Biodiversity Assessment Report

Light to Light Walk

Project Number: 18-569

September 2021

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DEFINITIONS

Avoid: measures taken by a proponent, such as careful site selection or actions taken through the design, planning, construction and operational phases of the development, to completely avoid impacts on biodiversity values or certain areas of biodiversity. Refer to the BAM for operational guidance in Section 9.

BAM: the *Biodiversity Assessment Method 2017*.

BC Act: the *Biodiversity Conservation Act 2016.*

BC Regulation: the *Biodiversity Conservation Regulation 2017.*

Biodiversity offsets: management actions that are undertaken to achieve a gain in biodiversity values on areas of land in order to compensate for losses to biodiversity values from the impacts of development.

Biodiversity values: has the same meaning as s1.5(2) of the BC Act.

Direct impacts: are those that directly affect the habitat of species and ecological communities and of individuals using the study area. They include, but are not limited to, death through predation, trampling, poisoning of the animal/plant itself and the removal of suitable habitat. When applying each factor, consideration must be given to all of the likely direct impacts of the proposed activity or development. When applying each factor, both long-term and short-term impacts are to be considered.

Hollow bearing tree: a living or dead tree that has at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the entrance width is at least 5cm; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1m above the ground. Trees must be examined from all angles.

Impact assessment: an assessment of the impact or likely impact of an activity on biodiversity values which is prepared in accordance with Section 9 of the BAM.

Indirect impacts: occur when project-related activities affect species or ecological communities in a manner other than direct loss within the subject site. Indirect impacts may sterilise or reduce the habitability of adjacent or connected habitats. Indirect impacts can include loss of individuals through starvation, exposure, predation by domestic and/or feral animals, loss of breeding opportunities, loss of shade/shelter, reduction in viability of adjacent habitat due to edge effects, deleterious hydrological changes, increased soil salinity, erosion, inhibition of nitrogen fixation, weed invasion, noise, light spill, fertiliser drift, or increased human activity within or directly adjacent to sensitive habitat areas. As with direct impacts, consideration must be given, when applying each factor, to all of the likely indirect impacts of the proposed activity or development. When applying each factor, both long-term and short-term impacts are to be considered.

Life cycle: the series or stages of reproduction, growth, development, ageing and death of an organism.

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:

- 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.
- 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.
- 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.

  In cases where multiple populations occur in the study area, each population should be assessed separately.

Residual impact: an impact on biodiversity values after all reasonable measures have been taken to avoid and minimise the impacts of development.

Risk of extinction: the likelihood that the local population will become extinct either in the short term *or* in the long term as a result of direct or indirect impacts on the viability of that population.

Species Impact Statement: as defined in Division 5 of the BC Act.

Viable: the capacity to successfully complete each stage of the life cycle under normal conditions.

Specific definitions associated with the proposed activity

Note: These definitions are based on definitions in the BAM but with some clarifications which are subject to further discussion within OEH.

Activity (development) footprint: the area of land that is directly impacted by the proposed activity, this includes all aspects of the activity, clearing of vegetation and any ancillary works, facilities, accesses or hazard reduction zones that support the construction or operation of the activity.

Subject site: means the area affected by the proposed activity including direct, indirect and uncertain impacts.

Study Area: means the subject site and any additional areas (which may include a 5 km or 10 km radius associated with threatened entity searches). The study area should extend as far as is necessary to take all potential impacts into account in consultation with OEH. For this assessment it is the corridor assessed; 30m wide for the walking track and trails and polygons for activity 2, provided by the client, which provide a suitable buffer for assessment.

Subject land: is land to which the BAM is applied in Stage 1 to assess the biodiversity values of the land. It includes land that may be a development site, clearing site, proposed for biodiversity certification or land that is proposed for a biodiversity stewardship agreement. This includes the activity footprint plus a general 1500m buffer (or 500 m for linear projects) measured from outer extent.

Biodiversity Assessment Report

Executive Summary

The National Parks and Wildlife Service (NPWS) propose to undertake a series of works within the Ben Boyd National Park along the New South Wales Far South Coast.

The Ben Boyd National Park is among a system of parks that line the coast of NSW from Moruya to the Victorian border to protect sites of cultural and natural importance. There are a number of nationally significant features within the national park including several endangered and vulnerable flora and fauna species.

The proposed works in relation to this track comprise three separate activities:

- Activity 1 – Walking track
- Activity 2 – Accommodation and facilities
- Activity 3 – Vehicle and site access.

Under the *Biodiversity Conservation Act 2016* (BC Act), should the works be likely to generate a significant impact for a listed entity, a Species Impact Statement or Biodiversity Development Assessment Report must be prepared to fully assess and provide mitigation strategies to management impacts.

For this assessment, which utilises features of the Biodiversity Assessment Methodology (BAM), pursuant to the BC Act, significance was assessed iteratively as follows:

- A Threatened entity evaluation table was used to identify species that could be impacted by the works, should they occur in the study area (see Appendix A).
- Where a threatened species is considered likely to occur and the proposal posed potential adverse impacts, a Tests of Significance was applied. This set of tests characterises the significance of potential impacts (see Appendix B).
- If it was considered that a significant impact could result, the species was recommended for targeted survey to confirm presence or absence (or else presence was assumed).
- All Tests of Significance concluded that no significant impacts on any entity is likely.
- Avoidance and minimisation measures were developed to reduce impacts characterised in this report.

Biodiversity constraints mapping prepared following the initial field surveys was used to refine the proposal. Heritage matters and visitors safety improvements were being investigated concurrently and also led to refinements. The refined alignments and precinct layouts were verified to avoid the key values identified in this assessment to a large extent.

