC, SN	25	80	N, PC, RO	35	75
	Evening	335					N, R1, DR	220	55	N, R1, DR	95	65	N, R1, DR, PC, SN	35	75	N, PC, RO	35	75
	Night	500	N	500	45		N, R2, DR	335	50	N, PC, SN, R2, DR	145	60	AA, N, PC, SN, R2, DR	55	70	N, PC, RO	35	75
	Highly Affected	35														N, PC, RO	35	75
Propagation across a valley / over water	Day	175						N	65	70	N, PC, RO	40	75	N, PC, RO	40	75		
	Day (OOHW)	280					N, R1, DR	175	60	N, R1, DR	65	70	N, R1, DR, PC, SN	25	80	N, PC, RO	40	75
	Evening	445					N, R1, DR	280	55	N, R1, DR	105	65	N, R1, DR, PC, SN	40	75	N, PC, RO	40	75
	Night	690	N	690	45		N, R2, DR	445	50	N, PC, SN, R2, DR	175	60	AA, N, PC, SN, R2, DR	65	70	N, PC, RO	40	75
	Highly Affected	40														N, PC, RO	40	75

Standard hours		LAeq(15minute) noise level above NML						LAeq(15minute) 75 dB(A) or greater (Highly affected)					
		<10 dB(A)			10 to 20 dB(A)			20 to 30 dB(A)			> 30 dB(A)		
		Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Undeveloped green fields, rural areas with isolated dwellings	Period	NML	Affected distance (m)										
	Day	55	185		N	85	65	N, PC, RO	30	75			
Classroom at schools and other educational institutions	Day	65	85					N, PC, RO	30	75			
	Evening	55	185					N, PC, RO	30	75			
Hospital wards and operating theatres	Day	65	85					N, PC, RO	30	75			
	Evening	55	185					N, PC, RO	30	75			
Place of worship	Day	65	85					N, PC, RO	30	75			
	Evening	55	185					N, PC, RO	30	75			
Active recreation	Day	60	130					N, PC, RO	30	75			
	Evening	75	30					N, PC, RO	30	75			
Passive recreation	Day	75	30					N, PC, RO	30	75			
	Evening	70	50					N, PC, RO	30	75			
Industrial premise	Day	70	50					N, PC, RO	30	75			
	Evening	70	50					N, PC, RO	30	75			
Offices, retail outlets	Day	70	50					N, PC, RO	30	75			
	Evening	70	50					N, PC, RO	30	75			

		LAeq(15minute) noise level above NML															
		< 5 dB(A)			5 to 15 dB(A)			15 to 25 dB(A)			> 25 dB(A)						
		Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))				
Hospital wards and operating theatres	Period	NML	Affected distance (m)														
	Evening	65	85				N, R1, DR <td>50</td> <td>70</td> <td>N, R1, DR<td>17</td><td>80</td><td>N, R1, DR, PC, SN<td>5</td><td>90</td></td></td>	50	70	N, R1, DR <td>17</td> <td>80</td> <td>N, R1, DR, PC, SN<td>5</td><td>90</td></td>	17	80	N, R1, DR, PC, SN <td>5</td> <td>90</td>	5	90		
	Night	65	85	N	85	65			N, R2, NR <td>50</td> <td>70</td> <td>N, PC, SN, R2, DR<td>17</td><td>80</td><td>AA, N, PC, SN, R2, DR<td>5</td><td>90</td></td></td>	50	70	N, PC, SN, R2, DR <td>17</td> <td>80</td> <td>AA, N, PC, SN, R2, DR<td>5</td><td>90</td></td>	17	80	AA, N, PC, SN, R2, DR <td>5</td> <td>90</td>	5	90
	Evening	55	185				N, R1, DR <td>130</td> <td>60</td> <td>N, R1, DR<td>50</td><td>70</td><td>N, R1, DR, PC, SN<td>17</td><td>80</td></td></td>	130	60	N, R1, DR <td>50</td> <td>70</td> <td>N, R1, DR, PC, SN<td>17</td><td>80</td></td>	50	70	N, R1, DR, PC, SN <td>17</td> <td>80</td>	17	80		
	Night	55	185	N	185	55			N, R2, NR <td>130</td> <td>60</td> <td>N, PC, SN, R2, DR<td>50</td><td>70</td><td>AA, N, PC, SN, R2, DR<td>17</td><td>80</td></td></td>	130	60	N, PC, SN, R2, DR <td>50</td> <td>70</td> <td>AA, N, PC, SN, R2, DR<td>17</td><td>80</td></td>	50	70	AA, N, PC, SN, R2, DR <td>17</td> <td>80</td>	17	80
	Evening	65	85				N, R1, DR <td>50</td> <td>70</td> <td>N, R1, DR<td>17</td><td>80</td><td>N, R1, DR, PC, SN<td>5</td><td>90</td></td></td>	50	70	N, R1, DR <td>17</td> <td>80</td> <td>N, R1, DR, PC, SN<td>5</td><td>90</td></td>	17	80	N, R1, DR, PC, SN <td>5</td> <td>90</td>	5	90		
Place of worship	Evening	60	130				N, R1, DR <td>85</td> <td>65</td> <td>N, R1, DR<td>30</td><td>75</td><td>N, R1, DR, PC, SN<td>9</td><td>85</td></td></td>	85	65	N, R1, DR <td>30</td> <td>75</td> <td>N, R1, DR, PC, SN<td>9</td><td>85</td></td>	30	75	N, R1, DR, PC, SN <td>9</td> <td>85</td>	9	85		
	Night	60	130				N, R1, DR <td>85</td> <td>65</td> <td>N, R1, DR<td>30</td><td>75</td><td>N, R1, DR, PC, SN<td>9</td><td>85</td></td></td>	85	65	N, R1, DR <td>30</td> <td>75</td> <td>N, R1, DR, PC, SN<td>9</td><td>85</td></td>	30	75	N, R1, DR, PC, SN <td>9</td> <td>85</td>	9	85		
Active recreation	Evening	65	85				N, R1, DR <td>50</td> <td>70</td> <td>N, R1, DR<td>17</td><td>80</td><td>N, R1, DR, PC, SN<td>5</td><td>90</td></td></td>	50	70	N, R1, DR <td>17</td> <td>80</td> <td>N, R1, DR, PC, SN<td>5</td><td>90</td></td>	17	80	N, R1, DR, PC, SN <td>5</td> <td>90</td>	5	90		
	Night	65	85				N, R1, DR <td>50</td> <td>70</td> <td>N, R1, DR<td>17</td><td>80</td><td>N, R1, DR, PC, SN<td>5</td><td>90</td></td></td>	50	70	N, R1, DR <td>17</td> <td>80</td> <td>N, R1, DR, PC, SN<td>5</td><td>90</td></td>	17	80	N, R1, DR, PC, SN <td>5</td> <td>90</td>	5	90		
Passive recreation	Evening	60	130				N, R1, DR <td>85</td> <td>65</td> <td>N, R1, DR<td>30</td><td>75</td><td>N, R1, DR, PC, SN<td>9</td><td>85</td></td></td>	85	65	N, R1, DR <td>30</td> <td>75</td> <td>N, R1, DR, PC, SN<td>9</td><td>85</td></td>	30	75	N, R1, DR, PC, SN <td>9</td> <td>85</td>	9	85		
	Night	60	130				N, R1, DR <td>85</td> <td>65</td> <td>N, R1, DR<td>30</td><td>75</td><td>N, R1, DR, PC, SN<td>9</td><td>85</td></td></td>	85	65	N, R1, DR <td>30</td> <td>75</td> <td>N, R1, DR, PC, SN<td>9</td><td>85</td></td>	30	75	N, R1, DR, PC, SN <td>9</td> <td>85</td>	9	85		
Industrial premise	Evening	75	30	N	30	75			N, R2, NR <td>17</td> <td>80</td> <td>N, PC, SN, R2, DR<td>5</td><td>90</td><td>AA, N, PC, SN, R2, DR<td>2</td><td>100</td></td></td>	17	80	N, PC, SN, R2, DR <td>5</td> <td>90</td> <td>AA, N, PC, SN, R2, DR<td>2</td><td>100</td></td>	5	90	AA, N, PC, SN, R2, DR <td>2</td> <td>100</td>	2	100
	Night	75	30	N	30	75			N, R2, NR <td>17</td> <td>80</td> <td>N, PC, SN, R2, DR<td>5</td><td>90</td><td>AA, N, PC, SN, R2, DR<td>2</td><td>100</td></td></td>	17	80	N, PC, SN, R2, DR <td>5</td> <td>90</td> <td>AA, N, PC, SN, R2, DR<td>2</td><td>100</td></td>	5	90	AA, N, PC, SN, R2, DR <td>2</td> <td>100</td>	2	100
Offices, retail outlets	Evening	70	50				N, R1, DR <td>30</td> <td>75</td> <td>N, R1, DR<td>9</td><td>85</td><td>N, R1, DR, PC, SN<td>3</td><td>95</td></td></td>	30	75	N, R1, DR <td>9</td> <td>85</td> <td>N, R1, DR, PC, SN<td>3</td><td>95</td></td>	9	85	N, R1, DR, PC, SN <td>3</td> <td>95</td>	3	95		
	Night	70	50	N	50	70			N, R2, NR <td>30</td> <td>75</td> <td>N, PC, SN, R2, DR<td>9</td><td>85</td><td>AA, N, PC, SN, R2, DR<td>3</td><td>95</td></td></td>	30	75	N, PC, SN, R2, DR <td>9</td> <td>85</td> <td>AA, N, PC, SN, R2, DR<td>3</td><td>95</td></td>	9	85	AA, N, PC, SN, R2, DR <td>3</td> <td>95</td>	3	95

Standard hours		LAeq(15minute) noise level above NML						LAeq(15minute) 75 dB(A) or greater (Highly affected)					
		<10 dB(A)			10 to 20 dB(A)			20 to 30 dB(A)			> 30 dB(A)		
		Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Undeveloped green fields, rural areas with isolated dwellings	Period	NML	Affected distance (m)										
	Day	55	220		N	95	65	N, PC, RO	35	75			
Classroom at schools and other educational institutions	Day	65	95					N, PC, RO	35	75			
	Evening	55	220					N, PC, RO	35	75			
Hospital wards and operating theatres	Day	65	95					N, PC, RO	35	75			
	Evening	55	220					N, PC, RO	35	75			
Place of worship	Day	65	95					N, PC, RO	35	75			
	Evening	55	220					N, PC, RO	35	75			
Active recreation	Day	60	145					N, PC, RO	35	75			
	Evening	75	35					N, PC, RO	35	75			
Passive recreation	Day	75	35					N, PC, RO	35	75			
	Evening	70	55					N, PC, RO	35	75			
Industrial premise	Day	70	55					N, PC, RO	35	75			
	Evening	70	55					N, PC, RO	35	75			
Offices, retail outlets	Day	70	55					N, PC, RO	35	75			
	Evening	70	55					N, PC, RO	35	75			

			LAeq(15minute) noise level above NML											
OOHW			< 5 dB(A)			5 to 15 dB(A)			15 to 25 dB(A)			> 25 dB(A)		
Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Hospital wards and operating theatres	Evening	65	95			N, R1, DR	55	70	N, R1, DR	20	80	N, R1, DR, PC, SN	6	90
	Night	65	95	N	95	65			N, PC, SN, R2, DR	20	80	AA, N, PC, SN, R2, DR	6	90
Place of worship	Evening	55	220			N, R1, DR	145	60	N, R1, DR	55	70	N, R1, DR, PC, SN	20	80
	Night	55	220	N	220	55			N, PC, SN, R2, DR	55	70	AA, N, PC, SN, R2, DR	20	80

	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
99		Active recreation	Evening	65	95					N, R1, DR	55	70	N, R1, DR	20	80	N, R1, DR, PC, SN	6	90	
100		Passive recreation	Evening	60	145					N, R1, DR	95	65	N, R1, DR	35	75	N, R1, DR, PC, SN	11	85	
101		Industrial premise	Evening	75	35					N, R1, DR	20	80	N, R1, DR	6	90	N, R1, DR, PC, SN	2	100	
102			Night	75	35		N	35	75	N, R2, NR	20	80	N, PC, SN, R2, DR	6	90	AA, N, PC, SN, R2, DR	2	100	
103		Offices, retail outlets	Evening	70	55					N, R1, DR	35	75	N, R1, DR	11	85	N, R1, DR, PC, SN	4	95	
104			Night	70	55		N	55	70	N, R2, NR	35	75	N, PC, SN, R2, DR	11	85	AA, N, PC, SN, R2, DR	4	95	
105																			
106		Non-residential receiver																	
107		Propagation across a valley / over water																	
108																			
109																			
110																			
111																			
112																			
113		Classroom at schools and other educational institutions	Day	55	280														
114		Hospital wards and operating theatres	Day	65	105														
115		Place of worship	Day	55	280														
116		Active recreation	Day	65	105														
117		Passive recreation	Day	60	175														
118		Industrial premise	Day	75	40														
119		Offices, retail outlets	Day	70	65														
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Distanced Based Assessment (Construction Scenario)

Please pick from drop-down list in orange cells

Noise area category		R3
RBL or LA90 Background level (dB(A))	Day	50
	Evening	45
	Night	40
LAeq(15minute) Noise Mangement Level (dB(A))	Day	60
	Day (OOHW)	55
	Evening	50
	Night	45
Scenario		Corridor clearing
Is there line of sight to receiver?		Yes

Steps for Screening Assessment:

- Schedule noisy works to occur in standard hours where possible or before 11pm and implement Standard Measures.
- Select the representative noise area category. The worksheet titled 'Representative Noise Environ.' provides a number of examples to help select the noise area category.
- Select the scenario. If not found in drop-down list, refer to 'Source List' and select a representative scenario with similar plant combination.
- Is there line of sight to receiver? Select the appropriate scenario from the drop down list .

Identify and implement standard mitigation measures where feasible and reasonable. Include any shielding implemented as part of the standard mitigation measures by changing the selection in the 'Is there line of sight to receiver' drop-down list. Solid barrier can be in the form of road cutting, solid construction hoarding, acoustic curtain, timber lapped and capped fence, shipping container, site office, etc. Please note that vegetation and trees are not considered to be a form of solid barrier and any gaps would compromise the acoustic integrity of the solid barrier.

- Determine if there are any receivers (both residential and non-residential receivers) within the affected distance for each relevant time period . Consider background noise measurements to check assumption in Step #2 if:
(a) there are many affected receivers and the impact duration at any one receiver is more than 3 weeks; or
(b) there are a few affected receivers and the impact duration at any one receiver is more than 6 weeks.
Note that consideration need to be given to the construction staging plan when determining impact duration.
- Identify if there are any receivers within the additional mitigation measures distances and identify feasible and reasonable measures at each receiver
- Where night works are involved, identify sleep disturbance affected distance.
- Document the outcomes of these steps.

(Note that suitable noise management levels for other noise-sensitive businesses not identified in the Construction and Maintenance Noise Estimator should be investigated on a project-by-project basis. Please contact a Roads and Maritime noise specialist for more information)

Abbreviation	Measure
N	Notification
SN	Specific notifications
PC	Phone calls
IB	Individual briefings
RO	Respite offer
R1	Respite period 1
R2	Respite period 2
DR	Duration respite
AA	Alternative accommodation
V	Verification

Note that spot check verification of noise levels and individual briefings are not required for projects with less than 3 weeks impact duration

Residential receiver			LAeq(15minute) noise level above background (LA90)												LAeq(15minute) 75 dB(A) or greater (Highly affected)			Sleep disutrbance LAmax 65 dB(A)
Affected distance (m)			5 to 10 dB(A) Noticeable			10 to 20 dB(A) Clearly audible			20 to 30 dB(A) Moderately intrusive			> 30 dB(A) Highly intrusive			Measures			Affected distance (m)
			Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))	Measures	Within distance (m)	Mitigation level (dB(A))				
Undeveloped green fields, rural areas with isolated dwellings	Day	200							N	85	70	N, PC, RO	45	75	N, PC, RO	45	75	
	Day (OOHW)	290				N, R1, DR	200	60	N, R1, DR	85	70	N, R1, DR, PC, SN	25	80	N, PC, RO	45	75	
	Evening	420				N, R1, DR	290	55	N, R1, DR	135	65	N, R1, DR, PC, SN	45	75	N, PC, RO	45	75	
	Night	605	N	605	45	N, R2, DR	420	50	N, PC, SN, R2, DR	200	60	AA, N, PC, SN, R2, DR	85	70	N, PC, RO	45	75	230
	Highly Affected	45													N, PC, RO	45	75	
Developed settlements (urban and suburban)	Day	235							N	95	70	N, PC, RO	50	75	N, PC, RO	50	75	
	Day (OOHW)	360				N, R1, DR	235	60	N, R1, DR	95	70	N, R1, DR, PC, SN	25	80	N, PC, RO	45	75	
	Evening	540				N, R1, DR	360	55	N, R1, DR	155	65	N, R1, DR, PC, SN	50	75	N, PC, RO	50	75	
	Night	800	N	800	45	N, R2, DR	540	50	N, PC, SN, R2, DR	235	60	AA, N, PC, SN, R2, DR	95	70	N, PC, RO	50	75	280
	Highly Affected	50													N, PC, RO	50	75	
Propagation across a valley / over water	Day	305							N	110	70	N, PC, RO	50	75	N, PC, RO	50	75	
	Day (OOHW)	485				N, R1, DR	305	60	N, R1, DR	110	70	N, R1, DR, PC, SN	30	80	N, PC, RO	50	75	
	Evening	745				N, R1, DR	485	55	N, R1, DR	185	65	N, R1, DR, PC, SN	50	75	N, PC, RO	50	75	
	Night	1120	N	1120	45	N, R2, DR	745	50	N, PC, SN, R2, DR	305	60	AA, N, PC, SN, R2, DR	110	70	N, PC, RO	50	75	
	Highly Affected	50													N, PC, RO	50	75	

Non-residential receiver				LAeq(15minute) noise level above NML									LAeq(15minute) 75 dB(A) or greater (Highly affected)		
Undeveloped green fields, rural areas with isolated dwellings				Standard hours			<10 dB(A)			10 to 20 dB(A)			Measure		
				Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))			
Classroom at schools and other educational institutions				Day	55	290				N	135	65	N, PC, RO	45	75
Hospital wards and operating theatres				Day	65	135							N, PC, RO	45	75
Place of worship				Day	55	290				N	135	65	N, PC, RO	45	75
Active recreation				Day	65	135							N, PC, RO	45	75
Passive recreation				Day	60	200				N	85	70	N, PC, RO	45	75
Industrial premise				Day	75	45							N, PC, RO	45	75
Offices, retail outlets				Day	70	85							N, PC, RO	45	75

				LAeq(15minute) noise level above NML											
				OOHW			< 5 dB(A)			5 to 15 dB(A)			15 to 25 dB(A)		
				Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Hospital wards and operating theatres				Evening	65	135				N, R1, DR	85	70	N, R1, DR	25	80
				Night	65	135	N	135	65	N, R2, NR	85	70	N, PC, SN, R2, DR	25	80
Place of worship				Evening	55	290				N, R1, DR	200	60	N, R1, DR	85	70
				Night	55	290	N	290	55	N, R2, NR	200	60	N, PC, SN, R2, DR	85	70
Active recreation				Evening	65	135				N, R1, DR	85	70	N, R1, DR	25	80
				Evening	60	200				N, R1, DR	135	65	N, R1, DR	45	75
Industrial premise				Evening	75	45				N, R1, DR	25	80	N, R1, DR	8	90
				Night	75	45	N	45	75	N, R2, NR	25	80	N, PC, SN, R2, DR	8	90
Offices, retail outlets				Evening	70	85				N, R1, DR	45	75	N, R1, DR	14	85
				Night	70	85	N	85	70	N, R2, NR	45	75	N, PC, SN, R2, DR	14	85

Non-residential receiver			
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Developed settlements (urban and suburban)	Standard hours			LAeq(15minute) noise level above NML								
				<10 dB(A)			10 to 20 dB(A)			LAeq(15minute) 75 dB(A) or greater (Highly affected)		
	Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Classroom at schools and other educational institutions	Day	55	360				N	155	65	N, PC, RO	50	75
Hospital wards and operating theatres	Day	65	155							N, PC, RO	50	75
Place of worship	Day	55	360				N	155	65	N, PC, RO	50	75
Active recreation	Day	65	155							N, PC, RO	50	75
Passive recreation	Day	60	235				N	95	70	N, PC, RO	50	75
Industrial premise	Day	75	50							N, PC, RO	50	75
Offices, retail outlets	Day	70	95							N, PC, RO	50	75

				LAeq(15minute) noise level above NML											
	OOHW			< 5 dB(A)			5 to 15 dB(A)			15 to 25 dB(A)			> 25 dB(A)		
	Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Hospital wards and operating theatres	Evening	65	155				N, R1, DR	95	70	N, R1, DR	28	80	N, R1, DR, PC, SN	9	90
	Night	65	155	N	155	65	N, R2, NR	95	70	N, PC, SN, R2, DR	28	80	AA, N, PC, SN, R2, DR	9	90
Place of worship	Evening	55	360				N, R1, DR	235	60	N, R1, DR	95	70	N, R1, DR, PC, SN	28	80
	Night	55	360	N	360	55	N, R2, NR	235	60	N, PC, SN, R2, DR	95	70	AA, N, PC, SN, R2, DR	28	80
Active recreation	Evening	65	155				N, R1, DR	95	70	N, R1, DR	28	80	N, R1, DR, PC, SN	9	90
Passive recreation	Evening	60	235				N, R1, DR	155	65	N, R1, DR	50	75	N, R1, DR, PC, SN	16	85
Industrial premise	Evening	75	50				N, R1, DR	28	80	N, R1, DR	9	90	N, R1, DR, PC, SN	3	100
	Night	75	50	N	50	75	N, R2, NR	28	80	N, PC, SN, R2, DR	9	90	AA, N, PC, SN, R2, DR	3	100
Offices, retail outlets	Evening	70	95				N, R1, DR	50	75	N, R1, DR	16	85	N, R1, DR, PC, SN	5	95
	Night	70	95	N	95	70	N, R2, NR	50	75	N, PC, SN, R2, DR	16	85	AA, N, PC, SN, R2, DR	5	95