The supporting surveys involved five survey programs, led by senior ecologists to:

- Determine the Plant Community Types (PCTs) and habitat features with the study area, December 2018, January 2019, and in November 2020 following the 2019/20 bushfires (Senior BAM accredited ecologist and assistant)
- Targeted fauna surveys March 2019 (Senior ecologist and ecologist)
- Targeted fauna surveys April 2019 (Senior ecologist and ecologist)
- Evaluate impacts of study area refinements, August 2019-2021 (Senior BAM accredited ecologist and assistant).

In summary, Tests of Significant characterised the impacts to 31 threatened species. No Threatened Ecological Communities (TECs) occur within the study area. All tests concluded that no threatened species are subject to significant impacts. This result is due to the ability of the project to implement effective avoid and minimise strategies throughout the construction program in addition to additional recommendations set out in this report.

Important note: Bushfire context

The 2019/20 bushfire season has decimated many areas of native vegetation across the east coast of Australia and caused significant impacts to wildlife, including threatened species. An extent of 5.3 million ha of land representing 6.7% of NSW has been impacted by bushfires affecting over 60 threatened fauna species (DPIE, 2020). Scientists and government agencies have been working to understand how the fires have affected the environment and to determine where management intervention is needed.

On December 31, 2019, a fire from the East Gippsland complex of fires crossed over the Victorian border into Nadgee Nature Reserve becoming known as the Border Fire. It entered the Ben Boyd National Park on a southerly wind change on 4 January and merged with the Poole Road fire on 5 January, creating a fire of over 150,000 hectares that burnt through large tracts of Ben Boyd National Park, ranging from low to extreme severity. This area includes 56 ha of the study area which was burnt, with 32 ha of the study area left unburnt.

As above, the targeted survey program was completed before the fire. Additional surveys undertaken post fire in November 2020 found there to be a mosaic of significant groundcover recovery across the survey area, with early successional flora species appearing, which will be followed by mid-successional species. By the time construction begins (expected to be early 2022), there will be further groundcover, midstorey and overstorey vegetation recovery throughout the landscape. Native fauna are likely to begin utilising those burnt areas within the first 18 months, being less reliant on unburnt patches after this time. Studies have shown that vegetation recovery is between 5 to 7 years in dry sclerophyll forests, woodlands, and heathlands in the Sydney Basin (van Loon 1977, Conroy 1993, Penman and York 2010). Caccamo *et al.* (2015) have also demonstrated a rapid 5 to 7 year recovery of dry sclerophyll forests in the Sydney Basin (Heath *et al.* 2016), which are considered applicable to the study area's dry sclerophyll forests, woodlands, and heathlands.

This assessment has been updated post fire to ensure the current site conditions and implications of the fire for species recovery are accounted for in the assessment's conclusions regarding significance and mitigation recommendations.

1. The activity

The proposal is located in the Ben Boyd National Park along the New South Wales Far South Coast. The national park spans 10,485 ha and is comprised of three main sectors; the largest sector located south of Eden, a central sector north of Eden and a smaller sector north of the Pambula River.

There are a number of nationally significant features within Ben Boyd National Park which include:

- Several sites containing Devonian era fossil relics, believed to originate from the intermediate period as marine animals evolved into terrestrial animals. These are of high scientific value regarding both fish species development and landscape development.
- The geologically spectacular Pinnacles erosional landform.
- The Pambula Estuarine Wetland, an ecologically important site, is currently listed on the Directory of Important Wetlands as determined by the Commonwealth Department of Environment and Heritage.
- Several endangered and vulnerable flora and fauna species residing in the Park.

The Ben Boyd National Park is among a system of parks that line the coast of NSW from Moruya to the Victorian border to protect sites of cultural and natural importance. The national park is also bordered on the west by East Boyd, Broadwater and Nullica State Forests.

The existing Light to Light Walking Track is located within the southern sector of the national park, south of Eden. The track is approximately 31 km long and meanders along the coast from Boyds Tower southward to Green Cape Light Station.

The proposed works in relation to this track comprise three separate activities:

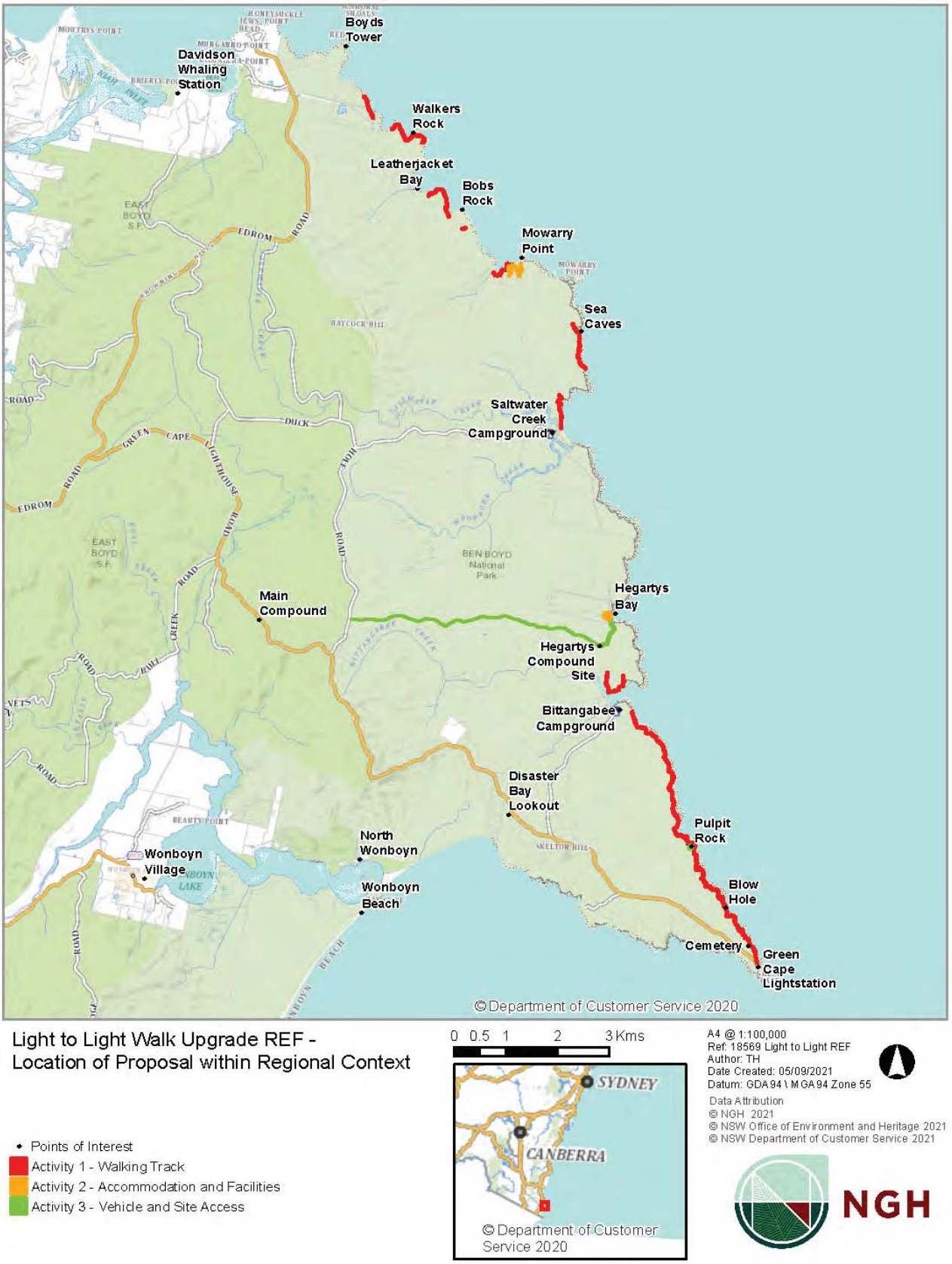
- Activity 1 - Walking track
    - Realignment of the existing Light to Light Walk from Boyds Tower to Green Cape Lightstation
    - Reinstate bushfire impacted sections of track that are not identified for realignment
    - Maintenance of existing sections of track that were not bushfire impacted or are not identified for realignment
    - Rehabilitation and revegetation of redundant sections of the track that would be closed
    - Installation of wayfinding, directional and interpretative signs
- Activity 2 - Accommodation and facilities
    - New hut accommodation and facilities at Mowarry Point
    - Formalisation of the existing campground at Mowarry Point.
    - New hut accommodation and facilities at Hegartys Bay.
- Activity 3 - Vehicle and site access
    - Maintenance of Hegartys Bay vehicle access trail including a establishing a small compound site capable of helicopter sling operations.
    - Upgrade of Hegartys Bay Access Track to a boardwalk from the aforementioned compound area to the Hegartys Bay hut accommodation area to enable ATV, eBike, or trolley access to the Hegartys Bay precinct.

- Upgrade of the Pulpit Rock car park including adjusting turning circle and parking. The existing amenity block will be retained.

The initial proposal included an extension of the walk from Green Cape to Disaster Bay to create a fourth day. This has been removed from the scope. Other changes have been made to avoid sensitive areas identified in the constraints mapping. Although not currently being proposed, a project to reconfigure the buildings at Green Cape Lightstation to provide a third nights accommodation for Light to Light walkers may commence in the future subject to funding and additional assessment.

An overview locality map is provided as Figure 1-1. The locations of the proposed activities are provided in Figure 1-2 to

Figure 1-9. Greater detail is provided in the map set provided in Appendix D.1.



Light to Light Walk Upgrade REF -
Location of Proposal within Regional Context

- Points of Interest
- Activity 1 - Walking Track
- Activity 2 - Accommodation and Facilities
- Activity 3 - Vehicle and Site Access

A4 @ 1:100,000
Ref: 18569 Light to Light REF
Author: TH
Date Created: 05/09/2021
Datum: GDA94 \ MGA94 Zone 55

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Figure 1-1 Locality overview

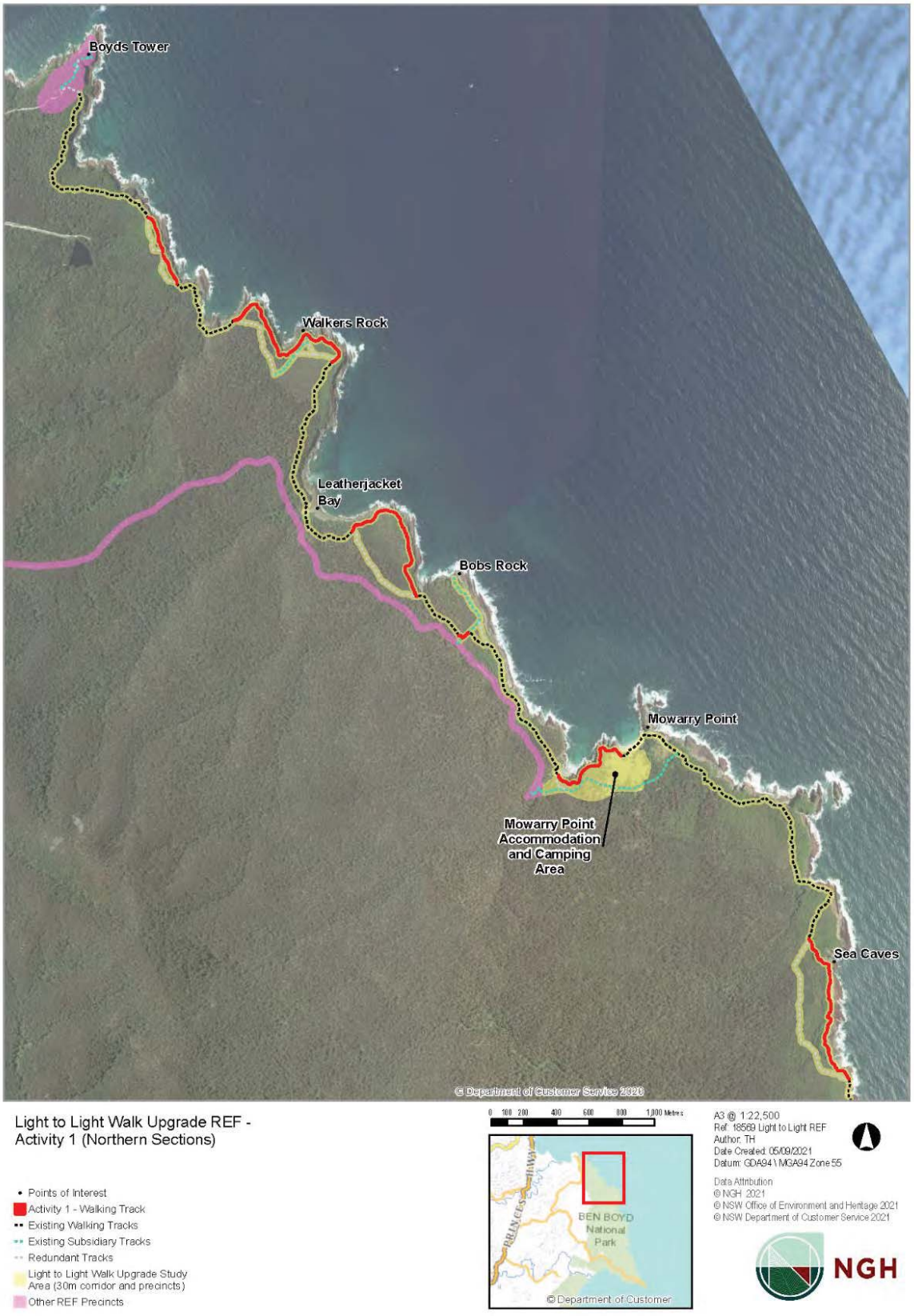

Figure 1-2 Activity 1 – Walking track works (Northern Sections).

Figure 1-3 Activity 1 – Walking track works (MIddle Sections).

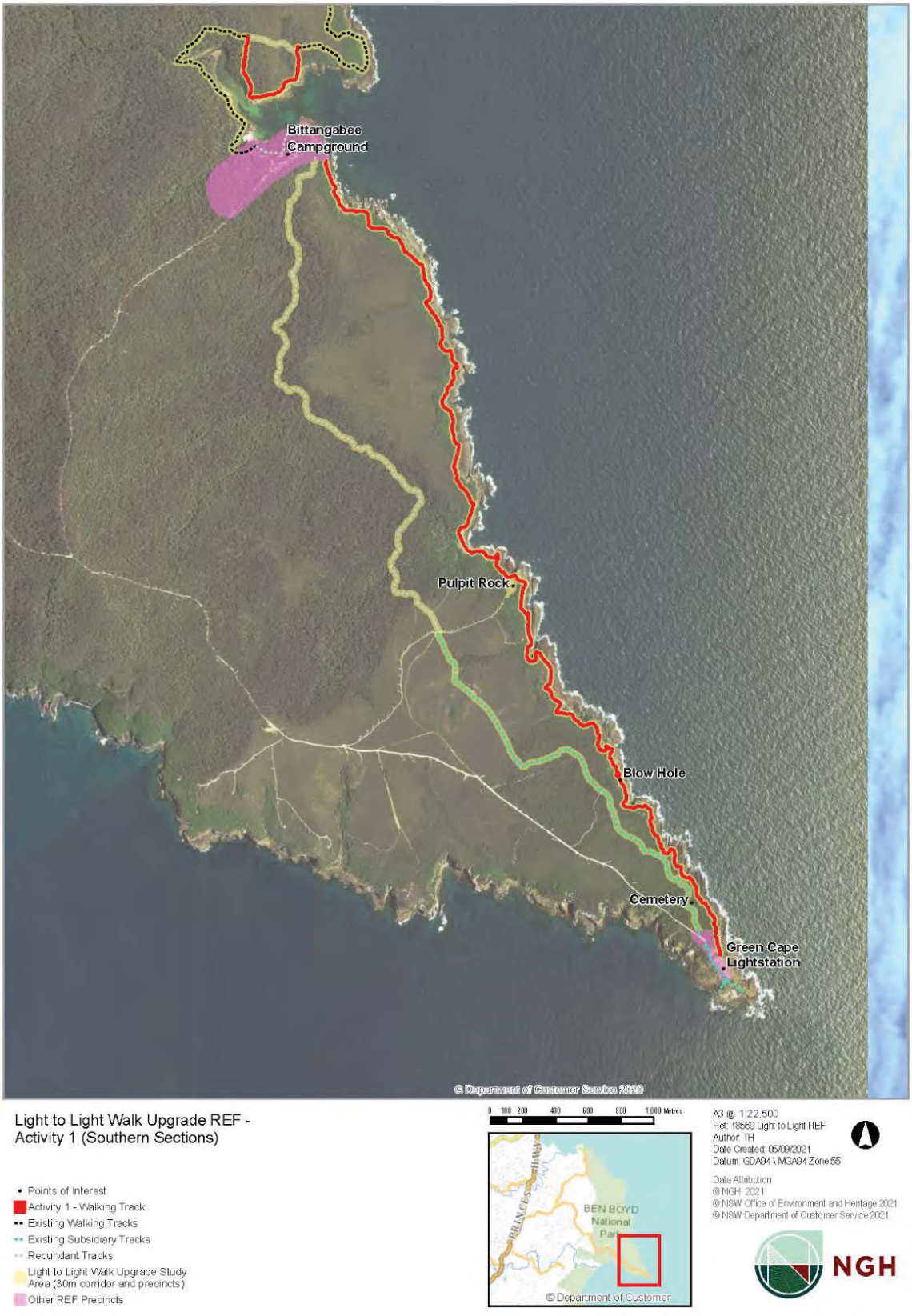

Figure 1-4 Activity 1 – Walking track works (Southern Sections).