Non-residential receiver Propagation across a valley / over water				LAeq(15minute) noise level above NML								
				<10 dB(A)			10 to 20 dB(A)			LAeq(15minute) 75 dB(A) or greater (Highly affected)		
	Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Classroom at schools and other educational institutions	Day	55	485				N	155	65	N, PC, RO	50	75
Hospital wards and operating theatres	Day	65	185							N, PC, RO	50	75
Place of worship	Day	55	485				N	155	65	N, PC, RO	50	75
Active recreation	Day	65	185							N, PC, RO	50	75
Passive recreation	Day	60	305				N	95	70	N, PC, RO	50	75
Industrial premise	Day	75	50							N, PC, RO	50	75
Offices, retail outlets	Day	70	110							N, PC, RO	50	75

				LAeq(15minute) noise level above NML											
	OOHW			< 5 dB(A)			5 to 15 dB(A)			15 to 25 dB(A)			> 25 dB(A)		
	Period	NML	Affected distance (m)	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))	Measure	Within distance (m)	Mitigation level (dB(A))
Hospital wards and operating theatres	Evening	65	185				N, R1, DR	110	70	N, R1, DR	28	80	N, R1, DR, PC, SN	9	90
	Night	65	185	N	185	65	N, R2, NR	110	70	N, PC, SN, R2, DR	28	80	AA, N, PC, SN, R2, DR	9	90
Place of worship	Evening	55	485				N, R1, DR	305	60	N, R1, DR	95	70	N, R1, DR, PC, SN	28	80
	Night	55	485	N	485	55	N, R2, NR	305	60	N, PC, SN, R2, DR	95	70	AA, N, PC, SN, R2, DR	28	80
Active recreation	Evening	65	185				N, R1, DR	110	70	N, R1, DR	28	80	N, R1, DR, PC, SN	9	90
Passive recreation	Evening	60	305				N, R1, DR	185	65	N, R1, DR	50	75	N, R1, DR, PC, SN	16	85
Industrial premise	Evening	75	50				N, R1, DR	30	80	N, R1, DR	9	90	N, R1, DR, PC, SN	3	100
	Night	75	50	N	50	75	N, R2, NR	30	80	N, PC, SN, R2, DR	9	90	AA, N, PC, SN, R2, DR	3	100
Offices, retail outlets	Evening	70	110				N, R1, DR	50	75	N, R1, DR	16	85	N, R1, DR, PC, SN	5	95
	Night	70	110	N	110	70	N, R2, NR	50	75	N, PC, SN, R2, DR	16	85	AA, N, PC, SN, R2, DR	5	95

Appendix D: Database searches

13 March 2025

Avishka Tillekeratne
Project Engineer – Project Services
Transport for NSW

Dear Avishka,

Preliminary assessment results for M1 Slopes Package based on Stage 1 of the Procedure for Aboriginal cultural heritage consultation and investigation (the procedure).

This package includes M1 Slopes 48834 & 48836
M1 Slopes 18840,18842,18858, 19031 & 48281

The project, as described in the Stage 1 assessment checklist and images below, was assessed as being unlikely to have an impact on Aboriginal cultural heritage.

The assessment is based on the following due diligence considerations:

- The works will be carried out within previously disturbed areas (cuttings of the M1 Motorway)
- The project is unlikely to harm known Aboriginal objects or places.
- The AHIMS search indicated there are 17 AHIMS sites in the study area, however none of these sites are not located in close proximity of the works locations.
- The study area contains landscape features that indicate the presence of Aboriginal objects, based on the Office of Environment and Heritage's *Due diligence Code of Practice for the Protection of Aboriginal objects in NSW* and the Transport for NSW procedure, however, the works will not cause impacts to Aboriginal cultural heritage.
- All site personnel will be made aware of the Aboriginal cultural heritage sites in the surrounding areas of their works zones.

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

If the scope of your project changes you must contact me and your regional Environment Officer Renae Martin to reassess any potential impacts on Aboriginal cultural heritage.

If any potential Aboriginal objects (including skeletal remains) are discovered during the project, all works in the vicinity of the find must cease. Follow the steps outlined in the Transport for NSW *Unexpected Archaeological Finds Procedure*.

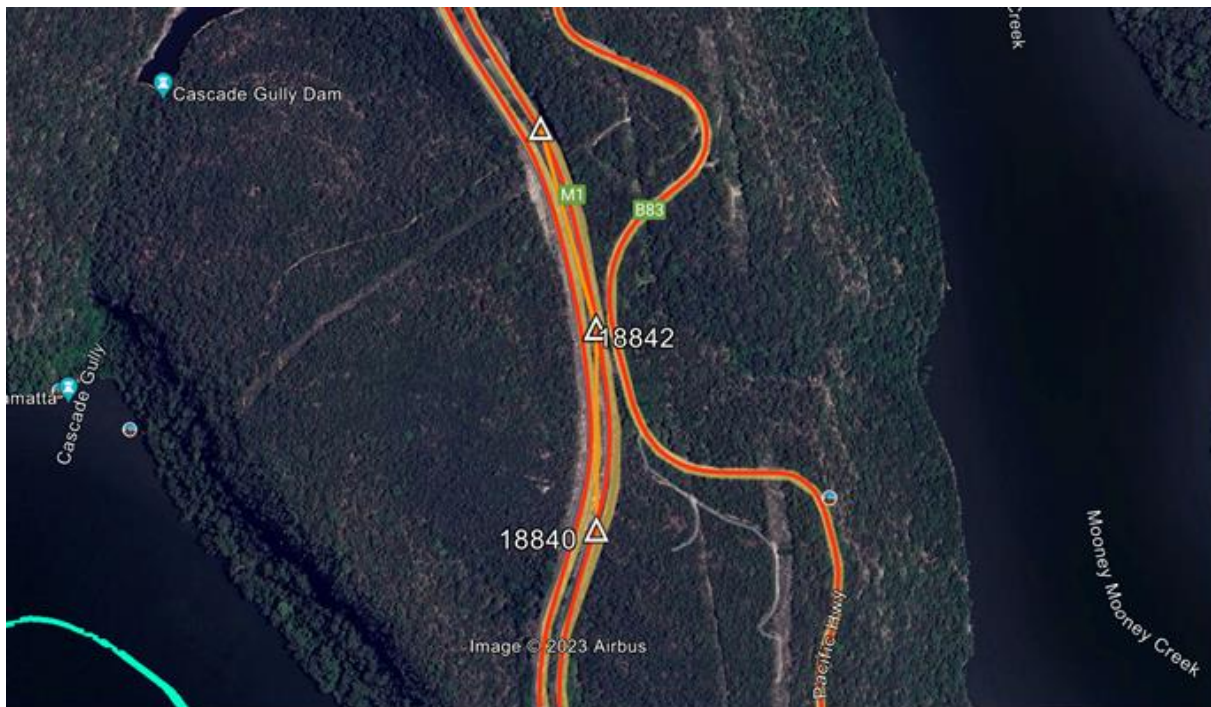
For further assistance in this matter do not hesitate to contact me.

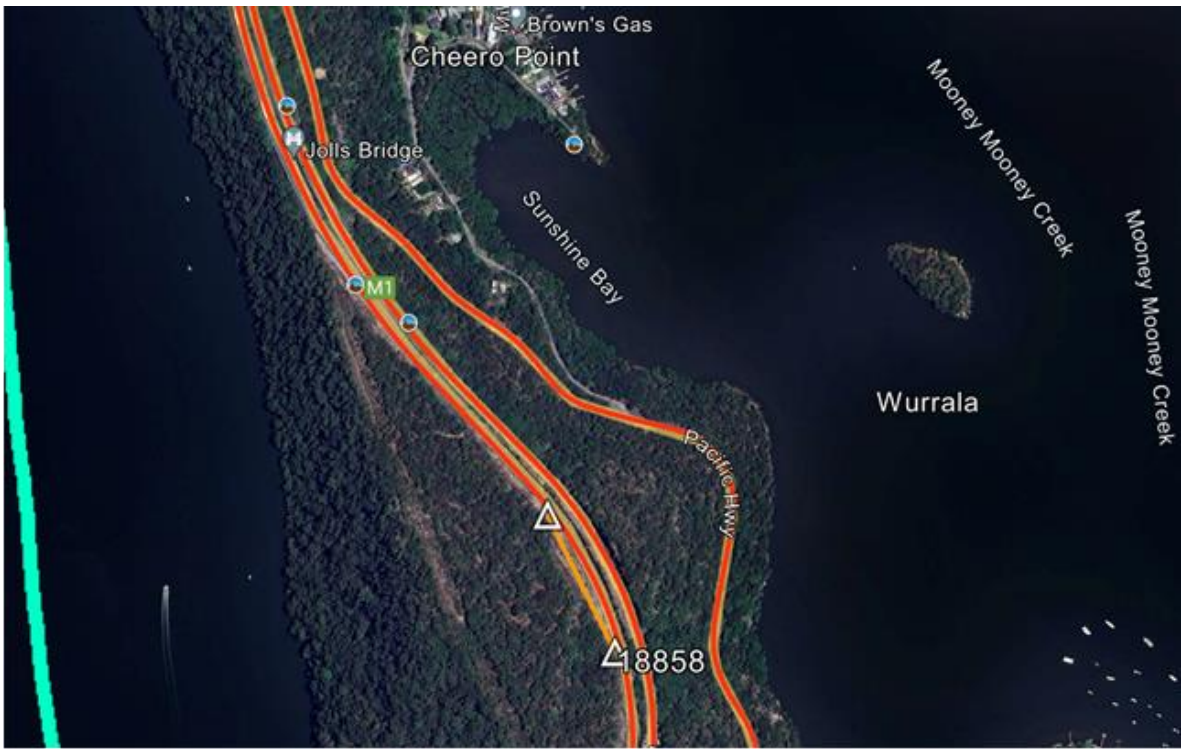
Yours sincerely

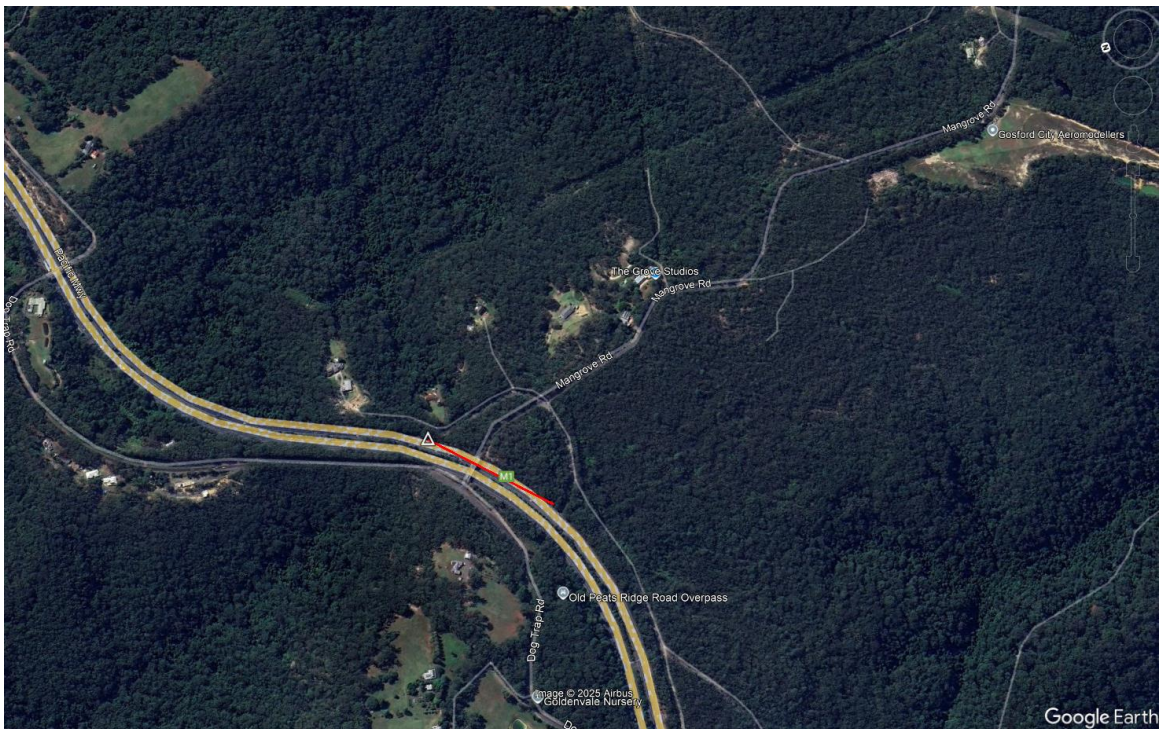
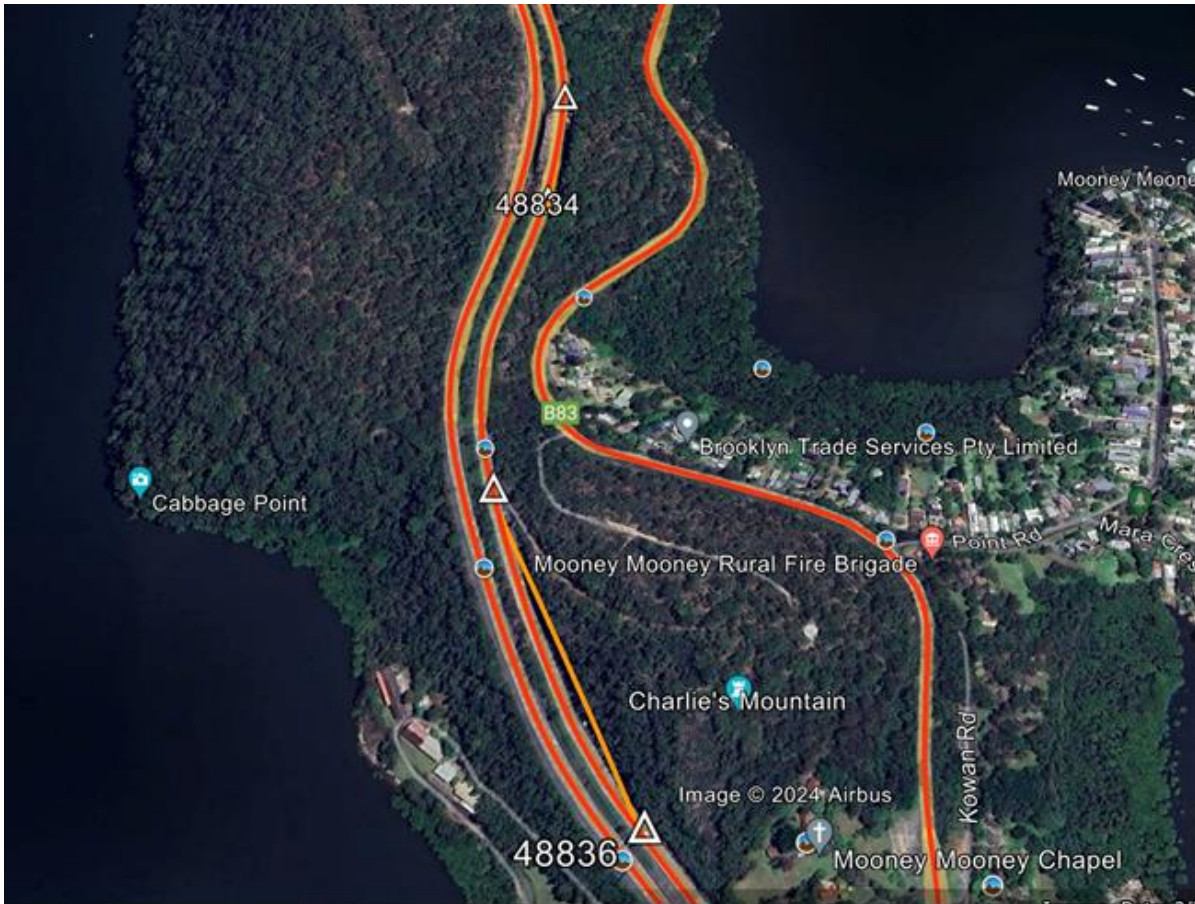
Lee Davison

Lee Davison
Aboriginal Community and Heritage Partner

Proposed works locations







bd infrastructure

Date: 20 August 2025

Suite 7.03, Level 7 45 Clarence Street
Sydney New South Wales 2000

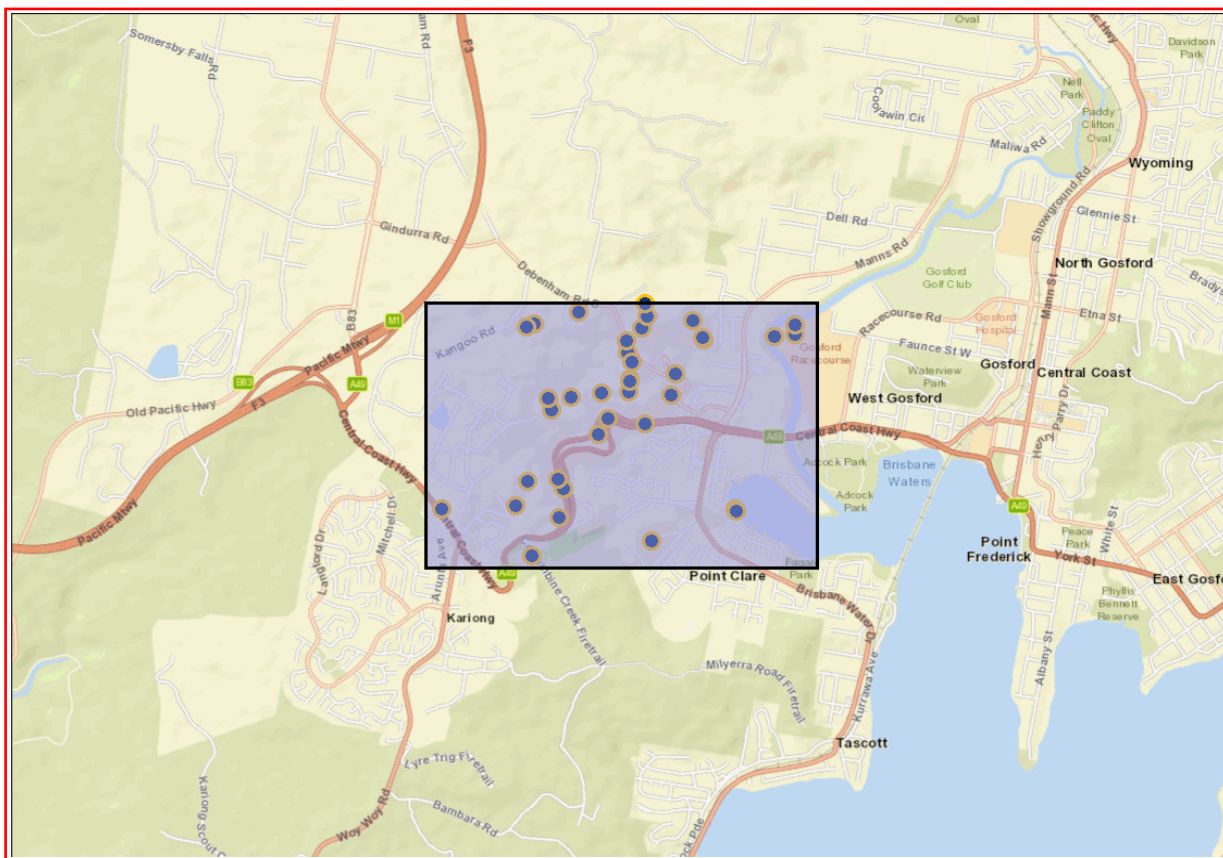
Attention: Stephen Hanna

Email: stephen.hanna@bdinfrastructure.com

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -33.4366, 151.2944 - Lat, Long To : -33.4187, 151.3253, conducted by Stephen Hanna on 20 August 2025.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.