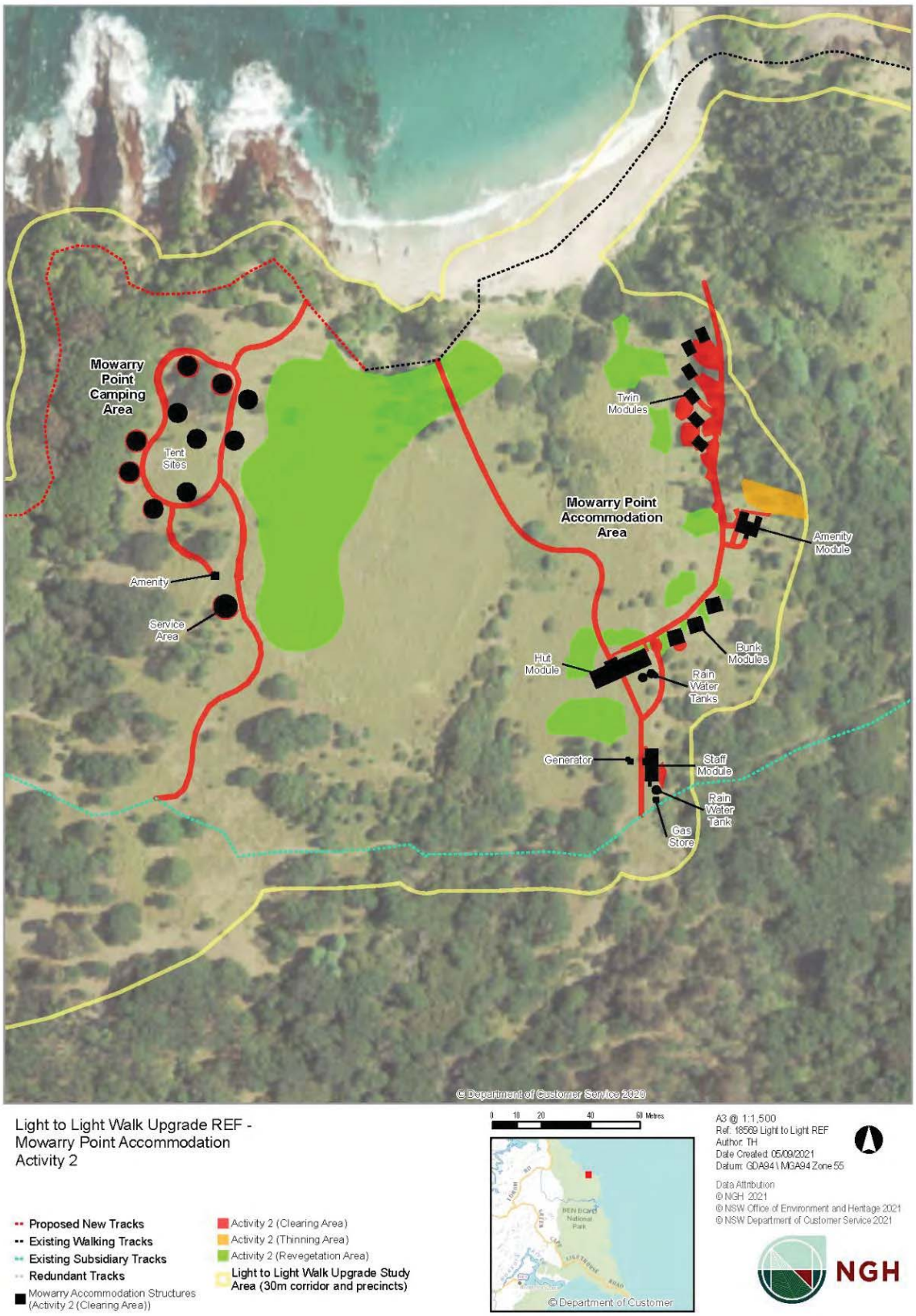

Figure 1-5 Activity 2 Mowarry point accommodation works.

Figure 1-6 Activity 2 Hegartys bay accommodation works.

Figure 1-7 Activity 3 Hegartys Trail vehicle access works.