A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

43	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the [NSW Government Gazette \(https://www.legislation.nsw.gov.au/gazette\)](https://www.legislation.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Heritage NSW upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Heritage NSW and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date. Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
45-3-3303	KG PAD 2	AGD	56	342600	6299840	Closed site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact T Russell	Recorders Jo McDonald Cultural Heritage Management see GML						Permits		
45-3-0031	Piles Creek (Gosford)	AGD	56	342397	6300115	Open site	Valid	Art (Pigment or Engraved) : -, Shell : -, Artefact : -	Midden,Rock Engraving	492
	Contact	Recorders ASRSYS						Permits		
45-3-3280	West Gosford 1	AGD	56	343359	6300555	Open site	Valid	Shell : -		
	Contact T Russell	Recorders Navin Officer Heritage Consultants Pty Ltd						Permits		
45-3-1495	Narara Creek;site 243;	AGD	56	342250	6300010	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	Contact	Recorders J.C Lough						Permits		
45-6-1598	DEBENHAM RD KENDALL GLEN AGGS	GDA	56	342724	6300335	Open site	Valid	Art (Pigment or Engraved) : -, Grinding Groove : -	Rock Engraving	
	Contact	Recorders Jenny Hanrahan,Ms.Collette Douchkov						Permits		
45-3-4384	PENANG RED STENCILS SWA	GDA	56	342188	6299672	Closed site	Valid	Art (Pigment or Engraved) : -		
	Contact	Recorders Ms.Collette Douchkov						Permits		
45-3-0307	KG 4 (Kariong)	AGD	56	342940	6299920	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	757
	Contact	Recorders Doctor.Jo McDonald,Laura-Jane Smith						Permits		
45-3-2435	Kangoo Rd.; RESERVOIR TRAIL ENGS	GDA	56	342929	6300446	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	Contact	Recorders Brad Welsh,Ms.Collette Douchkov						Permits		
45-3-1317	Mt Penang; TWO FISH ENG	GDA	56	342905	6300640	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	Contact	Recorders ASRSYS,Ms.Collette Douchkov						Permits		
45-3-3302	KG PAD 1	AGD	56	342350	6299430	Closed site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact T Russell	Recorders Jo McDonald Cultural Heritage Management see GML						Permits		
45-3-3155	Fagan's Bay	AGD	56	343610	6299300	Open site	Valid	Shell : -, Artefact : -	Midden	1333
	Contact	Recorders Warren Bluff						Permits		
45-3-3162	PT.Clare Cemetery	AGD	56	343000	6299050	Open site	Valid	Shell : -, Artefact : -	Midden	1333
	Contact	Recorders Warren Bluff						Permits		
45-3-3163	Fagan's Bay	AGD	56	343620	6299280	Open site	Valid	Shell : -, Artefact : -	Midden	1333
	Contact	Recorders Warren Bluff						Permits		

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
45-3-2935	B.W.N.P.; COORUMBINE CK ENGS	GDA	56	342234	6299115	Open site	Valid	Grinding Groove : -, Art (Pigment or Engraved) : -	Axe Grinding Groove,Rock Engraving	1333
	<u>Contact</u>	<u>Recorders</u>	Warren Bluff,Ms.Collette Douchkov <u>Permits</u>							
45-3-0043	Old Gosford Road;Piles Creek;	AGD	56	342112	6300658	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	102848
	<u>Contact</u>	<u>Recorders</u>	I.M Sim <u>Permits</u>							
45-3-2436	Debenham Rd.; SWD	GDA	56	343263	6300492	Closed site	Valid	Artefact : -, Art (Pigment or Engraved) : -	Shelter with Deposit	
	<u>Contact</u>	<u>Recorders</u>	Brad Welsh,Ms.Collette Douchkov <u>Permits</u>							
45-3-0611	Debenham Road South ENG	GDA	56	342895	6300729	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>	McKenzie,Mr.Oliver Descoeudres <u>Permits</u>							
45-3-1455	Old Gosford Road Gosford Racecourse	AGD	56	343880	6300590	Open site	Valid	Shell : -, Artefact : -	Midden	377,98683
	<u>Contact</u>	<u>Recorders</u>	ASRSYS <u>Permits</u>							
45-3-0495	Point Clare; SIM GROUP 171 ENGS	GDA	56	342103	6299486	Open site	Valid	Grinding Groove : -, Art (Pigment or Engraved) : -	Axe Grinding Groove,Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>	I.M Sim,Ms.Collette Douchkov <u>Permits</u>							
45-3-1319	Mt Penang; KOWARA RD JUNCTION ENGS	GDA	56	342545	6300940	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>	Unknown Author,Ms.Collette Douchkov <u>Permits</u>							
45-3-0558	Gosford;Narara Ck;	AGD	56	344033	6300603	Open site	Valid	Shell : -, Artefact : -	Midden	98683
	<u>Contact</u>	<u>Recorders</u>	Ms.Casey Edwards <u>Permits</u>							
45-3-1456	Old Gosford Road (Gosford Racecourse)	AGD	56	344030	6300680	Open site	Valid	Shell : -, Artefact : -	Midden	377
	<u>Contact</u>	<u>Recorders</u>	ASRSYS <u>Permits</u>							
45-3-0305	KG 2 (Kariong)	AGD	56	342310	6299500	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	757
	<u>Contact</u>	<u>Recorders</u>	Doctor.Jo McDonald,Laura-Jane Smith <u>Permits</u>							
45-3-0306	KG 3 (Kariong)	AGD	56	342670	6299960	Open site	Valid	Grinding Groove : -	Axe Grinding Groove	757
	<u>Contact</u>	<u>Recorders</u>	Doctor.Jo McDonald,Laura-Jane Smith <u>Permits</u>							
45-3-2437	Kangoo Rd; FISH ENG	GDA	56	342918	6300351	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>	Brad Welsh,Ms.Collette Douchkov <u>Permits</u>							
45-3-0527	Point Clare; SIM MANKIND GROUP 170 ENGS	GDA	56	342234	6299115	Open site	Valid	Grinding Groove : -, Art (Pigment or Engraved) : -	Axe Grinding Groove,Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>	I.M Sim,Ms.Collette Douchkov <u>Permits</u>							

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
45-6-1599	DEBENHAM RD SOUTH ENGS	GDA	56	342929	6300446	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	Contact	Recorders	J.C Lough,Ms.Collette Douchkov							
45-3-3219	PN-EN-1	AGD	56	342230	6300100	Closed site	Valid	Art (Pigment or Engraved) : -		
	Contact	Recorders	Rebecca Simon							
45-3-4391	DEBENHAM RD AGGS	GDA	56	343233	6300329	Open site	Valid	Grinding Groove : -		
	Contact	Recorders	Ms.Collette Douchkov							
45-3-0035	Piles Creek	AGD	56	342397	6300115	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	492
	Contact	Recorders	I.M Sim							
45-3-3625	SIE MCH1	GDA	56	342163	6300816	Open site	Valid	Art (Pigment or Engraved) : 1, Water Hole : 1		102848
	Contact	Recorders	Mr.Jeffrey Hill,RPS AAP Consulting Pty Ltd - Echuca Victoria							
45-3-1316	Mt Penang; SHELTER WITH SHELL	GDA	56	342945	6300570	Closed site	Valid	Shell : -, Artefact : -, Grinding Groove : -	Axe Grinding Groove,Shelter with Midden	98683
	Contact	Recorders	Unknown Author,Ms.Collette Douchkov							
45-3-1321	Mt Penang; GRINDING GROOVE PLATFORM	GDA	56	343011	6300828	Open site	Valid	Grinding Groove : -	Axe Grinding Groove	98683
	Contact	Recorders	ASRSYS,Ms.Collette Douchkov							
45-6-1600	Un-named; DEBENHAM RD SOUTH ENGRAVINGS	GDA	56	342929	6300446	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	Contact	Recorders	J.C Lough,Ms.Collette Douchkov							
45-3-4044	MPP MT1	GDA	56	341567	6299450	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	Contact	Recorders	Extent Heritage Pty Ltd - Pyrmont - Individual users,Mr.Paul Irish,Coast History & I							
45-3-0032	Old Gosford Road;Kendall's Rock; DEBENHAM RD ENGS	GDA	56	342895	6300729	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	98683
	Contact	Recorders	ASRSYS,Ms.Collette Douchkov							
45-3-3281	West Gosford 3	AGD	56	343280	6300700	Closed site	Valid	Shell : 1		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd							
45-3-1318	Mt Penang; DEBENHAM RD SOUTH ENGS	GDA	56	342895	6300729	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	98683
	Contact	Recorders	ASRSYS,Ms.Collette Douchkov							
45-3-4396	KENDALL GLEN PENANG WHALE ENG	GDA	56	342929	6300427	Open site	Valid	Art (Pigment or Engraved) : -		
	Contact	Recorders	Ms.Collette Douchkov							
45-3-3279	West Gosford 2	AGD	56	343355	6300575	Closed site	Valid	Shell : -		

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
	<u>Contact</u> T Russell	<u>Recorders</u>	<u>Permits</u>							
45-3-0033	Old Gosford Road;Gosford 10;	GDA	56	343051	6300912	Open site	Valid	Art (Pigment or Engraved) : -, Grinding Groove : -	Axe Grinding Groove,Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-0034	Piles Creek; SIM SITE 2/31 ENGS	GDA	56	343033	6301008	Open site	Valid	Art (Pigment or Engraved) : -, Grinding Groove : -	Axe Grinding Groove,Rock Engraving	
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
45-3-0304	KG 1(Kariong) EEL AND SHIELD ENG	GDA	56	342425	6299399	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	757
	<u>Contact</u>	<u>Recorders</u>	<u>Permits</u>							
		Doctor.Jo McDonald,Laura-Jane Smith,Ms.Collette Douchkov								

**** Site Status**

Valid - The site has been recorded and accepted onto the system as valid

Destroyed - The site has been completely impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There is nothing left of the site on the ground but proponents should proceed with caution.

Partially Destroyed - The site has been only partially impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There might be parts or sections of the original site still present on the ground

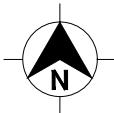
Not a site - The site has been originally entered and accepted onto AHIMS as a valid site but after further investigations it was decided it is NOT an aboriginal site. Impact of this type of site does not require permit but Heritage NSW should be notified

Report generated by AHIMS Web Service on 20/08/2025 for Stephen Hanna for the following area at Lat, Long From : -33.4366, 151.2944 - Lat, Long To : -33.4187, 151.3253. Number of Aboriginal sites and Aboriginal objects found is 43

This information is not guaranteed to be free from error omission. Heritage NSW and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

Appendix E: Design Drawings

CENTRAL COAST COUNCIL
KARIONG HILL, CENTRAL COAST HWY, NSW
NATURAL DISASTER RECOVERY - SLOPE 85716
SLOPE STABILISATION WORKS WITH SOIL NAILS
FINAL DESIGN



SITE OF WORKS

LOCATION PLAN
(NOT TO SCALE)

TITLE:	NAME:	SIGNED:	DATE:
DESIGNER	MERRICK JONES		
REVIEWER	JULES DARRAS		
PROJECT MANAGER	STEVE BOARD		
TECHNICAL REVIEWER	KEITH CHAN		
RECOMMENDED	SISIRA MABOTUWANA		
CONSURANCE			
APPROVED			

REFERENCE DRAWING SCHEDULE	
DRAWING No.	DRAWING TITLE:
GT-SL-000	SLOPE 85716 STABILISATION WORKS - COVER SHEET AND REFERENCE DRAWING SCHEDULE
GT-SL-001	SLOPE 85716 STABILISATION WORKS - GEOTECHNICAL CONSTRUCTION SEQUENCE & GENERAL NOTES
GT-SL-002	SLOPE 85716 STABILISATION WORKS - GEOTECHNICAL WORKS SPECIFICATION - SHEET 01 OF 02
GT-SL-003	SLOPE 85716 STABILISATION WORKS - GEOTECHNICAL WORKS SPECIFICATION - SHEET 02 OF 02
GT-SL-004	SLOPE 85716 STABILISATION WORKS - GENERAL ARRANGEMENT - PLAN VIEW
GT-SL-005	SLOPE 85716 STABILISATION WORKS - TYPICAL CROSS SECTION - SOIL NAILS
GT-SL-006	SLOPE 85716 STABILISATION WORKS - TYPICAL SOIL NAIL ARRANGEMENT
GT-SL-007	SLOPE 85716 STABILISATION WORKS - TYPICAL DETAILS - SOIL NAIL DETAILS
GT-SL-008	SLOPE 85716 STABILISATION WORKS - TYPICAL DETAILS - SUB-HORIZONTAL DRAIN DETAILS
GT-SL-009	SLOPE 85716 STABILISATION WORKS - TYPICAL DETAILS - STEEL MESH DETAILS
GT-SL-010	SLOPE 85716 STABILISATION WORKS - CONSTRUCTION PLANT - SET-BACK DISTANCE

ACCEPTED FOR CONSTRUCTION

DRAWING FILE LOCATION / NAME \\t.local\cof\5798\F\GEO\TECHNICS\1. JOBS\NTLGE\31754-NTLGE\312180 - Kariiong Hill Slope Instability\CAD\Native Files - Working\GT-SL-000_RevB.dwg						DESIGN LOT CODE		DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING				PLOT DATE / TIME 21-06-2024 11:29 AM		PLOT BY d.rodriquesleite		CLIENT  Transport for NSW		LOCALITY - CENTRAL COAST COUNCIL ROAD NUMBER - HW30 KARIOING HILL, CENTRAL COAST HWY, NSW NATURAL DISASTER RECOVERY - SLOPE 85716 SLOPE STABILISATION WORKS WITH SOIL NAILS		A3
EXTERNAL REFERENCE FILES		REV	DATE	AMENDMENT / REVISION DESCRIPTION		WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING		DRAWINGS / DESIGN PREPARED BY		TITLE		NAME	DATE	COVER SHEET AND REFERENCE DRAWING SCHEDULE				
		1	29.02.24	ISSUED FOR 80% DESIGN REVIEW								DRAWN		M. BACON	21.06.24					
		2	30.04.24	ISSUED FOR 100% FINAL DESIGN								DRG CHECK		C. DAI	21.06.24					
												DESIGN		M. JONES	21.06.24					
												DESIGN CHECK		J. DARRAS	21.06.24					
												DESIGN MNGR		-	-	PREPARED FOR NETWORK AND ASSETS ASSETS NORTH REGIONAL AND OUTER METROPOLITAN				
												PROJECT MNGR		-	-					
																TNSW REGISTRATION No. DS2024/000287				
																ISSUE STATUS FOR 100% FINAL DESIGN		EDMS No.	SHEET No. GT-SL-000	PART A ISSUE 2

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

50mm ON A3 SIZE ORIGINAL

PROJECT ROLES:

- a.

THE PRINCIPAL: TRANSPORT FOR NSW (TfNSW) PREVIOUSLY KNOWN AS ROAD AND MARITIME SERVICES (RMS).
- b.

THE SUPERINTENDENT: APPOINTED PERSON OVERSEEING THE WORK ON BEHALF OF THE PRINCIPAL. THE SUPERINTENDENT SHALL ADMINISTRATE THE WORKS, BE THE FOCAL POINT FOR CONTACT BETWEEN THE PRINCIPAL, DESIGNER, AND CONTRACTOR, BE RESPONSIBLE FOR CONTINUALLY ASSESSING THE COMPLIANCE OF THE WORK OF THE CONTRACTOR TO THE DESIGN, SPECIFICATION AND DRAWINGS, AND BE RESPONSIBLE FOR RELEASING HOLD POINTS REQUESTED BY THE CONTRACTOR.
- c.

THE DESIGNER: THE GEOTECHNICAL CONSULTANT WHO DESIGNED THE REMEDIAL WORKS (TETRA TECH COFFEY). THE SUPERINTENDENT OR PRINCIPAL MAY CONSULT WITH THE DESIGNER WITH RESPECT TO CONSTRUCTION QUERIES ON AN AS-NEEDED BASIS. AT THE REQUEST OF THE SUPERINTENDENT, THE DESIGNER WILL ATTEND SITE TO OBSERVE ASPECTS OF THE WORKS, OR REVIEW RELEVANT INFORMATION, AS OUTLINED IN THIS DOCUMENT TO ALLOW THE SUPERINTENDENT TO RELEASE HOLD POINTS. THE SERVICES OF THE DESIGNER WILL BE REQUIRED TO ASSIST WITH MANAGEMENT OF NAIL SET-OUT AROUND TREES THAT ARE TO BE RETAINED. TETRA TECH COFFEY WILL BE REQUIRED TO OBSERVED AND CONFIRM THE DESIGN INTENT IS MET DURING CONSTRUCTION OF THE SLOPE REMEDIATION.
- d.

THE CONTRACTOR: THE CONTRACTOR APPOINTED TO UNDERTAKE THE CONSTRUCTION WORKS TO THE DESIGN, SPECIFICATION, DRAWINGS AND TENDERED COST AND TIMEFRAMES. THE CONTRACTOR SHALL DIRECT ALL QUERIES REGARDING THE WORKS TO THE SUPERINTENDENT AND SHALL RELY ONLY ON WRITTEN INSTRUCTIONS FROM THE PRINCIPAL OR SUPERINTENDENT WITH RESPECT TO THE UNDERTAKING OF THE WORKS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COMPLETING THE WORKS TO THE DESIGN AND SPECIFICATION AND OTHER WRITTEN INSTRUCTIONS.

CONSTRUCTION SEQUENCE AND GENERAL HOLD POINTS:

THE DESIGNER ENVISAGES THE WORKS TO PROCEED IN THE FOLLOWING MANNER, WITH SUPERINTENDENT APPROVAL NEEDED TO RELEASE HOLD POINTS.

ANY VARIATION FROM THE GENERAL SEQUENCE SUGGESTED BY THE CONTRACTOR MAY BE SUBMITTED FOR CONSIDERATION BY THE PRINCIPAL AND DESIGNER.

THE SUGGESTED CONSTRUCTION SEQUENCING DOES NOT RELIEVE THE CONTRACTOR OF ULTIMATE RESPONSIBILITY FOR SITE SAFETY, GOOD WORKMANSHIP AND ADHERING TO THE DESIGN INTENT, SPECIFICATION AND TENDERED COST AND TIMEFRAMES.

THE SUGGESTED SEQUENCING IS NOT NECESSARILY EXHAUSTIVE OF ALL THE STEPS THAT MAY BE REQUIRED TO COMPLETE THE WORK TO THE SPECIFICATION BUT IS PROVIDED TO PRESENT THE CONCEPT OF HOW THE WORKS COULD BE EXECUTED.

THE ATTENTION OF THE CONTRACTOR IS DRAWN TO VARIOUS HOLD POINTS IN THE RELEVANT TfNSW SPECIFICATIONS REFERENCED IN THIS SPECIFICATION. SUCH HOLD POINTS SHALL BE SATISFIED AND ARE IN ADDITION TO THE GENERAL SEQUENCING HOLD POINTS BELOW.

SQ1.

THE CONTRACTOR IS TO PREPARE THE FOLLOWING DOCUMENTATION TO THE DESIGNER AND SUPERINTENDENT:

a.

THE PROPOSED CONSTRUCTION PROGRAM INCLUDING DATES FOR KEY TASKS AND ESTIMATED PAYMENT CLAIM AMOUNTS, WITH SPECIFIC CONSIDERATION OF THE EFFECT OF THE WORKS ON ROAD CLOSURE TIMES.

b.

RISK MITIGATION PLANS (EMERGENCY PROCEDURES / PROPOSED SHORING METHODOLOGY / WHAT TO DO IN WET WEATHER / WHEN SLOPE MOVEMENTS ARE OBSERVED ETC).

c.

WORK METHOD STATEMENTS AND ACCOMPANYING RISK ASSESSMENTS FOR SITE SAFETY.

d.

QA / QC DOCUMENTATION TEMPLATES AND EXAMPLES IN LINE WITH THIS SPECIFICATION.

e.

SAMPLES OF ASSEMBLED SOIL NAIL PRODUCTS PER THE DESIGN.

HOLD POINT 1:
PROCESS HELD - MOBILISATION TO SITE AND ALL SITE WORK.
RELEASE OF HOLD POINT 1 WILL BE THE PRINCIPAL'S APPROVAL OF ABOVE ITEMS.

SQ2.

MOBILISE TO SITE, CONSTRUCT COMPOUND, AND SET OUT TRAFFIC CONTROL AND ROAD CLOSURE, WORK AREAS, LEVEL AND LOCATION CONTROLS (INSTALL BASELINE SURVEY POINTS), INSTALL STORMWATER AND EROSION CONTROLS. UNDERTAKE ALL PRELIMINARY WORKS TO ALLOW CONSTRUCTION TO PROCEED.

SQ3.

NOMINAL CLEARING AND REMOVAL OF BATTER VEGETATION FROM THE UPPER 2.0 m ALONG THE CREST OF THE SLOPE ENSURING ADEQUATE TEMPORARY STABILITY MEASURES SUCH AS SET BACK DISTANCES ARE IMPLEMENTED. RELEVANT ENVIRONMENTAL APPROVALS SHALL BE SOUGHT PRIOR TO VEGETATION REMOVAL.

SQ4.

REMOVE EXISTING SAFETY BARRIER WITH MINIMAL DISTURBANCE TO THE SURROUNDING SOIL.

HOLD POINT 2:
PROCESS HELD - GENERAL CONSTRUCTION OF SOIL NAILS.
RELEASE OF HOLD POINT 2 WILL ENTAIL ACCEPTANCE OF SUITABILITY TESTING BY THE DESIGNER AND PRINCIPAL.

SQ5.

INSTALL THE SOIL NAILS REQUIRED FOR SUITABILITY TESTING, COMPLETE SUITABILITY TESTING AND ALLOW RECONSIDERATION OF THE DESIGN BY THE DESIGNER BASED ON THE TEST RESULTS (ALLOW 2 WEEKS FROM DELIVERY OF ALL TEST DATA).

- SQ6.

SOIL NAIL SUITABILITY TESTS ARE TO BE CARRIED OUT PRIOR TO CONSTRUCTION AS PER TfNSW SPECIFICATION R64. NOMINATED AT 1% OF TOTAL SOIL NAILS. THE DESIGNER WILL SPECIFY NAIL VERIFICATION TEST LOCATIONS. THE CONTRACTOR SHOULD ALLOW FOR A BOND LENGTH OF AT LEAST 2.0 m INTO TARGET SUBSTRATE. THE FINAL BOND LENGTHS MAY VARY (I.E. A SELECTION OF BOND LENGTHS MAY BE SELECTED). WE ANTICIPATE THAT TESTING EQUIPMENT CAPABLE OF TESTING UP TO 200 kN (20 TONNE) NAIL LOAD WILL BE REQUIRED.
- SQ7.

SOIL NAIL PULL OUT TESTS ARE TO BE CONDUCTED PRIOR TO CONSTRUCTION AS PER TfNSW SPECIFICATION R64. THE LOAD SHALL BE CARRIED OUT TO A MAXIMUM PULL OUT LOAD OF 150% WORKING LOAD PRESENTED IN THE DRAWINGS. ACCEPTANCE TESTING ON 10% OF TOTAL SOIL NAILS IS REQUIRED.
- SQ8.

REMOVE EXISTING PAVEMENT, TRIM DOWN TO THE PROPOSED EXCAVATION LEVEL, SET OUT THE SOIL NAILS AND PREPARE WORKING PLATFORMS OR USE RIGID STEEL PLATES AS REQUIRED WITH APPROPRIATE SET BACK DISTANCES.
- SQ9.

INSTALL THE SOIL NAIL SUPPORT MEASURES IN FULL:

a.

THE CONTRACTOR SHALL PROPOSE NAIL INSTALLATION WORK METHODS (IE. EQUIPMENT, INSTALLATION ORDER (BOTTOM TO TOP, WORK SECTIONS, ETC.), VEGETATION CLEARANCE, MULTIPLE CREWS, WORK PLATFORMS, MESH INSTALLATION AROUND TREES, ETC. TO THE DESIGNER AND SUPERINTENDENT FOR CONSIDERATION PRIOR TO INSTALLING ANY NAILS.

HOLD POINT 3:
PROCESS HELD - CONSTRUCTION METHOD OF SOIL NAILS.
RELEASE OF HOLD POINT 3 WILL ENTAIL ACCEPTANCE OF CONSTRUCTION METHOD BY THE DESIGNER AND PRINCIPAL.

- b.

THE SUPERINTENDENT SHALL REQUEST THE DESIGNER TO ATTEND SITE IN ORDER TO:

i.

OBSERVE THAT SITE CLEARANCE HAS BEEN UNDERTAKEN APPROPRIATELY.

WITNESS POINT

ii.

OBSERVE THAT GENERAL NAIL SET-OUTS HAVE BEEN MADE TO THE DESIGN REQUIREMENTS.

WITNESS POINT

iii.

GROUTING HAS BEEN COMPLETED TO THE GROUND SURFACE.

WITNESS POINT

iv.

THE MESH FACING HAS BEEN INSTALLED AND TENSIONED APPROPRIATELY.

WITNESS POINT

HOLD POINT 4:
PROCESS HELD - INSTALLATION OF SOIL NAILS (WITNESS POINTS).
RELEASE OF HOLD POINT 4 WILL ENTAIL GEOTECHNICAL OBSERVATION BY THE DESIGNER.

c. THE CONTRACTOR SHALL COMPLETE ACCEPTANCE TESTING OF THE SOIL NAILS AND SUBMIT A TESTING REPORT AS DESCRIBED IN THE SPECIFICATION FOR REVIEW BY THE DESIGNER.

HOLD POINT 5:
PROCESS HELD - REVIEW OF ACCEPTANCE TESTING OF SOIL NAILS.
RELEASE OF HOLD POINT 5 WILL ENTAIL APPROVAL OF ACCEPTANCE TESTING BY THE DESIGNER AND PRINCIPAL.

- SQ10.

RECONSTRUCT THE PAVEMENT WITHIN THE EXCAVATION ZONE. THE PAVEMENT LAYERS SHALL MATCH THE EXISTING PAVEMENT.
- SQ11.

INSTALL SAFETY BARRIERS AS PER TfNSW DESIGN. TfNSW R132 SHALL BE FOLLOWED.
- SQ12.

COMPLETE WORK AS EXECUTED SURVEY AND DRAWINGS.
- SQ13.

PRINCIPAL'S FINAL INSPECTION AND APPROVAL OF WORKS.

HOLD POINT 6:
PROCESS HELD - DEMOBILISATION.
RELEASE OF HOLD POINT 6 WILL ENTAIL PRINCIPALS ACCEPTANCE OF ACCEPTANCE TESTING ANDWAE DRAWINGS.

SQ14. CLEAN UP AND DEMOBILISE FROM SITE.

CHANGE REGISTER			
DATE	REVISION	REFERENCE	SUMMARY OF CHANGES
16/02/2024	0	ORIGINAL DOCUMENT	N/A

INSTRUMENTATION MONITORING

- IM1.

INSTRUMENTATION AND MONITORING SHALL BE CARRIED OUT TO SATISFY THE MINIMUM REQUIREMENTS STIPULATED IN TABLE 01 AND TABLE 02.
- IM2.

THE FREQUENCY OF MONITORING SHALL BE REVISED DEPENDING ON THE CONSTRUCTION ACTIVITY AND THE PACE OF WORK. THE FOLLOWING GUIDELINES SHALL BE USED WHEN DECIDING ON THE FREQUENCY OF MONITORING:

-

MONITORING SHALL BE REPEATED AS SOON AS PRACTICABLE IF READINGS WERE CONSIDERED INCONSISTENT; AND

-

IF THE READINGS SHOW SIGNIFICANT CHANGE, THE FREQUENCY OF MONITORING SHALL BE INCREASED.
- IM3.

THE FREQUENCY OF MONITORING SHALL BE INCREASED IF THE OCCURRENCE OF UNDESIRABLE PHENOMENON SUCH AS EXCESSIVE GROUND MOVEMENT IS DETECTED.

TABLE 01: PROGRAMME FOR INSTRUMENTATION & MONITORING	
INSTRUMENT / METHOD	MONITORING FREQUENCY
VISUAL INSPECTION (BY CONTRACTOR) OBSERVABLE WIDENING OR LENGTHENING OF CRACKS	- EVERY DAY PRIOR TO COMMENCING CONSTRUCTION ACTIVITIES AND DURING THE CONSTRUCTION ACTIVITIES UNTIL ONE WEEK AFTER COMPLETION OF CONSTRUCTION. - WEEKLY AFTER COMPLETION OF CONSTRUCTION UNTIL THREE CONSECUTIVE READINGS INDICATE NEGLIGIBLE CHANGE (< 2 mm). - FOLLOWING GREATER THAN 50 mm RECORDED RAINFALL IN A 72 HOUR PERIOD.
EXISTING INCLINOMETERS AND SURVEY TARGETS (BY TfNSW / TETRA TECH COFFEY)	- REVIEW ONE WEEK PRIOR TO CONSTRUCTION COMMENCING UNTIL ONE WEEK AFTER COMPLETION OF CONSTRUCTION. - WEEKLY REVIEW AFTER COMPLETION OF CONSTRUCTION UNTIL THREE CONSECUTIVE READINGS INDICATE NEGLIGIBLE CHANGE (< 2 mm). - FOLLOWING GREATER THAN 50 mm RECORDED RAINFALL IN A 72 HOUR PERIOD.

TABLE 02: TYPICAL TRIGGER LEVELS	
TRIGGER LEVELS	ACTION (BY CONTRACTOR)
OBSERVED PAVEMENT CRACKS AND DISTRESS	SEEK GEOTECHNICAL ADVICE IMMEDIATELY
LATERAL MOVEMENT ≤ 5 mm	MONITOR AND CONTINUE CONSTRUCTION
5 mm < LATERAL MOVEMENT ≤ 15 mm	CONTINUE CONSTRUCTION WITH FREQUENCY OF MONITORING INCREASED TO DAILY AND NOTIFY DESIGN ENGINEER IMMEDIATELY FOR ADVICE
LATERAL MOVEMENT > 15 mm	STOP WORK, NOTIFY DESIGN ENGINEER IMMEDIATELY FOR ADVICE

RELEVANT AUSTRALIAN STANDARDS & TfNSW SPECIFICATIONS / GUIDELINES

AUSTRALIAN STANDARDS:

-

AS1726-2017

-

GEOTECHNICAL SITE INVESTIGATIONS

-

AS2159-2009

-

PILING

-

AS5100-2017

-

BRIDGE DESIGN

-

AS1170.04-2007

-

EARTHQUAKE ACTIONS IN AUSTRALIA

TfNSW SPECIFICATIONS / GUIDELINES:

-

GTD 2018/001

-

GEOTECHNICAL DESIGN FOR REMEDIATION OF EXISTING SLOPES AND EMBANKMENTS

-

R11

-

STORMWATER DRAINAGE.

-

R40

-

HORIZONTAL DRAINS

-

R44

-

EARTHWORKS.

-

R53

-

CONCRETE (FOR GENERAL USE), MORTAR & GROUT

-

R63

-

GEOTEXTILES. (SEPARATION AND FILTRATION)

-

R64

-

SOIL NAIL WALL.

-

R81

-

NO FINES CONCRETE SUB-BASE.

-

R131

-

GUIDE POSTS.

-

R132

-

SAFETY BARRIER SYSTEMS.

-

B30

-

EXCAVATION AND BACKFILL FOR BRIDGEWORKS.

-

B80

-

CONCRETE WORK FOR BRIDGES.

-

G40

-

CLEARING AND GRUBBING.

-

G1

-

SLOPE STABILISATION WORKS.

-

G2

-

C41 GENERAL REQUIREMENTS.

-

Q6

-

QUALITY MANAGEMENT SYSTEM (TYPE 6)

-

G10

-

TRAFFIC MANAGEMENT.

-

G22

-

WORK, HEALTH AND SAFETY.

-

G36

-

ENVIRONMENTAL PROTECTION

-

G38

-

SOIL AND WATER MANAGEMENT.

-

AUSTROADS DESIGN GUIDELINES.

ACCEPTED FOR CONSTRUCTION

DRAWING FILE LOCATION / NAME \\t.local\cof\S798\F\GEOTECH\NCS\1. JOBS\INTLGE\31754-NTLGE\312180 - Kariang Hill Slope Instability\CAD\Native Files - Working\GT-SL-001-010_RevB.dwg					DESIGN LOT CODE		DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING					PLOT DATE / TIME 21-06-2024 11:14 AM			PLOT BY d.rodriguesleite		CLIENT		LOCALITY - CENTRAL COAST COUNCIL ROAD NUMBER - HW30 KARIOING HILL, CENTRAL COAST HWY, NSW NATURAL DISASTER RECOVERY - SLOPE 85716 SLOPE STABILISATION WORKS WITH SOIL NAILS			A3			
EXTERNAL REFERENCE FILES					REV	DATE	AMENDMENT / REVISION DESCRIPTION			WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING		DRAWINGS / DESIGN PREPARED BY					TITLE		NAME	DATE	 Transport for NSW PREPARED FOR NETWORK AND ASSETS ASSETS NORTH REGIONAL AND OUTER METROPOLITAN		
					1	29.02.24	ISSUED FOR 80% DESIGN REVIEW												DRAWN	M. BACON	21.06.24				
					2	30.04.24	ISSUED FOR 100% FINAL DESIGN												DRG CHECK	C. DAI	21.06.24				
								DESIGN	M. JONES										21.06.24						
								DESIGN CHECK	J. DARRAS										21.06.24						
																			DESIGN MNGR	-	-				
																			PROJECT MNGR	-	-				

THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED

50mm ON A3 SIZE ORIGINAL

WORK SPECIFICATION GENERAL NOTES:

- GN1. THESE SPECIFICATIONS SHALL BE READ IN CONJUNCTION WITH THE DRAWINGS AND DESIGN REPORT, TfNSW SPECIFICATION R64 AND WITH SUCH OTHER WRITTEN INSTRUCTIONS THAT MAY BE ISSUED DURING THE COURSE OF CONSTRUCTION. ANY DISCREPANCY SHALL BE REFERRED TO THE SUPERINTENDENT BEFORE PROCEEDING WITH WORK.
- GN2. THE DRAWINGS ARE DERIVED FROM SURVEY DATA PROVIDED BY TfNSW. AS IS TYPICAL FOR PROJECTS OF THIS TYPE, SOME VARIATIONS FROM THE SURVEY AND ESTIMATED QUANTITIES SHOULD BE ALLOWED FOR. THE CONTRACTOR SHALL REQUEST CLARIFICATION FROM THE SUPERINTENDENT WHERE VARIATIONS BETWEEN THE DESIGN INTENT AND SITE CONDITIONS OCCUR.
- GN3. THE DRAWINGS ARE A DIAGRAMMATIC REPRESENTATION OF THE WORK TO BE CARRIED OUT ONLY AND DIMENSIONS SHALL NOT BE OBTAINED BY SCALING.
- GN4. ALL LEVELS SHALL BE OBTAINED FROM ESTABLISHED BENCHMARKS ONLY. DATUM FOR ALL DRAWINGS IS RELATIVE. THE CONTRACTOR SHALL ESTABLISH AND SET OUT SUITABLE RELATIVE BENCH MARKS AND CALIBRATE THEM TO THE LEVELS IN THE DRAWINGS.
- GN5. BEFORE ANY OF THE GIVEN SURVEY MARKS ON THE BASE LINES ARE AFFECTED BY ANY WORKS, THE CONTRACTOR SHALL TRANSFER SUCH SURVEY MARKS TO STABLE, SIDE POSITIONS CLEAR OF OPERATIONS AND SHALL NOTE, AND INFORM THE SUPERINTENDENT IN WRITING, OF THE NEW LOCATION AND SURVEYED CO-ORDINATES.
- GN6. THE CONTRACTOR SHALL GIVE THE SUPERINTENDENT NOT LESS THAN TWO FULL WORKING DAYS' NOTICE OF THE INTENTION TO PERFORM ANY PORTION OF THE RELOCATION OF SURVEY CONTROL, ESTABLISHMENT OF RECOVERY PEGS, OR SETTING OUT OR LEVELING, SO THAT SUITABLE ARRANGEMENTS CAN BE MADE FOR CHECKING OF THE WORK BY THE SUPERINTENDENT. IF NO SUCH NOTIFICATION IS GIVEN AND A CONTROL MARK IS DISTURBED OR DESTROYED, THEN THE COST OF RE-ESTABLISHING THE CONTROL SHALL BE BORNE BY THE CONTRACTOR.
- GN7. ALL PEGS AND PROFILES PLACED BY THE CONTRACTOR SHALL BE REMOVED ON COMPLETION OF WORK UNLESS OTHERWISE DIRECTED BY THE SUPERINTENDENT.
- GN8. ALL WORKS SHALL BE DONE IN ACCORDANCE WITH THE FOLLOWING FOUR SOURCES, AND IN ORDER OF DECREASING PRECEDENCE.

i. THE DRAWINGS; THEN

ii. THIS SPECIFICATION; THEN

iii. THE RELEVANT TfNSW SPECIFICATION; THEN

iv. THE RELEVANT MANUFACTURER'S SPECIFICATION.

a. ALL REFERENCE IN THESE SOURCES IN RELATION TO COSTS BEING PAID BY THE PRINCIPAL OR TASKS BEING DONE BY THE SUPERINTENDENT ARE THE CONTRACTOR'S RESPONSIBILITY.

b. WITH RESPECT TO ANY DISCREPANCY BETWEEN INSTRUCTIONS, UNCLEAR INSTRUCTION OR OMISSION OF INSTRUCTION, THE CONTRACTOR SHALL PREPARE A WRITTEN QUERY TO THE SUPERINTENDENT FOR CLARIFICATION. THE SUPERINTENDENT SHALL THEN PREPARE A DESIGN REVIEW REQUEST (DRR) TO SEEK RESPONSE FROM THE DESIGNER.

c. THE ABOVE ORDER OF PRECEDENCE SHALL APPLY PROVIDED THE ORDER OF PRECEDENCE DOES NOT RESULT IN MATERIALLY INFERIOR WORKMANSHIP OR END PRODUCT INTENDED BY ANY OF THE FOLLOWING FOUR SOURCES.
- GN9. UNLESS OTHERWISE SPECIFIED IN THE CONTRACT, AND WHERE APPLICABLE, MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE RELEVANT STANDARD OF THE TRANSPORT FOR NSW (TfNSW).
- GN10. ALL MATERIAL AND STRUCTURAL ELEMENT TESTING AND SURVEY AS REQUIRED BY THE SPECIFICATIONS SHALL BE ARRANGED AND CARRIED OUT BY THE CONTRACTOR AND ALL TEST RESULTS AND SURVEY RECORDS MADE AVAILABLE TO THE SUPERINTENDENT. THE COST OF ALL SUCH TESTING AND SURVEY SHALL BE BORNE BY THE CONTRACTOR.
- GN11. THE PRINCIPAL WILL NOT BE RESPONSIBLE FOR THE SAFE-KEEPING OF ANY OF THE CONTRACTOR'S PLANT, EQUIPMENT, TOOLS, MATERIALS OR OTHER PROPERTY. THE CONTRACTOR MAY PROVIDE, AND PAY FOR, ANY SECURITY FENCING CONSIDERED NECESSARY AROUND ANY OFFICE, WORKSHOP OR STORAGE AREA, SUBJECT TO THE SUPERINTENDENT'S APPROVAL.
- GN12. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN TEMPORARY FENCING TO THE SATISFACTION OF THE SUPERINTENDENT DURING THE CONTRACT TO PREVENT UNAUTHORISED ENTRY INTO THE SITE, AND SHALL REMOVE TEMPORARY FENCING ON COMPLETION OF THE WORK.
- GN13. THE CONTRACTOR SHALL ERECT APPROPRIATE REGULATORY, HAZARD, EMERGENCY INFORMATION AND FIRE SIGNS, IN ACCORDANCE WITH AS.1319 SAFETY SIGNS FOR THE OCCUPATIONAL ENVIRONMENT, AT PROMINENT LOCATIONS AROUND THE WORKING AREAS AND TEMPORARY SITE FACILITIES. SIGNS SHALL INCLUDE, BUT ARE NOT LIMITED TO: MANDATORY SIGNS FOR PERSONAL PROTECTIVE EQUIPMENT SUCH AS EYE, HEAD AND FOOT PROTECTION, AND DANGER SIGNS SUCH AS "DANGER, CONSTRUCTION SITE. NO UNAUTHORISED ACCESS". ALL WORDS ON WORD-MESSAGE SIGNS SHALL BE APPROVED BY THE SUPERINTENDENT PRIOR TO SIGN MANUFACTURE OR PURCHASE.
- GN14. CONSTRUCTION WORK CARRIED OUT UNDER THIS CONTRACT ADJACENT TO OR ADJOINING EXISTING WORKS, SHALL MAKE SMOOTH JUNCTIONS WITH THE EXISTING WORK INCLUDING BLENDING OF AESTHETIC FEATURES / COLOURING.
- GN15. NO CLEARING WORKS SHALL COMMENCE PRIOR TO THE CONTRACTOR SEEKING APPROVAL FROM THE SUPERINTENDENT.
- GN16. DIVERSION OF WATER AND THE PROTECTION OF WORKS IS THE CONTRACTOR'S RESPONSIBILITY AND SHOULD BE IN ACCORDANCE WITH THE PROJECT REF.
- GN17. THE CONTRACTOR SHALL PROVIDE FOR THE EFFECTUAL DIVERSION OF SURFACE WATER FROM THE WORKS AND PROVIDE AND ENSURE PROPER FLUSHING FOR STORM AND SUBSOIL WATER ACROSS AND BEYOND THE WORKS AT ALL TIMES. THE FLOW OF STORMWATER AND DRAINAGE ALONG EXISTING GUTTERS AND TABLE DRAINS SHALL NOT BE INTERRUPTED.
- GN18. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE AND COMPENSATION PAYMENTS AS A RESULT OF NON-OBSERVANCE OF THE ABOVE REQUIREMENTS. NO CLAIM BY THE CONTRACTOR WILL BE CONSIDERED BY THE PRINCIPAL.
- GN19. THE CONTRACTOR SHALL PLAN AND CARRY OUT THE WORKS TO AVOID EROSION, CONTAMINATION AND SEDIMENTATION OF THE SITE AND ITS SURROUNDINGS. EROSION AND SEDIMENT CONTROL SHALL IN INSTALLED IN ACCORDANCE WITH THE NSW EROSION AND SEDIMENT CONTROL HANDBOOK PUBLISHED BY THE DEPARTMENT OF ENVIRONMENT AND CONSERVATION, NSW.