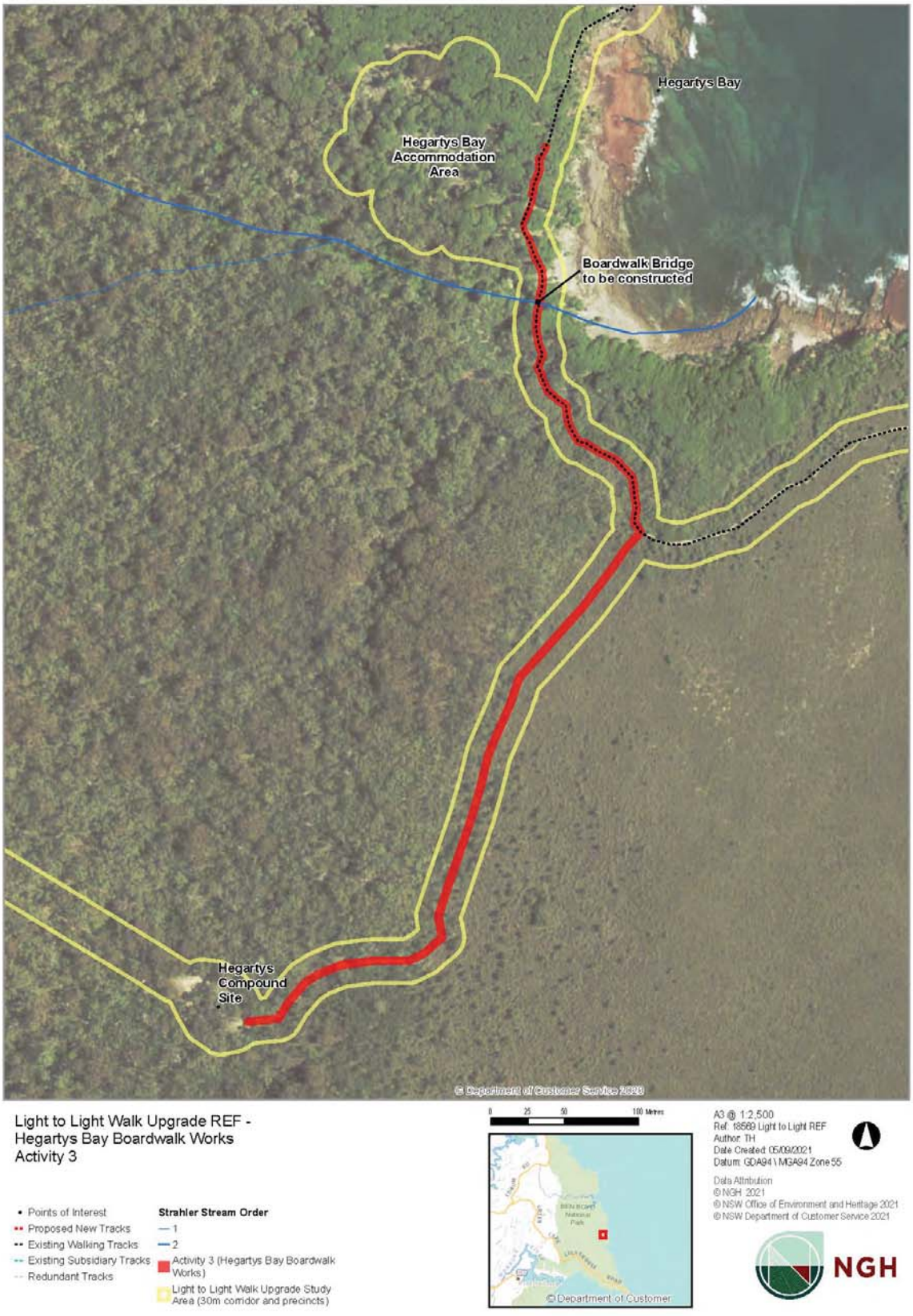

Figure 1-8 Activity 3 Hegartys bay boardwalk works.