- GN20. HERBICIDES AND OTHER TOXIC CHEMICALS SHALL NOT BE USED ON THE SITE WITHOUT THE PRIOR WRITTEN APPROVAL OF THE SUPERINTENDENT.
- GN21. NO NOISE OR SMOKE OR OTHER NUISANCE, WHICH IN THE OPINION OF THE SUPERINTENDENT IS UNNECESSARY OR EXCESSIVE SHALL BE PERMITTED BY THE CONTRACTOR IN THE PERFORMANCE OF THE WORKS UNDER THIS CONTRACT. ACTIVE DUST SUPPRESSION WILL BE REQUIRED DURING ALL DRILLING WORKS.
- GN22. THE CONTRACTOR SHALL PREPARE A WORK PLAN STATING THE INTENDED HOURS OF WORK ACCORDING TO THE PROJECT REF.
- GN23. SHOULD WORK OUTSIDE CUSTOMARY WORKING HOURS BE APPROVED, THE CONTRACTOR SHALL NOT USE, DURING SUCH PERIOD, ANY PLANT, MACHINERY OR EQUIPMENT WHICH IN THE OPINION OF THE SUPERINTENDENT IS CAUSING OR IS LIKELY TO CAUSE A NUISANCE TO THE PUBLIC. THESE TIMES ARE SUBJECT TO REVIEW BY THE PRINCIPAL DEPENDING ON COMMUNITY FEEDBACK AND CONSTRUCTION REQUIREMENTS.
- GN24. THE CONTRACTOR SHALL ENSURE THAT FUGITIVE DUST FROM DISTURBED AREAS IS MINIMISED BY A METHOD APPROVED BY THE SUPERINTENDENT.
- GN25. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE AND COMPENSATION PAYMENTS AS A RESULT OF NON-OBSERVANCE OF THE ABOVE REQUIREMENTS. NO CLAIM BY THE CONTRACTOR WILL BE CONSIDERED BY THE PRINCIPAL.
- GN26. THE CONTRACTOR SHALL OBTAIN CURRENT SERVICES PLANS (AND MAINTAIN THE CURRENCY OF THESE THROUGHOUT THE WORKS) FROM ANY AND ALL SERVICES PROVIDERS IN THE REGION PRIOR TO THE WORKS. THE CONTRACTOR SHALL CONFIRM AND MARK THESE LOCATIONS PRIOR TO THE WORKS, USING NON-DESTRUCTIVE DIGGING FOR POSITIVE IDENTIFICATION OF THE LOCATION OF UNDERGROUND SERVICES (IF ANY). RELOCATION OF SERVICES, IF REQUIRED, SHALL BE UNDERTAKEN BY THE CONTRACTOR AT THE CONTRACTOR'S COST. ANY DAMAGE TO SERVICES SHALL BE REPAIRED AT THE CONTRACTOR'S COST.
- GN27. ALL WASTE, CLEARED VEGETATION, EARTH SPOIL, OR DEMOLISHED MATERIALS SHALL BE DISPOSED LAWFULLY OFF-SITE TO A PRINCIPAL APPROVED SITE. ALL FEES AND CHARGES SHALL BE BORNE BY THE CONTRACTOR. CONTRACTOR SHALL PROVIDE PROOF THAT ALL WASTE HAS BEEN TRANSPORTED TO APPROPRIATE RECEIVER(S).
- GN28. THE CONTRACTOR SHALL ARRANGE FOR ROAD OCCUPANCY LICENSES, PREPARE TRAFFIC CONTROL PLANS AND SHALL MANAGE TRAFFIC CONTROL AT THE SITE. THE TRAFFIC CONTROL PLANS SHALL BE PREPARED BY AN ACCREDITED PERSON AND SHALL BE SUBMITTED TO THE SUPERINTENDENT FOR REVIEW.
- GN29. THE CONTRACTOR SHALL MAINTAIN PUBLIC VEHICLE TRAFFIC ACCESSIBILITY ALONG THE CENTRAL COAST HIGHWAY AND SHALL UNDERTAKE WORKS TO MINIMISE THE DISRUPTION TO THROUGH TRAFFIC ALONG CENTRAL COAST HIGHWAY DURING THE DURATION OF THE WORKS. THE CONTRACTOR SHALL SUBMIT A PLAN IDENTIFYING LAYDOWN AND STAGING AREAS FOR SUPERINTENDENT APPROVAL PRIOR TO MOBILISATION.
- GN30. THE CONTRACTOR SHALL SUPPLY THE SUPERINTENDENT WITH FULLY MARKED-UP AND CERTIFIED 'WORK-AS-EXECUTED' DRAWINGS FOR THE WHOLE OF THE CONTRACT PRIOR TO ISSUE OF THE FINAL CERTIFICATE. THE ONUS SHALL REST WITH THE CONTRACTOR TO SHOW THAT THE WORKS HAVE BEEN EXECUTED PER THE DESIGN AND ANY SITE INSTRUCTIONS FROM THE SUPERINTENDENT.
- GN31. 'WORK-AS-EXECUTED' DRAWINGS SHALL BE PLOTTED SHOWING DEVIATIONS FROM THE DESIGN USING RED INK. EACH AND EVERY SOIL NAIL INSTALLED SHALL BE LOCATED ON THE DRAWINGS ACCURATELY AND UNIQUELY NUMBERED. ALL CHANGES TO THE CONTRACT DRAWINGS AND ACTUAL VALUES OF ALL LEVELS SHOWN ON THE DRAWINGS SHALL BE SHOWN. THE DRAWINGS SHALL BE SIGNED BY A SURVEYOR AND CERTIFIED BY THE CONTRACTOR.
- GN32. THIS PROJECT REQUIRES THE ONGOING OVERSIGHT DURING CONSTRUCTION OF THE WORKS BY THE DESIGNER. THIS IS TO ASSIST WITH MANAGING COMPLEX GROUND CONDITIONS AND REDUCE THE POTENTIAL COST OF VARIATIONS TO THE PRINCIPAL.
- GN33. IF THE CONTRACTOR PROPOSES AN ALTERNATIVE WORK METHOD, THE CONTRACTOR SHALL SUBMIT WORK PLANS TO THE SUPERINTENDENT AND DESIGNER FOR APPROVAL (IN WRITING WITH APPROPRIATE SKETCHES). WORK SHALL NOT COMMENCE UNTIL APPROVAL IS GIVEN IN WRITING.
- GN34. THE CONTRACTOR SHALL FAMILIARISE ITSELF WITH THE GEOTECHNICAL CONDITIONS ENCOUNTERED IN THE- BOREHOLES SET OUT IN TETRA TECH COFFEY DESIGN REPORT '*Detailed Design Report (754-NTLGE312180-AB) dated 29 February 2024*'. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TEMPORARY WORKS, CASING, OR WHATEVER MEASURES NECESSARY TO COMPLETE THE WORKS TO THE DESIGN, SPECIFICATIONS AND WRITTEN INSTRUCTIONS RECEIVED DURING CONSTRUCTION. IF FURTHER GEOTECHNICAL INFORMATION IS REQUIRED TO MANAGE THE CONTRACTORS RISK, THIS SHALL BE UNDERTAKEN AT THE CONTRACTORS COST.
- GN35. WHERE THE CONTRACTOR SEEKS TO SUBSTITUTE AN ALTERNATIVE PRODUCT THAN THAT SPECIFIED, THE CONTRACTOR SHALL SUBMIT TO THE SUPERINTENDENT A WRITTEN REQUEST WHICH WILL NEED APPROVAL FROM THE PRINCIPAL AND DESIGNER. THE REQUEST SHALL DOCUMENT:

a. THE ELEMENT TO BE SUBSTITUTED USING ALTERNATIVE PRODUCT.

b. REASONS FOR THE SUBSTITUTION.

c. COST SAVINGS TO THE PRINCIPAL THAT CAN BE ACHIEVED.

d. A DEMONSTRATION OF HOW THE PROPOSED ELEMENT IS EQUIVALENT IN ALL TECHNICAL ASPECTS TO THE SPECIFIED PRODUCTS THAT ARE TO BE CONSIDERED FOR SUBSTITUTION.
- GN36. REQUESTS FOR PRODUCT SUBSTITUTIONS MADE AFTER THE COMMENCEMENT OF SITE WORKS OR CONTRARY TO THE TENDER SUBMITTED BY THE CONTRACTOR ARE UNLIKELY TO BE CONSIDERED FAVOURABLY.
- GN37. THE DECISION TO ALLOW (OR OTHERWISE) THE USE OF ALTERNATIVE MATERIALS THAN NOTED IN THE DRAWINGS AND SPECIFICATION, AND/OR TO MEET THE DESIGN INTENT, RESTS ABSOLUTELY WITH THE DESIGNER OF THE WORKS.

EQUIPMENT POSITIONING:

- GN38. THE CONTRACTOR SHALL POSITION ALL EQUIPMENT ASSOCIATED WITH THE WORKS TO AVOID DAMAGE TO THE PAVEMENT, INSTALLED ELEMENTS SUCH AS BUT NOT LIMITED TO NAILS, MESH FACING, DRAINS, SERVICES, TREES. REPAIR COSTS FOR ALL SUCH DAMAGE SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
- GN39. THE CONTRACTOR SHALL MAKE ALL NECESSARY ALLOWANCES FOR APPROPRIATELY POSITIONING EQUIPMENT TO UNDERTAKE INSTALLATION OF THE WORKS.
- GN40. THE CONTRACTOR SHALL PROVIDE MEASURES SUCH AS STEEL BEARING PLATES, ETC. AS NECESSARY TO MANAGE THE POTENTIAL FOR DAMAGE TO THE PAVEMENT. GEOTECHNICAL ADVICE AND CERTIFICATION OF THE CAPACITY OF THE SLOPE TO SUPPORT THE PROPOSED DRILLING AND CONSTRUCTION EQUIPMENT SHALL BE AT THE CONTRACTOR'S COST.

QA / QC RECORDS SUBMISSION:

- GN41. AT THE MINIMUM FREQUENCY OF MONTHLY, AND ACCOMPANYING EVERY PAYMENT CLAIM, THE CONTRACTOR MUST SUBMIT FOR REVIEW:

i. A SUMMARY OF WORKS COMPLETED IN A FORMAT THAT MATCHES THE CONTRACT DOCUMENTATION.

ii. GROUT VOLUMES USED FOR EACH NAIL AND TEST RESULTS FOR THE WORKS UNDER THE CLAIM AS PER THE SPECIFICATION.

iii. DRILLER'S LOGS FOR ALL BOREHOLES (SOIL NAILS).

iv. SOIL NAIL AS-INSTALLED LENGTHS.

v. A FACE PLAN SHOWING WHICH SOIL NAILS, AND WHICH SECTIONS OF THE FACING HAVE BEEN COMPLETED, AND WHEN.

vi. MANUFACTURER'S CERTIFICATION OF a) MESH PRODUCT AND NAIL PLATES AND b) SOIL NAIL ELEMENTS.

vii. RESULTS OF ANY SOIL NAIL TESTS.

viii. PHOTOGRAPHS OF THE WORK COMPLETED SHOWING THE a) THE INSTALLED NAILS, b) THE MESH AS PLACED, c) SUB-SOIL DRAINAGE INSTALLED, d) ANY OTHER WORKS COMPLETED.

CONTRACTORS SLOPE RISK MANAGEMENT:

- GN42. THE CONTRACTOR SHALL OBSERVE THE SLOPES DAILY PRIOR TO THE BEGINNING OF WORK ON THE SITE TO CHECK AND DOCUMENT:

a. THE AMOUNT OF OVERNIGHT RAINFALL FROM THE SITE GAUGE.

b. IF ANY CRACKS / BULGES HAVE APPEARED IN THE SLOPE / GROUND ABOVE THE WORKS SINCE THE PREVIOUS DAY.

c. HALT WORK AND MOVE CONSTRUCTION EQUIPMENT TO A DESIGNATED PLACE AWAY FROM THE WORKS WHEN HEAVY OR CONTINUED RAIN COMMENCES AND AT THE END OF EACH WORKING DAY.

d. MODIFY AND UPDATE RISK MITIGATION PLANS AS SITE CONDITIONS VARY THOUGHT THE PROJECT.
- GN43. THE DESIGNER AND SUPERINTENDENT SHALL BE CONTACTED IMMEDIATELY IF ANY SLOPE MOVEMENTS OR UNEXPECTED CHANGES ARE OBSERVED.

SITE CLEARANCE AND PREPARATION:

- SC1. THE CONTRACTOR SHALL PROVIDE ALL ENVIRONMENTAL AND SEDIMENT CONTROLS NECESSARY, INCLUDING SEDIMENT CONTROLS AS SHOWN ON THE DRAWINGS AND FLOATING BOOMS IN THE WATERWAY.
- SC2. THE SLOPE VEGETATION AND EXISTING EROSION CONTROL ELEMENTS SHALL BE TRIMMED TO GROUND LEVEL PRIOR TO THE INSTALLATION OF SUPPORT.
- SC3. TOPSOIL SHALL NOT BE REMOVED FROM THE SLOPE FACE.
- SC4. THE CONTRACTOR SHALL INCLUDE AN ALLOWANCE FOR BACKFILLING AT THE SOIL NAIL TEST LOCATIONS UNDERTAKEN AS PART OF THE WORKS. THE BACKFILLING SHALL BE DONE TO RE-INSTATE THE SLOPE SURFACE TO MATCH THE SURROUNDING SLOPE.

a. BACKFILL MATERIAL MAY COMPRISE:

i. NO-FINES CONCRETE

ii. SELECT FILL AS PER TfNSW R44 PLACED TO AT LEAST 95% SMDD AT ± 2% OMC.

iii. OTHER FILL MATERIALS APPROVED BY THE SUPERINTENDENT AND DESIGNER.

ACCEPTED FOR CONSTRUCTION

DRAWING FILE LOCATION / NAME \\tt.local\cof\5798\F\GEOTECHNICS\1. JOBS\NTLGE31\754-NTLGE312180 - Kariong Hill Slope Instability\CAD\Native Files - Working\GT-SL-001-010_RevB.dwg					DESIGN LOT CODE		DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING				PLOT DATE / TIME 21-06-2024 11:14 AM			PLOT BY d.rodriguesleite		CLIENT		LOCALITY - CENTRAL COAST COUNCIL ROAD NUMBER - HW30 KARIONG HILL, CENTRAL COAST HWY, NSW NATURAL DISASTER RECOVERY - SLOPE 85716 SLOPE STABILISATION WORKS WITH SOIL NAILS GEOTECHNICAL WORK SPECIFICATIONS - SHEET 01 OF 02			A3
EXTERNAL REFERENCE FILES					REV	DATE	AMENDMENT / REVISION DESCRIPTION			WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING		DRAWINGS / DESIGN PREPARED BY			TITLE				
					1	29.02.24	ISSUED FOR 80% DESIGN REVIEW										DRAWN		M. BACON	21.06.24	
					2	30.04.24	ISSUED FOR 100% FINAL DESIGN										DRG CHECK		C. DAI	21.06.24	
					DESIGN		M. JONES	21.06.24													
					DESIGN CHECK		J. DARRAS	21.06.24													
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															ISSUE STATUS FOR 100% FINAL DESIGN		EDMS No.	SHEET No. GT-SL-002	ISSUE 2		

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50mm ON A3 SIZE ORIGINAL

NOTES FOR HEAVY RAINFALL PRECAUTIONS:

GENERAL PRECAUTIONS:

- HR1. THE CONTRACTOR SHALL INSTALL A RAINFALL GAUGE AT THE SITE, A MINIMUM OF 1.5 m OFF THE GROUND AND AT LEAST TWICE THE DISTANCE AWAY FROM VERTICAL OBSTRUCTIONS AS THEY ARE HIGH. IF THE RAIN GAUGE IS ATTACHED TO A WOODEN POST, THE INLET OF THE GAUGE SHALL BE AT LEAST 50 mm ABOVE THE TOP OF THE POST, OR THE TOP OF THE POST SHALL BE BEVELLED OR FILLETED IN SUCH A WAY AS TO REDUCE SPLASH INTO THE GAUGE.
- HR2. THE CONTRACTOR SHALL KEEP A LOG OF DAILY RAINFALL AT A FIXED TIME, BUT PREFERABLY 9 am EACH DAY FOR ALIGNMENT WITH BUREAU OF METEOROLOGY RECORDS. THESE RAINFALL READINGS SHALL BE COMMUNICATED TO THE SUPERINTENDENT WEEKLY, OR ON THE DAY IF MORE THAN 30 mm OF RAIN FALLS WITHIN A 24 HOUR PERIOD TO THE FIXED TIME SELECTED BY THE CONTRACTOR.
- HR3. SURFACE WATER FLOWING INTO THE SITE FROM UPHILL SHALL BE INTERCEPTED AND ROUTED FROM THE SITE TO A SAFE DISCHARGE POINT. ALL DRAINAGE WORKS SHALL BE KEPT CLEAR OF DEBRIS.
- HR4. WHERE PARTIALLY COMPLETED PERMANENT DRAINAGE WORKS DISCHARGE WITHIN A SITE, A TEMPORARY CONDUIT SHALL BE PROVIDED TO THE DISCHARGE POINT.
- HR5. ALL EARTHWORKS SHALL BE GRADED TO ENSURE RUN-OFF AND TO AVOID PONDING AT ANY PART OF THE SITE.
- HR6. A METHOD OF WORKING SHALL BE ADOPTED WHICH THE MINIMUM OF BARE SOIL IS EXPOSED AT ANY TIME.
- HR7. WHERE SLOPE FACES ARE TEMPORARILY EXPOSED FOR MORE THAN ONE WEEK, TEMPORARY SHEETING SHALL BE PROVIDED AND TEMPORARY DRAINS SHALL BE INSTALLED AS REQUIRED.

WHEN HEAVY RAINFALL IS IMMINENT: (AS DETERMINED BY THE SUPERINTENDENT)

- HR8. EXCAVATIONS SHALL NOT BE LEFT OPEN ON OR ADJACENT TO A SLOPE.
- HR9. IF TRENCHES ON OR ADJACENT TO SLOPES HAVE TO BE EXCAVATED THIS SHALL BE DONE WITH EXTREME CARE AND IN SHORT SECTIONS AT A TIME, PRECAUTIONS SHALL BE TAKEN TO PREVENT WATER ENTERING AND COLLECTING IN SUCH TRENCHES.
- HR10. BARE EARTH SLOPE FACES SHALL BE SEALED WITH SUITABLE SHEETING (A34 GEOFABRIC OR PLASTIC SHEETING OR THE LIKE) WHICH IS TO BE WELL SECURED AGAINST THE WIND. SUFFICIENT SUITABLE SHEETING SHALL BE KEPT ON SITE AT ALL TIMES DURING THE WORKS.
- HR11. EARTHWORKS SHALL BE SEALED TO THE SATISFACTION OF THE SUPERINTENDENT TO PREVENT INFILTRATION AND EROSION.

SOIL NAIL INSTALLATION:

- SN1. ALL WORK SHALL COMPLY WITH TfNSW R64 SPECIFICATION.
- SN2. THE LOCATIONS OF THE SOIL NAILS ON THE DRAWINGS ARE INDICATIVE. SET OUT SHALL BE CONFIRMED WITH CO-ORDINATION OF THE DESIGNER.
- SN3. PRIOR TO PRODUCTION SUITABILITY TESTING SHALL BE UNDERTAKEN PER TfNSW R64 AND IN ACCORDANCE WITH THE DESIGN REPORT. (HOLD POINT)
- SN4. DRILLING, INSTALLATION AND GROUTING OF SOIL NAILS SHALL BE AS PER TfNSW R64 - SOIL NAILING.
- SN5. ALL DEBRIS AND STANDING WATER SHALL BE REMOVED FROM THE DRILLED HOLES BY COMPRESSED AIR DURING THE HOLE DRILLING. WATER SHALL NOT BE USED.
- SN6. PLANT EMPLOYING WATER AS THE DRILL FLUSHING MEDIUM SHALL NOT BE USED AS THIS CAN RESULT IN SATURATION OF THE SOIL SURROUNDING THE NAIL AND SUBSEQUENT HOLE INSTABILITY.
- SN7. NO DRILLING SHALL BE CARRIED OUT ON ANY ADJACENT FRESHLY GROUTED SOIL NAILS, (IE, WORKS ARE TO BE CARRIED OUT ON ALTERNATE NAILS) INCLUDING SOIL NAILS FOR SUITABILITY TESTS, GROUTED LESS THAN 24 HOURS PREVIOUSLY. CASING SHALL BE SUPPLIED BY THE CONTRACTOR AT HIS EXPENSE WHERE REQUIRED. NO CLAIMS FOR UNEXPECTED GROUND CONDITIONS WILL BE ACCEPTED BY THE PRINCIPAL, WHATSOEVER.
- SN8. THE IN-GROUND LENGTH OF SOIL NAILS SHALL BE AS SPECIFIED ON THE DRAWINGS. THE CONTRACTOR SHALL ALLOW ADDITIONAL BAR LENGTH TO COMPLETE NECESSARY TESTING AND CONSTRUCT THE NAIL HEAD, WITHOUT THE NEED TO COUPLE BARS WITHIN 3.0 m OF THE FACE BEING RESTRAINED EITHER FOR TESTING OR PERMANENT ARRANGEMENTS.
- SN9. NAILS SHALL BE INSTALLED INTO MINIMUM 150 mm DIAMETER HOLES DRILLED TO AT LEAST 100 mm LONGER THAN THE IN-GROUND NAIL LENGTH, ANGLED DOWN FROM THE HORIZONTAL AT 30 DEGREES UNLESS OTHERWISE SPECIFIED ON THE DRAWINGS OR AS DIRECTED BY THE SUPERINTENDENT.
- SN10. CENTRALISING SPACERS SHALL BE PROVIDED AROUND THE BAR AS PER THE DRAWINGS. THE SPACERS SHALL BE FABRICATED FROM MATERIALS WHICH HAVE NO DELETERIOUS EFFECT ON THE SOIL NAIL SYSTEM. SPACERS SHALL BE MANUFACTURED TO PERMIT THE FREE FLOW OF GROUT.
- SN11. TWO GROUT TUBES ARE REQUIRED, ONE TO TREMIE GROUT INTO THE SPACE BETWEEN THE HDPE SHEATH AND THE BAR, AND ONE TO TREMIE GROUT INTO THE SPACE BETWEEN THE SOIL AND THE HDPE SHEATH.
- SN12. THE SOIL NAILS INCLUDING THE BAR, SPACERS, CORRUGATED SHEATH AND GROUT TUBES SHALL BE MADE UP PRIOR TO INSERTION INTO THE DRILLED HOLE.
- SN13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR AVOIDING ALL CONFLICTS (AND MAKING GOOD COSTS) BETWEEN NAILS AND OTHER SUBSURFACE ELEMENTS SUCH AS, BUT NOT LIMITED TO UNDERGROUND SERVICES AND INCLINOMETERS. IF SPLAYING OF NAILS IS REQUIRED TO AVOID CONFLICTS, SUBMIT WORK PLANS TO THE SUPERINTENDENT FOR REVIEW PRIOR TO UNDERTAKING THE SPLAYED INSTALLATION.
- SN14. A 300 x 300 x 10 mm THICK FACE PLATE, AND ARTICULATED PLATE AND DOMES NUT ARE REQUIRED AT THE FACE. ARTICULATED PLATE AND DOMED NUT ARE TO BE SUPPLIED BY THE BAR MANUFACTURER.

SOIL NAIL GROUTING:

- SN15. THE CONTRACTOR SHALL USE GROUTING EQUIPMENT APPROPRIATE FOR THE SLOPE REMEDIATION.
- SN16. GROUT SHALL BE PUMPED INTO THE HOLE THROUGH THE GROUT TUBES BY DOUBLE TUBE TREMIE UNTIL THE GROUT IS FORCED OUT OF THE TOP OF THE HOLE. THE AMOUNT OF GROUT PUMPED INTO THE HOLE SHALL BE RECORDED TO DETERMINE IF THE HOLE IS BLOCKED OR IF THERE ARE VOIDS IN THE GROUT. EACH SOIL NAIL SHALL BE COMPLETELY AND CONTINUOUSLY SURROUNDED BY A GROUT ANNULUS. WHERE THERE IS DISCREPANCY IN THE VOLUME OF GROUT TAKEN BY THE HOLE FROM THAT CALCULATED, THE NAIL ASSEMBLY SHALL BE REMOVED AND THE HOLE RE-DRILLED PRIOR TO NAIL RE-INSERTION AND GROUTING.

SOIL NAIL GROUTING:

- SN17. SOIL NAILS SHALL BE GROUTED ON THE DAY WHEN THE STEEL BARS ARE INSERTED INTO DRILL HOLES. SOIL NAILS WHICH ARE NOT GROUTED AFTER INSERTION AND ARE LEFT IN DRILL HOLE OVERNIGHT SHALL BE WITHDRAWN FROM THE DRILL HOLE AND THE DRILL HOLE SHALL BE CHECKED FOR CLEANLINESS AND OBSTRUCTIONS PRIOR TO RE-INSERTION.
- SN18. AFTER INSERTION OF STEEL BAR INTO THE DRILL HOLE, THE TOP END OF THE DRILL HOLE SHALL BE SEALED WITH AN APPROPRIATE PLUG CAPABLE OF WITHSTANDING A GROUT PRESSURE HEAD, WHICH IS MAINTAINED DURING THE FIRST HOUR AFTER COMPLETION OF GROUTING.
- SN19. AN OUTLET PIPE EXTENDING ABOVE THE SLOPE SURFACE SHALL BE INSTALLED THROUGH THE PLUG TO ALLOW DISCHARGE OF AIR, WATER AND GROUT FROM THE UPPER END OF THE DRILL HOLE DURING GROUTING. THE ARRANGEMENT OF OUTLET PIPE AND SEALING PLUG SHALL BE SUBMITTED FOR THE AGREEMENT OF THE GE AND A SITE TRIAL SHALL BE CARRIED TO DEMONSTRATE THAT THE SET UP PERFORMS SATISFACTORILY.
- SN20. SOIL NAILS SHALL BE GROUTED OVER THEIR ENTIRE LENGTH OF STEEL BAR IN ONE SINGLE OPERATION. GROUT SHALL BE INJECTED INTO DRILL HOLE THROUGH THE GROUT TUBE TO THE LOWER END OF DRILL HOLE SUCH THAT AIR AND WATER ARE DISPLACED FROM THE DRILL HOLE AS GROUTING PROCEEDS. WHEN THE CONSISTENCY OF THE GROUT FLOWING OUT OF THE OUTLET PIPE IS THE SAME AS THE INJECTING GROUT, THE GROUTING OPERATION SHALL STOP AND THE INLET GROUT PIPE SEALED. A PRESSURE HEAD OF AT LEAST 300 mm OF GROUT MEASURED FROM THE TOP OF DRILL HOLE SHALL BE MAINTAINED IN THE OUTLET PIPE DURING THE FIRST HOUR AFTER COMPLETION OF GROUT. ANY SETTLEMENT OF THE GROUT LEVEL INSIDE THE OUTLET PIPE OBSERVED SHALL BE REPLENISHED WITH FRESH GROUT IMMEDIATELY.
- SN21. THE SET-UP OF GROUTING PLANT AND ANCILLARY EQUIPMENT SHALL BE IN SUCH A MANNER THAT WATER, SPILLAGE OF GROUT, DUST, FUMES AND NOISE GENERATED DURING THE GROUTING OPERATION SHALL BE SUFFICIENTLY DIVERTED, CONTROLLED, SUPPRESSED AND MUFFLED.
- SN22. THE VOLUME OF GROUT USED FOR GROUTING EACH DRILL HOLE AND THE VOLUME USED FOR REFILLING EACH DRILL HOLE AFTER GROUT SETTLEMENT SHALL BE RECORDED. A COPY OF THE RECORDS SHALL BE SUBMITTED TO THE GE ON COMPLETION OF THE SOIL NAIL. THE RECORDS SHALL INCLUDE THE FOLLOWING:

a. A LABELED ELEVATION OF THE SOIL NAILS INSTALLED SHALL BE PROVIDED ACCOMPANIED BY A TABLE SHOWING:

i. NAIL NUMBER.

ii. NAIL LENGTH.

iii. DATE OF DRILLING.

iv. DRILL HOLE LENGTH.

v. DATE OF GROUTING.

vi. THE TOTAL VOLUME OF GROUT IN EACH SOIL NAIL.

vii. VOLUME OF GROUT SPILLED FROM THE DRILL HOLE.

viii. VOLUME OF GROUT ADDED TO THE OUTLET PIPE AFTER GROUT SETTLEMENT.

ix. THE CORRESPONDING GROUT STRENGTH REPORT RESULT AND REPORT NUMBER.
- SN23. ANY EXCESSIVE GROUT LOSS SHALL BE REPORTED TO THE DESIGNER IMMEDIATELY. IF A DRILL HOLE CANNOT BE FULLY FILLED WITH GROUT AFTER INJECTING A VOLUME OF GROUT EQUAL TO 10 TIMES THE CALCULATED GROSS VOLUME OF THE DRILL HOLE, IGNORING THE VOLUME OF ALL CAST-IN COMPONENTS, THE GROUTING OPERATION SHALL IMMEDIATELY CEASE FOR THAT DRILL HOLE UNLESS OTHERWISE AGREED BY THE DESIGNER. THE GROUTED LENGTH OF THE DRILL HOLE SHALL BE REPORTED TO THE DESIGNER AND PROPOSALS FOR COMPLETING THE GROUTING FOR THAT DRILL HOLE SHALL BE SUBMITTED TO THE DESIGNER FOR APPROVAL AS SOON AS POSSIBLE.
- SN24. GROUT MIX DESIGN SHALL BE AS PER TfNSW R64 SECTION 2.2.7.
- SN25. GROUT INSERTION AND TESTING SHALL BE AS PER TfNSW R64 SECTION 3.4.3.
- SN26. CONSTRUCTION CONFORMITY RECORDS AS PER TfNSW R64 SECTION 3.4.3.10 SHALL BE SUPPLIED FOR EACH NAIL INSTALLATION.
- SN27. GROUT SAMPLING AND PREPARATION MAY BE UNDERTAKEN BY A SUITABLY TRAINED AND ACCREDITED NATA ACCREDITED SIGNATORY.
- SN28. GROUT STRENGTH TESTING IS TO BE UNDERTAKEN BY A NATA-ACCREDITED TESTING LABORATORY, WITH EACH CERTIFICATE NATA ENDORSED.
- SN29. THE FOLLOWING INFORMATION IS TO BE INCLUDED ON THE ORIGINAL LABORATORY TEST CERTIFICATE:

a. THE WORKS AREA (I.E. CHAINAGE, ROW LEVEL, ETC.).

b. BATCH NUMBER AND SOIL NAIL IDENTIFICATION NUMBERS FOR DEVICES GROUTED WITH THIS BATCH.

c. THE TIME AND DATE SAMPLED.

d. THE WATER / CEMENT RATIO AND ADDITIVE USED (IF ANY).

e. THE INITIALS OF THE CERTIFIED OPERATIVE RESPONSIBLE FOR MIXING/SAMPLING THE GROUT.

SOIL NAIL STRUCTURAL ELEMENTS:

- SN30. SOIL NAILS SHALL BE GEWI THREADBAR OR EQUIVALENT WITH A MINIMUM ULTIMATE GRADE OF 500 MPa.

a. EQUIVALENCE SHALL BE DEFINED BY, BUT NOT LIMITED TO, COST OF THE ENTIRE SOIL NAIL SYSTEM, STRENGTH, STIFFNESS, SHEAR CAPACITY, CREEP CHARACTERISTICS, DURABILITY AND CONSTRUCTION PRACTICALITY CONSIDERATIONS. SUGGESTED SUBSTITUTES SHALL REQUIRE APPROVAL FROM THE SUPERINTENDENT AND DESIGNER.
- SN31. ALL GALVANISED ELEMENTS SHALL BE DOUBLE HOT DIP GALVANISED TO AS.4680. AFTER GALVANISING, ELEMENTS SHALL BE PASSIVATED BY DIPPING IN 2% SOLUTION OF SODIUM DICHROMATE TO PREVENT ANY ADVERSE REACTIONS BETWEEN THE ZINC COATING AND CEMENT GROUT.
- SN32. SOIL NAIL HEADS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE DETAILS ON THE DRAWINGS. NUT ASSEMBLIES AND FACE PLATES (OR EQUIVALENT) SHALL BE GALVANISED STEEL.
- SN33. PER ITEM 'SQ1' THE CONTRACTOR SHALL PRESENT EXAMPLES OF ASSEMBLED NAIL HEAD ELEMENTS IN A WORKSHOP TO THE DESIGNER, SUPERINTENDENT AND PRINCIPAL.

- SN34. AT FACING LOCATIONS, NAIL HEADS SHALL COMPRISE A 300 mm x 300 mm x 10 mm THK. PLATE SECURED ONTO THE MESH BY AN ASSEMBLY OF:

a. A DOMED CENTRALISING WASHER; AND,

b. A HEXAGONAL NUT.
- SN35. THE THREADS AT THE TOP END OF THREADBARS SHALL BE THOROUGHLY CLEANED WITHOUT DAMAGING THE BAR, PRIOR TO CONSTRUCTION OF THE SOIL NAIL HEADS.
- SN36. CONCRETE PACKING FOR LEVELING SOIL NAIL HEAD SPIKE PLATES (IF REQUIRED) SHALL BE GRADE 32 / 20 CONCRETE OR 32 MPa SHOTCRETE.
- SN37. THEREFORE ALL WORKS, AND PARTICULARLY ACCEPTANCE TESTING AND APPLICATIONS OF LOAD IN THE **TENSIONING** PROCEDURE MUST BE UNDERTAKEN WITH DUE CARE TO AVOID DAMAGING THE THREAD DURING TESTING, AND AS SUCH, NAIL BARS SHOULD BE LEFT LONG (I.E. NOT CUT OFF) TO ALLOW SACRIFICIAL LENGTH IF ACCEPTANCE TESTING IS TO BE CARRIED OUT AND TO ALLOW FIXING OF THE NAIL HEAD. THE LOADING OF THE NAIL THREAD DURING AN ACCEPTANCE TEST SHOULD BE APPLIED FORWARD OF THE THREAD LENGTH WHERE THE PERMANENT NUT WILL BE APPLIED.
- SN38. FOLLOWING ACCEPTANCE TESTING, ALL NAIL BARS SHALL BE CUT OFF FLUSH WITH THE NUT. THE CUT BAR SHALL BE COATED WITH EPOXY OR APPROVED ALTERNATE TO REDUCE THE POTENTIAL FOR CORROSION.
- SN39. WHERE THREADS HAVE BEEN DAMAGED FOR ANY REASON WHATSOEVER THE CONTRACTOR SHALL MAKE GOOD THE SOIL NAIL OR REINSTALL AN ADDITIONAL SOIL NAIL AT NO COST TO THE PRINCIPAL.

SOIL NAIL TESTING:

- SN40. SUITABILITY TESTS SHALL BE UNDERTAKEN ON 1% OF THE NUMBER OF SACRIFICIAL SOIL NAILS SPECIFIED PRIOR TO COMMENCEMENT OF ANY PRODUCTION NAILS, AS PER TfNSW R64 AND AT THE TEST SITE LOCATIONS SELECTED BY THE DESIGN ENGINEER ON SITE.
- SN41. THE FUNCTION OF THE SUITABILITY TEST SHALL BE TO CONFIRM THE DESIGN ULTIMATE BOND STRESS.
- SN42. THE SUITABILITY TEST LOADS AND BOND LENGTH WILL BE SPECIFIED BY THE DESIGNER AT THE TIME OF TESTING.
- SN43. TESTING AND MEASUREMENT EQUIPMENT FOR ALL NAIL TESTING SHALL BE AS PER TfNSW R64 SECTION 5.3, AND MEASUREMENT EQUIPMENT MUST HAVE A DIGITAL READOUT, SHALL HAVE A CURRENT CALIBRATION CERTIFICATE FOR ACCURACY AND SHALL HAVE A PRECISION OF 1kN OR BE MORE PRECISE.
- SN44. THE CONTRACTOR SHALL PROVIDE AN APPROPRIATE BEARING AREA TO APPLY THE REACTION TO THE SLOPE FACE WITHOUT DETRIMENTAL COMPRESSION OF THE SLOPE FACE.
- SN45. THE DESIGNER SHALL WITNESS SUITABILITY TESTING AND ACCEPT THE RESULTS AS A PART OF *HOLD POINT 2*.
- SN46. ACCEPTANCE TESTS SHALL BE UNDERTAKEN ON 10% OF THE TOTAL NUMBER OF PRODUCTION SOIL NAILS SPECIFIED, AS PER TfNSW R64 AND THE SOIL NAIL IS TO BE SELECTED BY THE GEOTECHNICAL DESIGN ENGINEER ON SITE.
- SN47. THE CONTRACTOR SHALL PREPARE A RECORD OF TESTING FOR EACH NAIL TESTED AND DEMONSTRATE TO THE SUPERINTENDENT THAT THE TEST PASSED OR FAILED THE REQUIREMENTS OF TfNSW R64, AND ANY REMEDIAL ACTIONS PROPOSED GUIDED BY TfNSW R64. THE CONTRACTOR SHALL SUBMIT A GRAPH OF EXTENSION VS LOG TIME PER TfNSW R64 TO THE SUPERINTENDENT FOR EACH TEST RESULT TO DEMONSTRATE THE CREEP BEHAVIOUR OF THE TESTED NAILS.
- SN48. THE DESIGNER SHALL WITNESS ACCEPTANCE TESTING AND ACCEPT RESULTS AS A PART OF *HOLD POINT 3*.
- SN49. THE COST OF REMEDIAL ACTIONS SHALL BE BORNE BY THE CONTRACTOR IN ALL CASES.

SOIL NAIL MESH FACING:

- SN50. A INSTALLATION OF THE MESH FACING SHALL BE AS PER THE REQUIREMENTS OF MacMatR MESH, OR EQUIVALENT.
- SN51. THE MESH SHALL COMPRISE:

a. MacMatR MESH OR EQUIVALENT.

b. A DOUBLE TWIST MESH MANUFACTURED FROM A 2.2 mm DIAMETER HIGH TENSILE WIRE, GALFAN GALVANISED AND PVC COATED TO A MEAN THICKNESS OF 0.5 mm.

c. THE MESH SHALL HAVE AN APERTURE SIZE OF 65 mm.

d. THE MESH SHALL, WHEN COMBINED WITH A FACE PLATE, HAVE 180 kN RESISTANCE AGAINST PUNCTURING, AND 30 kN RESISTANCE TO SLOPE PARALLEL STRESS.
- SN52. THE FACE PLATE TO THE NAIL HEAD TO CONTAIN THE MESH SHALL COMPRISE A 300 x 300 x 10 mm GALVANISED FACE PLATE, AN ARTICULATED PLATE AND DOMED NUT SUPPLIED BY THE BAR MANUFACTURER.

ADDITIONAL SOIL NAIL WORKS SPECIFICATION ITEMS:

- SN53. THE MINIMUM CHARACTERISTIC 28-DAY COMPRESSIVE STRENGTH OF THE GROUT SHALL BE 40 MPa.
- SN54. CONTRACTOR SHALL PREPARE WORK AS EXECUTED (WAE) DRAWINGS NOTING SURVEYED LOCATIONS OR ALL NAIL HEADS WITH EACH NAIL INDIVIDUALLY AN UNIQUELY NUMBERED.
- SN55. CONTRACTOR TO CONFIRM SOIL / ROCK TYPE / UNIT ALONG THE BONDED LENGTH OF EACH TEST NAIL DURING INSTALLATION. IF ACTUAL SOIL / ROCK TYPE / UNIT IS DIFFERENT FROM THAT SHOWN ON DRAWINGS THE DESIGNER SHALL BE NOTIFIED IMMEDIATELY.

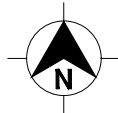
GENERAL EARTHWORKS:

- EW1. SITE STRIPPING, TOPSOIL STOCKPILING, BENCHING AND BACKFILLING, IF REQUIRED, SHALL BE UNDERTAKEN TO THE PROVISIONS OF TfNSW R44 - EARTHWORKS .
- EW2. EARTHWORKS SHALL BE SUPERVISED BY A SUITABLY QUALIFIED GEOTECHNICAL ENGINEER.

ACCEPTED FOR CONSTRUCTION

DRAWING FILE LOCATION / NAME \\tt.local\cof\S798\F\GEOTECHNICS\1. JOBS\INTLGE31\754-NTLGE312180 - Kariang Hill Slope Instability\CAD\Native Files - Working\GT-SL-001-010_RevB.dwg					DESIGN LOT CODE		DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING				PLOT DATE / TIME 21-06-2024 11:14 AM		PLOT BY d.rodriguesleite		CLIENT		LOCALITY - CENTRAL COAST COUNCIL ROAD NUMBER - HW30 KARIANG HILL, CENTRAL COAST HWY, NSW NATURAL DISASTER RECOVERY - SLOPE 85716 SLOPE STABILISATION WORKS WITH SOIL NAILS				A3		
EXTERNAL REFERENCE FILES					REV	DATE	AMENDMENT / REVISION DESCRIPTION			WVR No.	APPROVAL	SCALES ON A3 SIZE DRAWING		DRAWINGS / DESIGN PREPARED BY				TITLE		NAME	DATE		
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					2	30.04.24	ISSUED FOR 100% FINAL DESIGN											DRG CHECK		C. DAI	21.06.24		
																		DESIGN		M. JONES	21.06.24		
																		DESIGN CHECK		J. DARRAS	21.06.24		
																		DESIGN MNGR		-	-		
																		PROJECT MNGR		-	-		

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NOTES:
GENERAL:

- CHAINAGES AND REDUCED LEVELS ARE IN METRES.
- ANY EXISTING SERVICES SHALL BE LOCATED AND TEMPORARILY REMOVED AS REQUIRED DURING CONSTRUCTION.
- ROCK NAIL WALL SHALL BE CONSTRUCTED IN ACCORDANCE WITH TNSW SPECIFICATION R64 - SOIL NAILING.
- ROCK NAILS (28 mm DIA. THREADED BAR, GRADE 500 OR EQUIVALENT) SHALL BE INSTALLED INTO 150 mm DIA. PREDRILLED HOLES.
- ROCK NAILS SHALL BE EMBEDDED 3.0 m MINIMUM INTO CLASS IV SANDSTONE OR BETTER ROCK WITH MINIMUM ULTIMATE ROCK / CEMENT / GROUT BOND STRENGTH OF 150 kPa.
- GROUT STRENGTH SHALL BE 40 MPa FOR ROCK NAILS.
- ALL NUTS, WASHERS AND FACE PLATES SHALL BE HOT-DIP GALVANIZED IN ACCORDANCE WITH AS 1214 OR GALVANIZED BY AN ALTERNATIVE PROCESS APPROVED BY PRINCIPAL.
- ROCK NAILS BAR SHALL BE HOT DIP GALVANIZED TO AS/NZ 4680, EXCEPT THAT THE MINIMUM AVERAGE WEIGHT MUST BE 600 g/m² (EQUIVALENT TO 85 MICRONS IN THICKNESS) AND ENCAPSULATED WITHIN HDPC PLASTIC CORRUGATED SHEATH AS PER TNSW SPECIFICATION R64.

LEGEND:

- BH DENOTES BOREHOLE LOCATION
- DENOTES EXISTING INCLINOMETER
- DENOTES EXISTING PIEZOMETER

REFERENCE DRAWINGS:

- REFER TO DRG No. GT-SL-000 COVER SHEET AND REFERENCE DRAWING SCHEDULE.