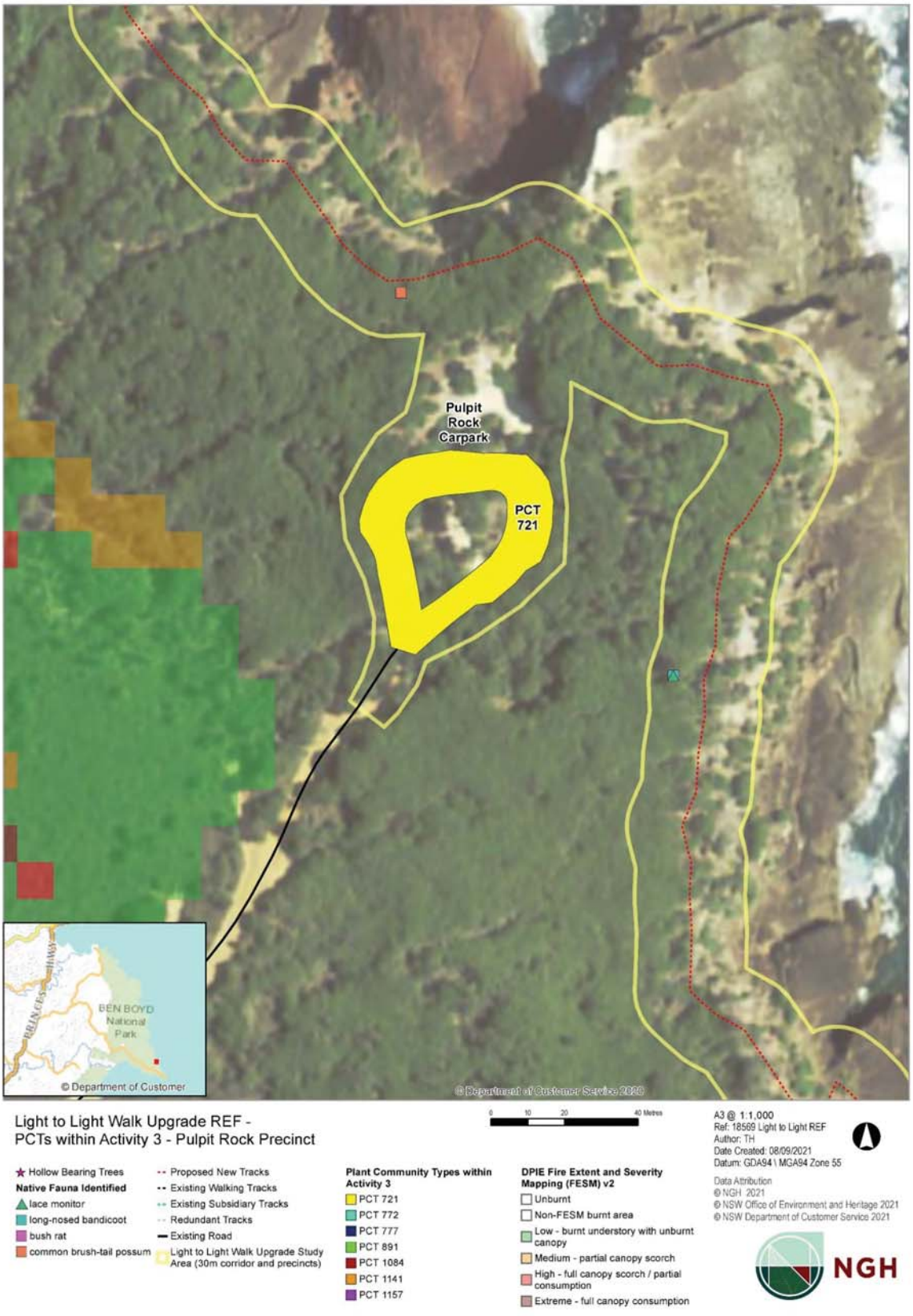

Figure 1-9 Activity 3 Pulpit rock car park precinct works.

2. Personnel

- Principal ecologist, preliminary review and technical input, Dave Maynard, BSc (Hons), accredited BAM assessor
- Project director, final review and technical input, Brooke Marshall, Ba Nat Res (Hons), accredited BAM assessor
- Senior ecologist, lead author of draft version and field assessment, Elisabeth Larsen, M Env Mgt, accredited BAM assessor
- Senior ecologist, Technical input, Gillian Young, Ba Nat Res (hons), accredited BAM assessor
- Senior zoologist, Fauna camera-trapping, Sam Patmore, BAppSc (Hons)
- Field ecologist, data analysis, Tony Hastings, BSc (Hons)
- Mapping and GIS analysis, Tom Hamilton, BSc GradDipUrbRegPlan
- Ecologist, report finalisation, Nick Weigner, BSc (Hons)
- Senior ecologist, senior review and report writing, Freya Gordon, BSc (Hons)

Section 2. Biodiversity values

3. Data analysis

This assessment has considered published data sources, as set out below. The most recent search date has been provided. Existing data was then validated by field inspections as described in Section 6.

3.1 Published biodiversity databases

- OEH BioNet Vegetation Classification (VIS) – sourced (19/12/2018) and used for field mapping purposes. Validated by field inspection.
- Threatened Biodiversity Profiles – sourced (06/11/2020) and used to establish potential habitat within the study area.
- OEH AOBVs public register – sourced (01/03/2020) to determine the works would / would not impact mapped areas.
- OEH Bionet Atlas of NSW – sourced (06/11/2020 updated 19/07/2021) and plotted on field maps to determine threatened entities likely to occur within the study area
- OEH Threatened Species Scientific Committee Determinations (Preliminary, Provisional and Final determinations) – sourced (2019) and used to establish potential habitat within the study area and whether vegetation would meet NSW EEC listing criteria.
- DPI Fisheries Threatened Species, and the Fisheries Critical Habitat and Species Register
- Australian Government Directory of Important Wetlands of Australia (DIWA) published by the Department of Environment & Energy.
- Australian Government Protected Matters Search Tool – sourced (06/11/2020)
- Australian Government Groundwater Dependent Ecosystems Atlas, produced by the Bureau of Meteorology.
- Australian Government Species Register of Critical Habitat
- Other data sources such as PlantNET, Online Zoological Collections of Australian Museum (http://www.ozcam.org/) etc.
- Published material, peer reviewed literature or information contained in the Saving our Species database, when assessing the habitat suitability of a site.

3.2 Local data

The OEH vegetation mapping layers were used. These provided a base field map that could be ground validated in the first survey program.

3.3 Additional requirements

A *Threatened Entities Evaluation Table* of all threatened species with known records within 10 km of the subject site is provided in Appendix A.

4. Landscape context

4.1 Site Context

The study area for the project is 87.92 ha and the proposal comprises the upgraded Light to Light Walk with a 15m buffer either side, accommodation precincts and access upgrades. Prior to the 2019/2020 bushfire, the lack of disturbance to the native vegetation was notable within the study area. Surveys following the 2019/2020 bushfire found 56 ha of vegetation was burnt within the study area (see section 4.4 for a detailed discussion of the bushfire extent).

4.1.1 Percent cover of native vegetation

Using GIS, the following calculations have been made in accordance with Section 4.3.2 of the BAM:

- Extent of native vegetation within 1500 m buffer of works footprint is 6,330 ha

4.1.2 Existing aquatic environment

Four major watercourses are located within the vicinity of the subject site:

- Mowarry Creek.
- Saltwater Creek.
- Woodburn Creek.
- Bittangabee Creek.

At both Saltwater and Woodburn Creeks, small estuarine lagoons are present, and several wetlands exist along Woodburn and Bittangabee Creeks in areas of poor drainage. The ecosystems of these sites are highly valued.

During site surveys conducted in December 2018 and January 2019, 39 smaller unnamed watercourses were identified. Three of these watercourses contained running water and 11 contained small pools of water. Waterways with running water are considered to provide higher value habitat (riparian and aquatic) and are more sensitive to impacts (including nutrient input / pollution that may disperse into larger areas of habitat).

A summary of Strahler stream orders within 300 m of the works footprint is provided below.

Table 4-1 Strahler stream orders within 300 m of the works footprint.

Strahler Order	Number of Stream Sections	Total length (km)
1	70	22.14
2	31	7.69
3	6	1.56
4	7	2.46

4.2 Matters of National Significance

The following matters were identified in a Protected Matters search on 06/11/2020, including a buffer of 10 km around the site:

Table 4-2 MNES relevant to the site.