SURVEY:

- DISCLAIMER FOR DETAIL SURVEYS:
SURVEY CONTROL INFORMATION IS REGARDED AS REPRESENTATIVE AT THE TIME OF SURVEY, BUT ALL SURVEY SHOULD BE VERIFIED BEFORE BEING USED FOR ANY PURPOSE.
- DIRECTION OF "NORTH" INDICATED ON ALL PLAN DRAWINGS REFERS TO APPROXIMATE TRUE NORTH DIRECTION, UNLESS NOTED OTHERWISE (U.N.O.)

'SLOPE 85716' - GENERAL ARRANGEMENT - (G.A.)

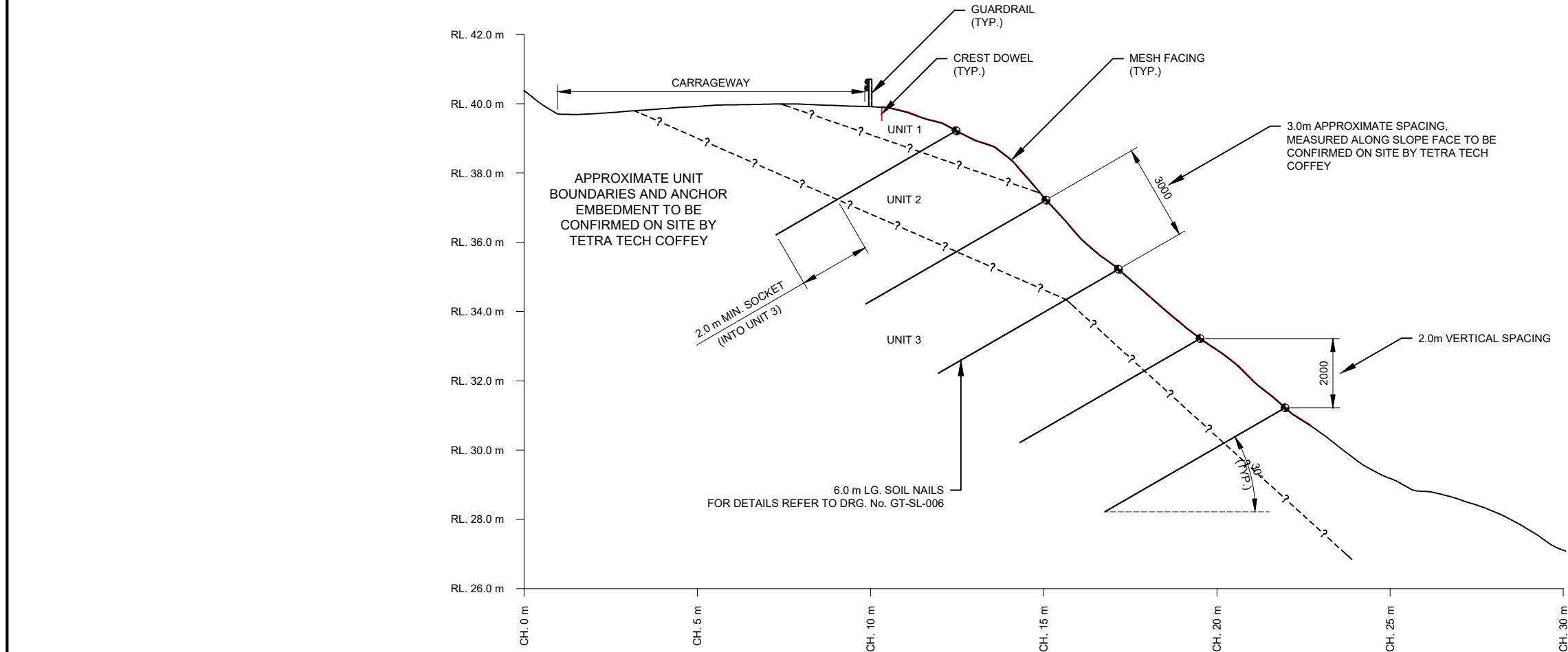
SCALE 1:200

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																		DESIGN MNGR	-	-					
																		PROJECT MNGR	-	-					

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50mm ON A3 SIZE ORIGINAL



SECTION 01 TYPICAL SOIL NAIL ARRANGEMENT
SCALE 1:150

UNIT LEGEND

- UNIT 1 - FILL / COLLUVIUM
UNIT 2 - RESIDUAL SOIL (RS) /
EXTREMELY WEATHERED MATERIAL (EXM)
UNIT 3 - SANDSTONE (SST) CLASS IV-III

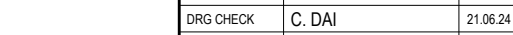
REFERENCE NOTES:

- ALL SOIL NAILS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THOSE SPECIFIED IN THE SOIL NAIL NOTES.
- ALL BOUNDARIES SHOWN ARE INFERRED GEOLOGICAL BOUNDARIES.
- CONTRACTOR TO CONFIRM LOCATION OF UNDERGROUND SERVICES.
- CONTRACTOR TO ENSURE NO CONFLICT BETWEEN THE SAFETY GUARDRAIL AND SOIL NAILS OCCURS.

REFERENCE DRAWINGS:

- REFER TO DRG No. GT-SL-000 COVER SHEET AND REFERENCE DRAWING SCHEDULE.

ACCEPTED FOR CONSTRUCTION

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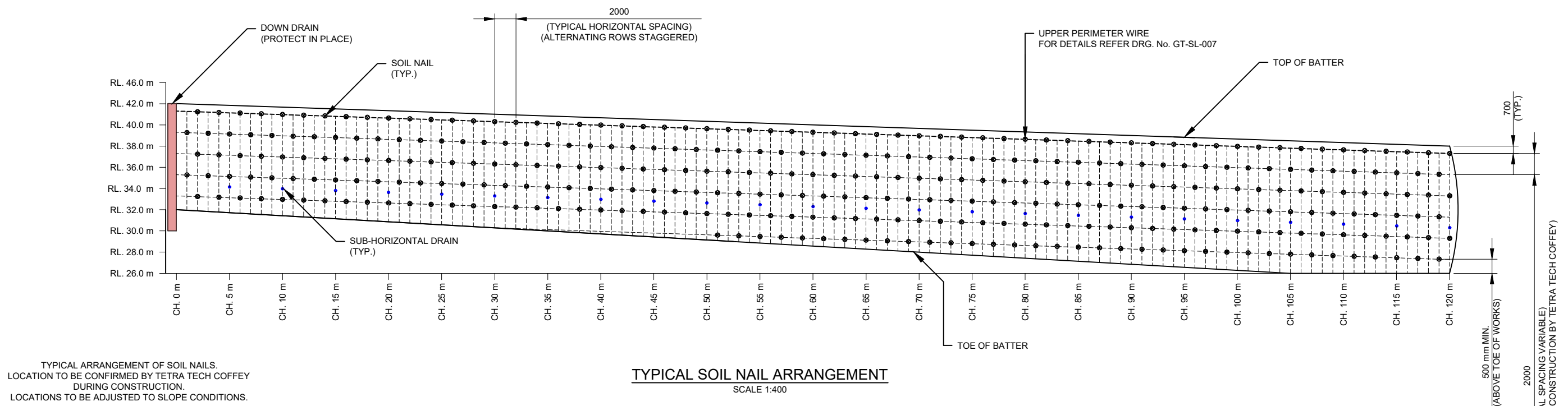


TABLE 03 - SOIL NAIL DETAILS			
SOIL NAIL DIA. (mm)	BOREHOLE DIA. (mm)	TENSILE CAPACITY (kN)	INCLINATION (°) TO HORIZONTAL
25	150	246	30

TABLE 04 - SOIL NAIL SCHEDULE			
REQUIRED MIN. LENGTH* (mm)	MIN. SOCKET CRITERIA (mm)	BONDED LENGTH * (mm)	WORKING LOAD (kN)
6000	CLASS IV SANDSTONE	2000	60

* SOIL NAIL LENGTH AND BOND IS APPROXIMATE AND TO BE CONFIRMED BY TETRA TECH COFFEY ON SITE DEPENDING ON THE DEPTH TO CLASS IV SANDSTONE OR BETTER.

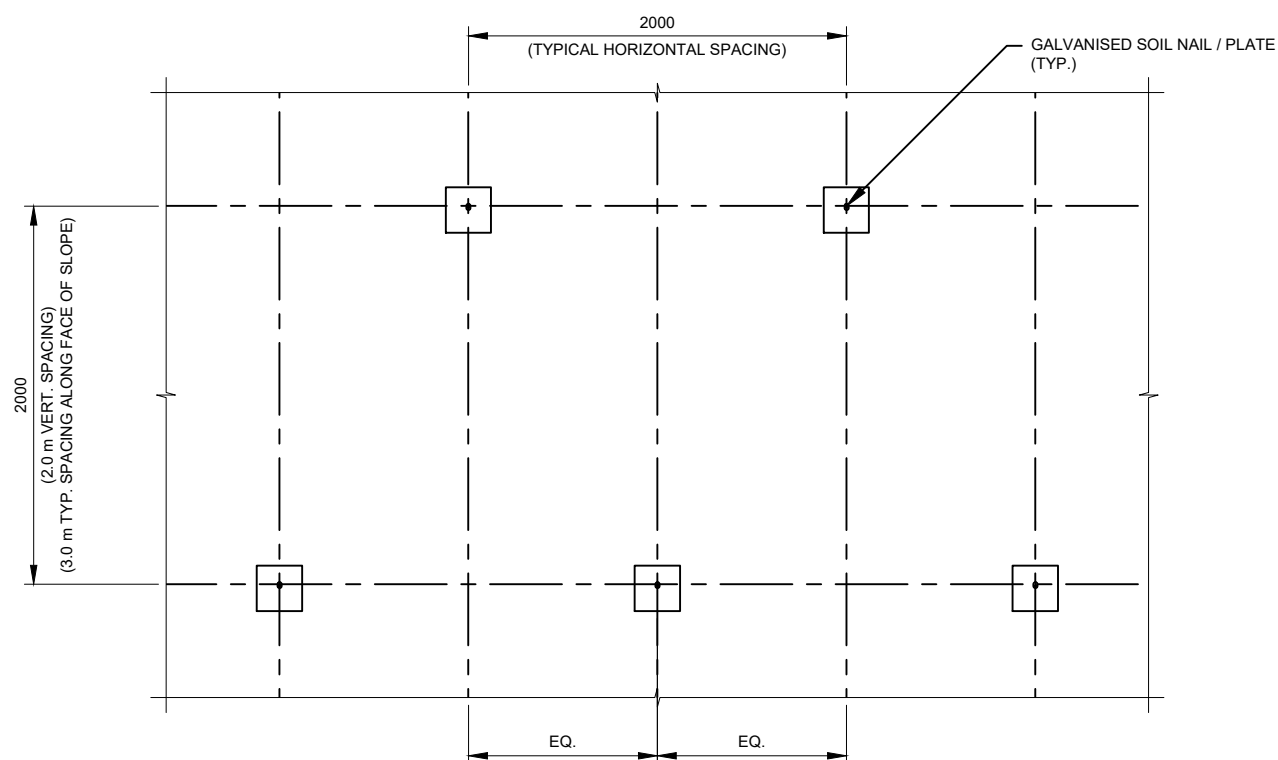
TABLE 05 - GEOTECHNICAL PARAMETERS					
UNIT	DESCRIPTION	UNIT WEIGHT (kN/m ³)	EFFECTIVE COHESION (C') (kPa)	EFFECTIVE FRICTION ANGLE (φ') (°)	ADOPTED ULTIMATE BOND STRESS FOR ROCK NAILS (kPa)
2	FILL (EMBANKMENT)	18	2	28	15
4	RESIDUAL SOIL (RS) EXTREMELY WEATHERED MATERIAL (XWM)	19	3	31	25
5a	ROCK (CLASS V - IV)	20	200	50	430

REFERENCE NOTES:

1. FOR LOCATION PLAN REFER TO DRAWING No. GT-SL-000.
2. FOR GENERAL NOTES REFER TO DRAWING No. GT-SL-001, GT-SL-002, GT-SL-003 & GT-SL-004.
3. FOR GENERAL ARRANGEMENT REFER TO DRAWING No. GT-SL-004.
4. ROCK LEVEL IS REQUIRED TO BE CONFIRMED ON SITE AND APPROVED BY A TETRA TECH COFFEY GEOTECHNICAL ENGINEER OR ENGINEERING GEOLOGIST DURING CONSTRUCTION. IF THE ROCK IS ENCOUNTERED UP TO 500 mm DEEPER THAN ANTICIPATED, CONSTRUCTION SHALL CONTINUE. 2.0 m SOCKET LENGTH SHALL BE MAINTAINED ALWAYS. IF THE ROCK IS ENCOUNTERED DEEPER THAN 1.0 m OF THE EXPECTED LEVEL, ADVICE SHALL BE SOUGHT FROM DESIGNER BEFORE PROGRESSING FURTHER.
5. EXISTING SLOPE SHALL BE CLEARED, GRUBBED, TOPSOIL REMOVED AND PRE-LAY TREATMENT OF SURFACE COMPLETED PRIOR TO LAYING OF NO FINES CONCRETE.
6. SOIL NAILS ARE SUBJECT TO ACCEPTANCE TESTING.

REFERENCE DRAWINGS:

- REFER TO DRG No. GT-SL-000 COVER SHEET AND REFERENCE DRAWING SCHEDULE.

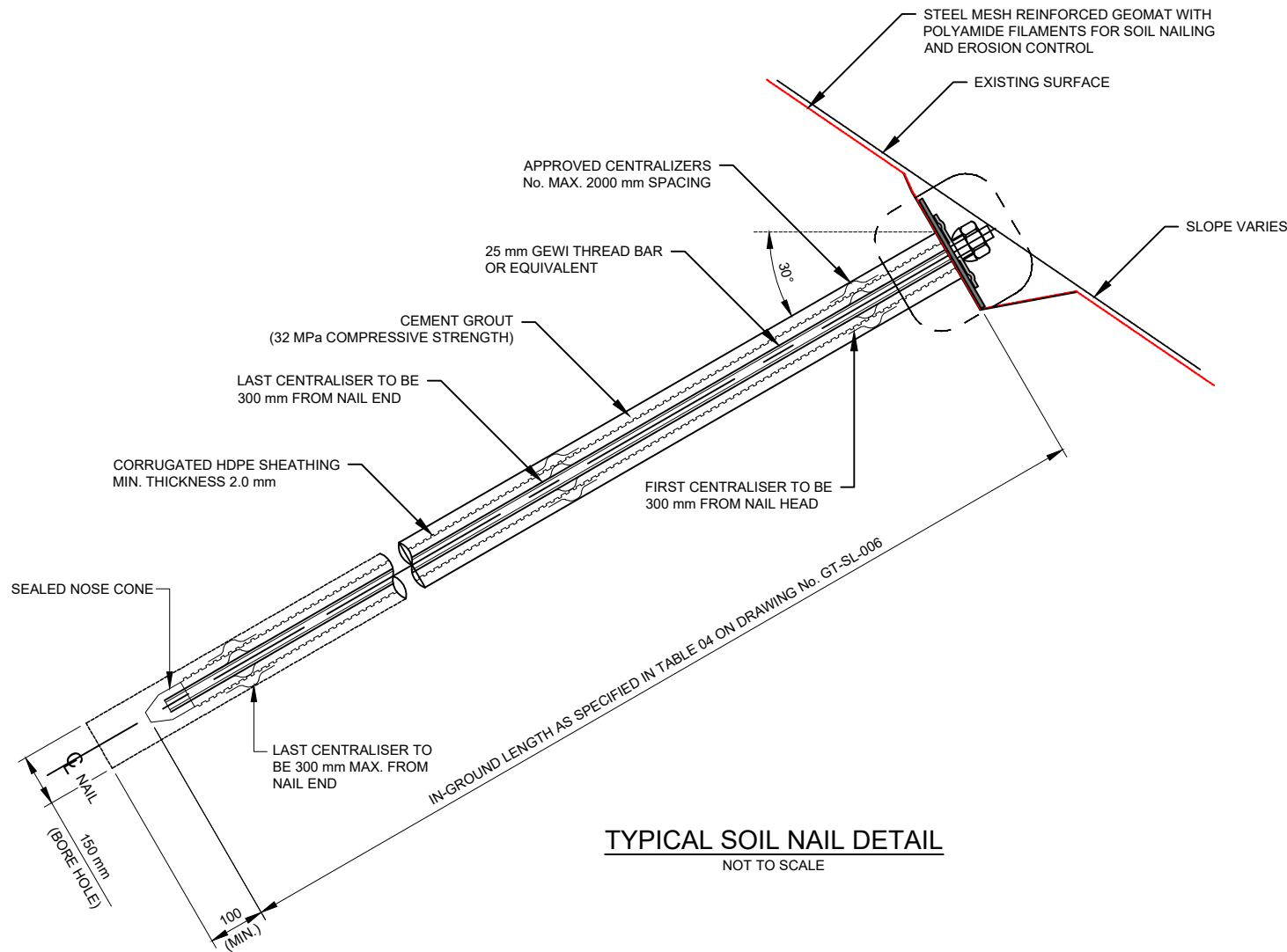


TYPICAL SOIL NAIL SPACING DETAIL

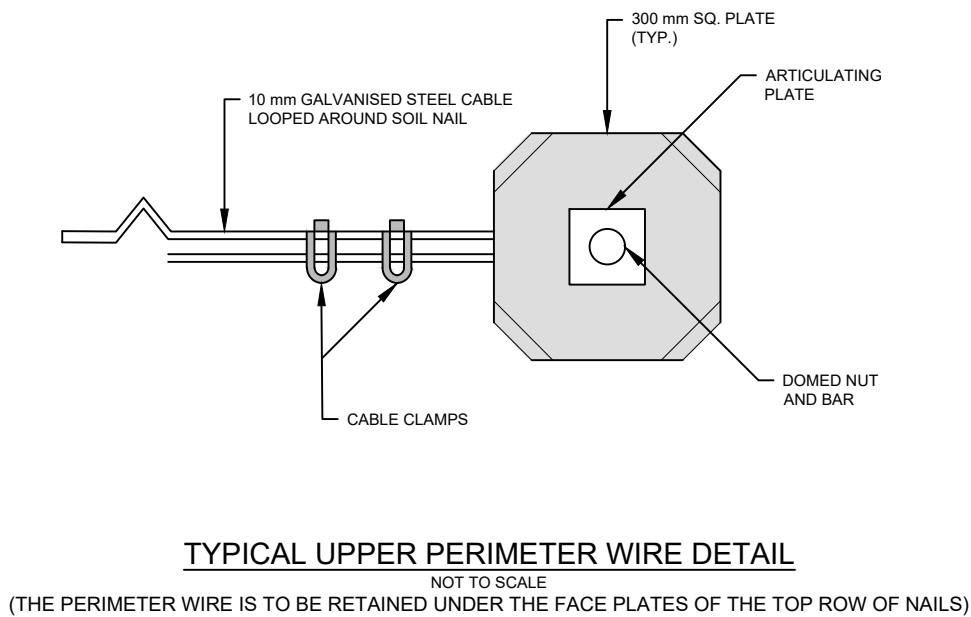
NOT TO SCALE

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												DESIGN	M. JONES	21.06.24							
								CO-ORDINATE SYSTEM MGA ZONE 56		HEIGHT DATUM AHD		DESIGN CHECK	J. DARRAS	21.06.24							
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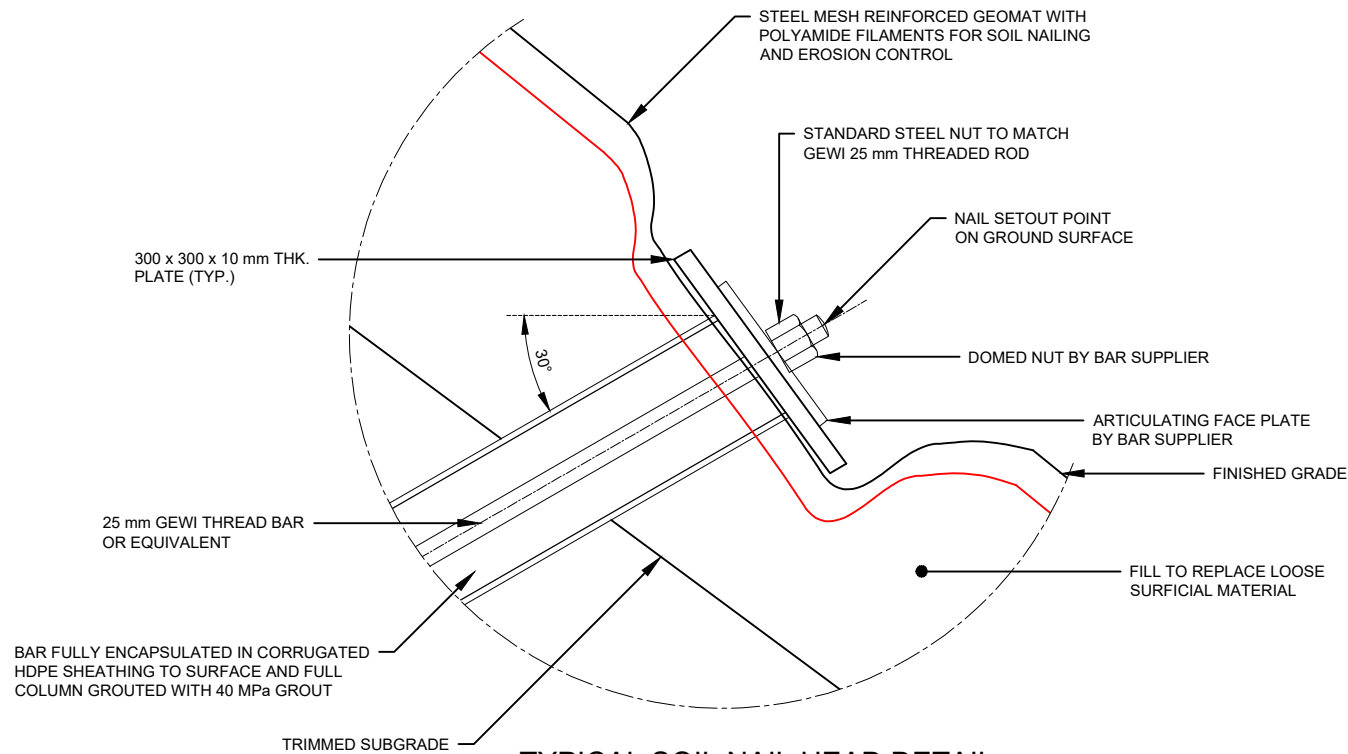


TYPICAL SOIL NAIL DETAIL
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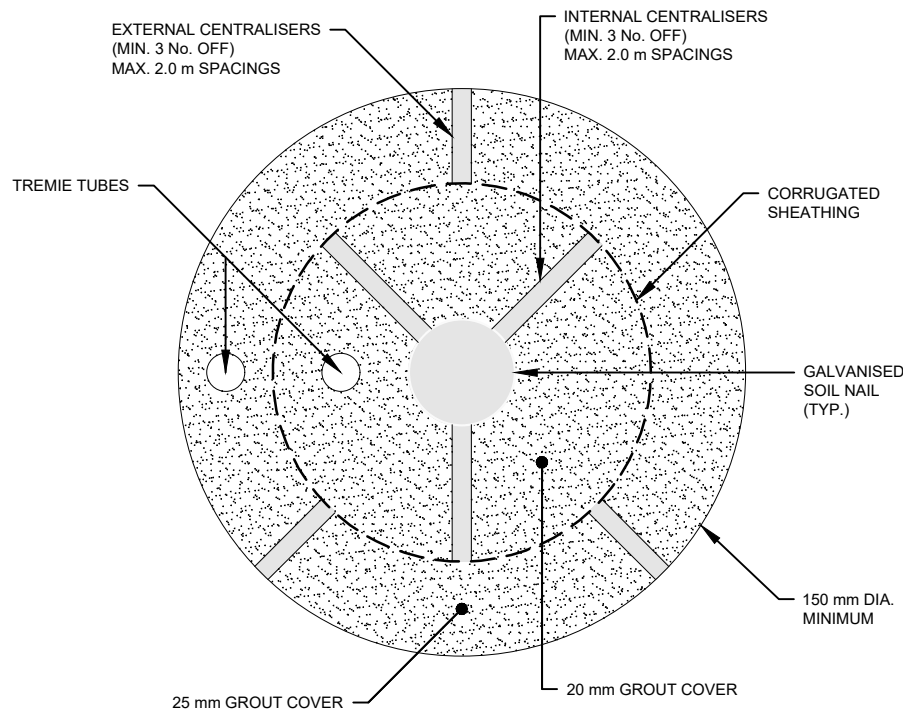


TYPICAL UPPER PERIMETER WIRE DETAIL
NOT TO SCALE

(THE PERIMETER WIRE IS TO BE RETAINED UNDER THE FACE PLATES OF THE TOP ROW OF NAILS)



TYPICAL SOIL NAIL HEAD DETAIL
NOT TO SCALE



TYPICAL SECTION THROUGH SOIL NAIL / ANCHOR
NOT TO SCALE

REFERENCE NOTES:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE PROJECT SPECIFICATION.

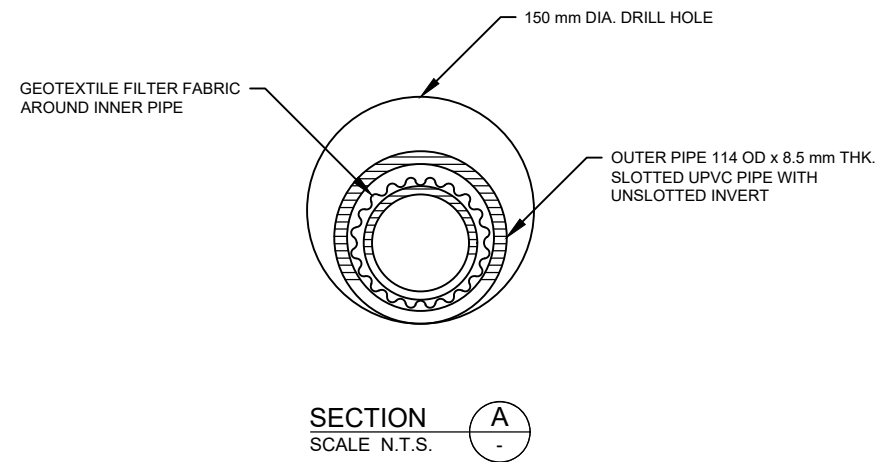
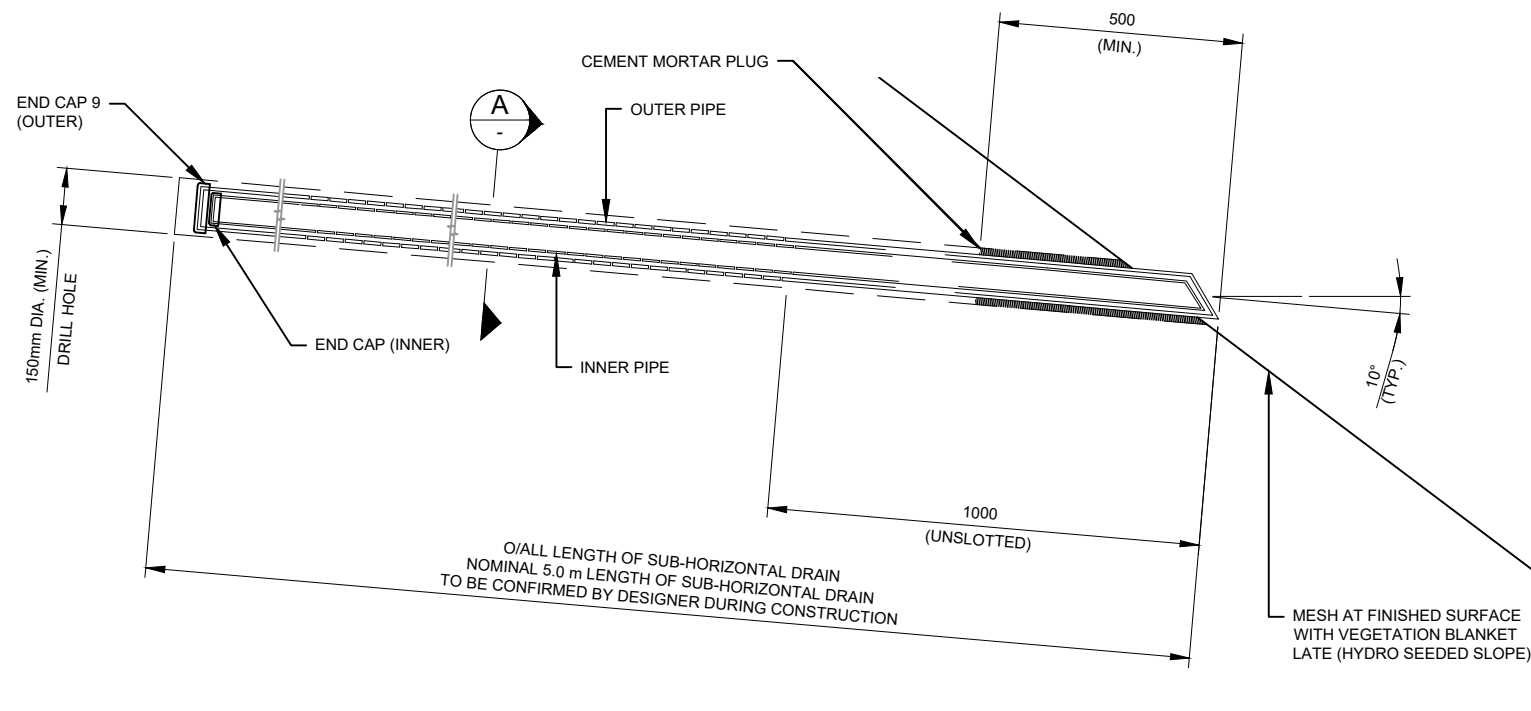
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CO-ORDINATE SYSTEM MGA ZONE 56							HEIGHT DATUM AHD																

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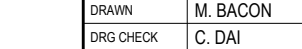
TYPICAL SUB-HORIZONTAL DRAIN DETAIL

NOT TO SCALE
(NOTE: INSTALLATION OF SUB-HORIZONTAL DRAIN MUST BE COMPLETED PRIOR TO INSTALLING EROSION CONTROL GEO-MATTING)

REFERENCE DRAWINGS:

- REFER TO DRG No. GT-SL-000 COVER SHEET AND REFERENCE DRAWING SCHEDULE.

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DRAWING FILE LOCATION / NAME \\t.local\cof\S798\F\GEO\TECHNICS\1. JOBS\NTLGE\31754-NTLGE\312180 - Kariiong Hill Slope Instability\CAD\Native Files - Working\GT-SL-001-010_RevB.dwg				DESIGN LOT CODE		DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING				PLOT DATE / TIME 21-06-2024 11:14 AM			PLOT BY d.rodriquesleite		CLIENT  Transport for NSW		LOCALITY - CENTRAL COAST COUNCIL ROAD NUMBER - HW30 KARIOIONG HILL, CENTRAL COAST HWY, NSW NATURAL DISASTER RECOVERY - SLOPE 85716 SLOPE STABILISATION WORKS WITH SOIL NAILS				A3																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
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50mm ON A3 SIZE ORIGINAL

NOTES:

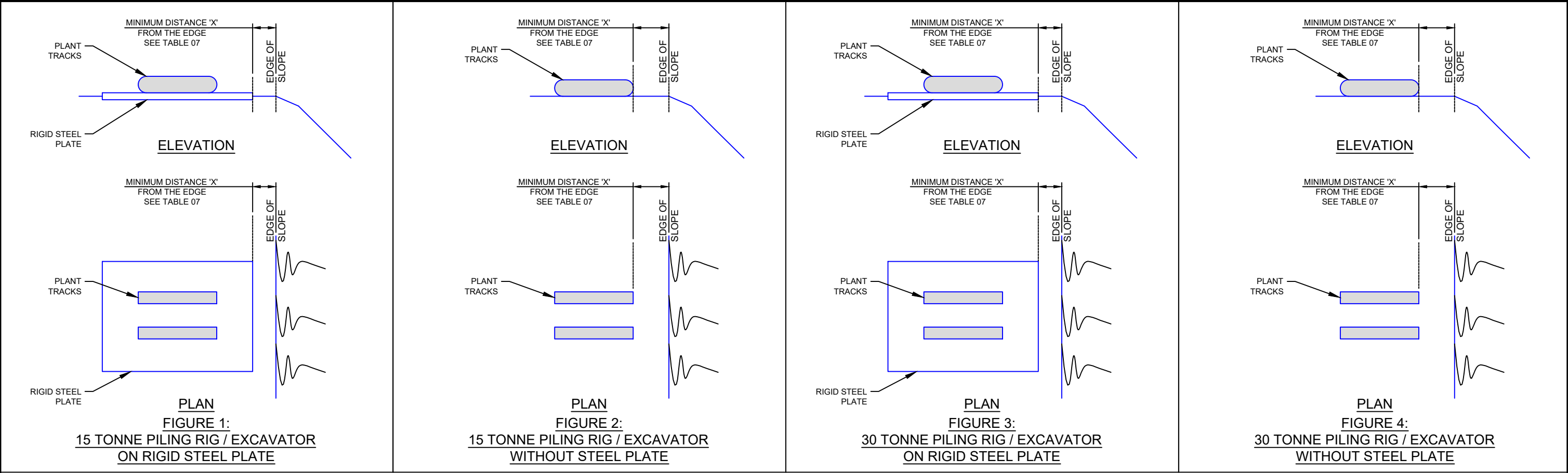
1. INSTALLATION OF SUB-HORIZONTAL DRAIN MUST BE COMPLETED PRIOR TO INSTALLING STEEL MESH.
2. UNLESS OTHERWISE SPECIFIED, THE INSTALLATION DETAILS OF WIRE MESH SHALL FOLLOW THE MANUFACTURERS RECOMMENDATIONS.

REFERENCE DRAWINGS:

- REFER TO DRG No. GT-SL-000 COVER SHEET AND REFERENCE DRAWING SCHEDULE.

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					1	29.02.24	ISSUED FOR 80% DESIGN REVIEW											DRAWN		M. BACON		21.06.24		PREPARED FOR NETWORK AND ASSETS ASSETS NORTH REGIONAL AND OUTER METROPOLITAN		TNSW REGISTRATION No. DS2024/000287		PART A							
					2	30.04.24	ISSUED FOR 100% FINAL DESIGN											DRG CHECK		C. DAI		21.06.24								DESIGN		M. JONES		21.06.24	
					DESIGN CHECK		J. DARRAS		21.06.24									DESIGN MNGR		-		-													
					PROJECT MNGR		-		-																										
														CO-ORDINATE SYSTEM MGA ZONE 56				HEIGHT DATUM AHD								ISSUE STATUS FOR 100% FINAL DESIGN		EDMS No.		SHEET No. GT-SL-009		ISSUE 2			

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PLANT SETOFF AND RELATED CONSTRUCTION NOTES:

- REFER TO DRAWINGS GT-SL-002 FOR GENERAL CONSTRUCTION SEQUENCE AND NOTES. NOTES IN THIS DRAWING IS RELATED TO PLANT SETOFFS ONLY.
- ASSESSMENT OF WORKING PLATFORM IS REQUIRED BY QUALIFIED GEOTECHNICAL ENGINEER PRIOR TO THE COMMENCEMENT OF THE WORK.
- WORKS SHALL BE CARRIED OUT IN DRY CONDITION. WORKING IN WET CONDITION IS NOT RECOMMENDED.
- INSTALLATION AND MONITORING OF INSTRUMENTS SHALL BE CARRIED OUT TO SATISFY MINIMAL REQUIREMENTS IN GT-SL-002. ADDITIONAL INSTRUMENTATION AND MONITORING MAY BE REQUIRED DEPENDING ON VARIABILITY ON THE SITE CONDITION. FOR EXAMPLE, TO MONITOR ANY LOCALISED DISTRESS OR FOLLOWING RAINFALL.
- SPOTTERS SHALL BE APPOINTED TO OBSERVE FOR ANY DISTRESS / INSTABILITY FEATURES OF SLOPES DURING CONSTRUCTION AND INFORM PLANT OPERATOR.
- TRAFFIC CONTROL SHALL BE IMPLEMENTED. ONE OR BOTH LANES CLOSURE MAY BE REQUIRED DEPENDING ON THE AVAILABLE ROAD WIDTH WITH WORKING PLANTS WITH SPECIFIED CLEAR DISTANCES.
- CLEAR COMMUNICATIONS SHALL BE MAINTAINED AMONG THE PUBLIC, TRAFFIC CONTROLLERS, SUPERVISOR AND WORKERS.
- MINOR CUTTING OR FILLING MAY BE REQUIRED TO CREATE EVEN WORKING PLATFORM. PRIOR APPROVAL FROM THE PRINCIPAL SHALL BE SOUGHT SHOULD PART OF THE PAVEMENT TO BE CUT.
- STABILITY MEASURES SUCH AS DISTRIBUTION OF LOADS THROUGH STEEL PLATES OR TEMPORARY SOIL NAILS SHALL BE CONSIDERED TO IMPROVE FACTOR OF SAFETY AGAINST INSTABILITY (SEE TABLES 06 AND 07).
- INSTALLATION SHALL COMMENCE FROM A STABLE SECTION OF SLOPE AND CONTINUE.
- THE EMERGENCY PLAN SHALL ADDRESS THE MOVEMENT OF PLANT AND WORKERS AND CONTINGENCY ACTIONS IF ANY DISTRESS OF INSTABILITY IDENTIFIED.
- SPECIFIED PLANT ADOPTED TO ASSESS SETBACK DISTANCES:
 - PILING RIG OR EXCAVATOR (15 TONNE)
 - PILING RIG OR EXCAVATOR (30 TONNE)
- TRACKS OF EXCAVATOR AND PILING RIGS SHALL BE KEPT PERPENDICULAR TO THE SLOPE ALL THE TIME.
- ASSESSED SURCHARGE OR LOAD OF THESE PLANT ARE SHOWN IN TABLE 07.

TABLE 06: ASSESSED LOADS FOR THE PROPOSED PLANT		
PLANT	ADOPTED DISTRIBUTED LOAD OVER THE FOOTPRINT (kPa)	ADOPTED DISTRIBUTED LOAD OVER ONE SIDE TRACK / TYRE (kPa)
15 TONNE PILING RIG OR EXCAVATOR	15	30
30 TONNE PILING RIG OR EXCAVATOR	30	65

- RIGID STEEL PLATE WITH AN AREA GREATER THAN THE FOOT PRINT OF THE PLANT SHALL BE USED TO DISTRIBUTE THE PLANT LOAD. MAXIMUM OF TWO PLATES (ASSUMED 2.0 m x 2.5 m EACH) WITH COMBINED AREA GREATER THAN THE FOOTPRINT OF THE PLANT SHALL BE USED AT A TIME. SHOULD TWO PLATES BE USED, TRACKS / TYRES OF THE PLANT SHALL BE KEPT AT THE MIDDLE OF THE PLATES. PLATES SHALL BE RIGID ENOUGH TO DISTRIBUTE THE LOADS EVENLY.
- MINIMUM CLEAR DISTANCES AND STABILITY MEASURES SPECIFIED IN TABLE 07 SHALL BE MAINTAINED AT ALL TIMES. CREST OF THE SLOPE SHALL BE CONSIDERED TO BE AT THE FOG LINE FOR DEFINING MINIMUM DISTANCES FROM THE CLOSEST PLANT / PLATE CONTACT POINT. ONSITE ASSESSMENT BY A QUALIFIED GEOTECHNICAL ENGINEER OR GEOLOGIST IS REQUIRED TO ASSESS LOCALISED WEAK ZONES. THE CREST MAY BE DEFINED BEYOND THE FOG LINE SHOULD AN ONSITE ASSESSMENT BY GEOTECHNICAL ENGINEER FINDS IT IS SATISFACTORY TO DO SO.

TABLE 07: SUMMARY OF ASSESSMENT FOR PLANT STANDOFF DISTANCES				
PLANT	SURCHARGE (kPa)	TEMPORARY STABILITY MEASURES	MINIMUM SETBACK DISTANCE FROM THE CREST (m)	FACTOR OF SAFETY
PILING RIG / EXCAVATOR (15 TONNE)	15	WITH RIGID PLATES ACROSS PAVEMENT CRACKS	1.0	1.1
	30	WITH RIGID PLATES ACROSS PAVEMENT CRACKS	1.5	1.1
	15	WITH RIGID PLATES TO DISTRIBUTE THE LOADS AND 2 ROWS OF SOIL NAILS	0.5	> 1.2
	30	WITH RIGID PLATES TO DISTRIBUTE THE LOADS AND 2 ROWS OF SOIL NAILS	1.0	> 1.2
PILING RIG / EXCAVATOR (30 TONNE)	30	WITH RIGID PLATES ACROSS PAVEMENT CRACKS	1.5	1.1
	65	WITH RIGID PLATES ACROSS PAVEMENT CRACKS	2.0	1.1
	30	WITH RIGID PLATES TO DISTRIBUTE THE LOADS AND 2 ROWS OF SOIL NAILS	1.0	> 1.2
	65	WITH RIGID PLATES TO DISTRIBUTE THE LOADS AND 2 ROWS OF SOIL NAILS	1.0	> 1.2

- WHERE SOIL NAILS WERE CONSIDERED TO IMPROVE STABILITY, THE FOLLOWING SHALL BE ADOPTED;
 - INSTALLATION OF THE SOIL NAILS SHALL BE CARRIED OUT USING LIGHTER RIG. THE LOAD OF THE RIG SHALL BE DISTRIBUTED USING RIGID STEEL PLATES TO LIMIT THE SURCHARGE LOAD TO 15 kPa OR LESS.
 - INSTALL THE FIRST ROW OF SOIL NAILS AND PLATES WITH ABOVE RIG FROM AT LEAST 1.5 m AWAY FROM THE EDGE OF THE SLOPE.
 - AFTER THE FIRST ROW OF SOIL NAILS AND PLATES ARE INSTALLED, INSTALL THE SECOND ROW OF SOIL NAILS AND PLATES USING ABOVE RIG FROM AT LEAST 700 mm AWAY FROM THE EDGE OF THE SLOPE.
 - INSTALL PERMANENT SOIL NAILS.
 - FOLLOW THE SUBSEQUENT ADOPTED CONSTRUCTION SEQUENCE AS PRESENTED ON DRAWING No. GT-SL-002 OR PROPOSED BY THE CONTRACTOR.

REFERENCE DRAWINGS:

- REFER TO DRG No. GT-SL-000 COVER SHEET AND REFERENCE DRAWING SCHEDULE.

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