Matters of national significance	Results	Comment
World Heritage Properties	None	Not Applicable
National Heritage Places	None	Not Applicable
Wetlands of International Importance	None	Not Applicable
Great Barrier Reef Marine Park	None	Not Applicable
Commonwealth Marine Areas	1	Not applicable. Proposed works area not within marine environment.
Threatened Ecological Communities	3	No Threatened Ecological Communities were identified within the study area during the field surveys. Impacts are not considered likely to be significant for any EPBC listed TECs.
Threatened Species	69	Threatened species have been assessed for potential impacts in Appendix A. Seven EPBC listed species were subject to an Assessment of Significance (See Appendix C). Impacts are not considered likely to be significant for any EPBC listed species.
Migratory Species	50	Potential impacts to migratory species have been assessed in Appendix A. Significant impacts are unlikely for any EPBC listed migratory species.

4.3 State Environmental Planning Policy mapped areas

The proposed works would not occur within land mapped as littoral rainforest or coastal wetlands or their proximity zones under the *State Environment and Planning Policy (Coastal Management) 2018*.

No other SEPPs are considered relevant to the activities.

4.4 Additional matters

The 2019/20 bushfire season has decimated many areas of native vegetation across the east coast of Australia and caused significant impacts to wildlife, including threatened species. An extent of 5.3 million ha of land representing 6.7% of NSW has been impacted by bushfires affecting over 60 threatened fauna species (DPIE, 2020). Scientists and government agencies have been working to understand how the fires have affected the environment and to determine where management intervention is needed.

The Border Fire entered the Ben Boyd National Park on a southerly wind change on 4 January and merged with the Poole Road fire on 5 January, creating a fire of over 150,000 hectares that burnt through large tracts of Ben Boyd National Park, ranging from low to extreme severity (Table 4-3). This area includes 56 ha of the study area which was burnt, with 32 ha of the study area left unburnt (Appendix D.1). Fire Extent and Severity Mapping (FESM) has been used to quantify these areas.

The implications of the bushfire have been considered in this report. While the *Guideline for applying the Biodiversity Assessment Method at severely burnt sites* (State of NSW & DPIE 2020) do not apply for this assessment, the principles of this document have been incorporated including using pre-burnt assessment of vegetation integrity and habitat suitability and consultation with the consent authority who have reviewed earlier versions of this report.

Many areas burnt in the 2019-2020 fires had also been burnt in 2018, 2014 and 1999. This repeated fire exposure may have resulted in area burning successively without recovering between events. This repeated and frequent exposure is likely to lead to population declines and reduced ability for vegetation to recovery. High Fire Frequency is listed as a Key Threatening Process under the NSW *Biodiversity Conservation Act 2016* (DPIE 2020b).

Refugia, such as rocky outcrops or mosaics of unburnt habitat (Turner *et al*. 1998) play an important role in survival and how post-fire recovery proceeds (Robinson *et al.* 2013; Southwell *et al.* 2020). Banks *et al.* (2011) demonstrated that recolonisation from unburnt habitat is a major driver of recovery for some small mammals (Southwell *et al.* 2020). Animals and plants that survive fire often perish afterwards because of the indirect effects of fire on predation, competition, shelter and resource availability (Christensen *et al*. 1981; Southwell *et al.* 2020). Plants may be affected by increased tree mortality, reduced understorey plant cover, and increased mortality in the soil seed bank following fires. For animals, high intensity fire can increase predation by invasive and native species, and fox and cat densities have been shown to increase in the weeks to months following fires as individuals move in from surrounding unburnt areas (Russell *et al.* 2003; Southwell *et al.* 2020).

This assessment has been updated post fire to ensure the current site conditions and implications of the fire for species recovery are accounted for in the assessment's conclusions regarding significance and mitigation recommendations.

Table 4-3: Fire Extent and Severity Mapping data

Activity	Name	PCT	FESM Category	Hectares
Activity 1 - Walking Track	Walking Track Alignment (3m corridor)	721	Extreme - full canopy consumption	0.5502
Activity 1 - Walking Track	Walking Track Alignment (3m corridor)	721	High - full canopy scorch / partial consumption	0.2652
Activity 1 - Walking Track	Walking Track Alignment (3m corridor)	721	Low - burnt understory with unburnt canopy	0.3678
Activity 1 - Walking Track	Walking Track Alignment (3m corridor)	721	Medium - partial canopy scorch	0.0773
Activity 1 - Walking Track	Walking Track Alignment (3m corridor)	721	Non-FESM burnt area	0.0573
Activity 1 - Walking Track	Walking Track Alignment (3m corridor)	721	Unburnt	1.3190
Activity 1 - Walking Track	Walking Track Alignment (3m corridor)	772	Extreme - full canopy consumption	0.0013
Activity 1 - Walking Track	Walking Track Alignment (3m corridor)	772	High - full canopy scorch / partial consumption	0.0006

Activity	Name	PCT	FESM Category	Hectares
Activity 1 - Walking Track	Walking Track Alignment (3m corridor)	772	Low - burnt understory with unburnt canopy	0.0127
Activity 1 - Walking Track	Walking Track Alignment (3m corridor)	772	Medium - partial canopy scorch	0.0172
Activity 1 - Walking Track	Walking Track Alignment (3m corridor)	772	Non-FESM burnt area	0.0079
Activity 1 - Walking Track	Walking Track Alignment (3m corridor)	772	Unburnt	0.6938
Activity 1 - Walking Track	Walking Track Alignment (3m corridor)	891	Unburnt	0.0122
Activity 1 - Walking Track	Walking Track Alignment (3m corridor)	1141	Extreme - full canopy consumption	0.0571
Activity 1 - Walking Track	Walking Track Alignment (3m corridor)	1141	High - full canopy scorch / partial consumption	0.0174
Activity 1 - Walking Track	Walking Track Alignment (3m corridor)	1141	Low - burnt understory with unburnt canopy	0.0159
Activity 1 - Walking Track	Walking Track Alignment (3m corridor)	1141	Medium - partial canopy scorch	0.0201
Activity 1 - Walking Track	Walking Track Alignment (3m corridor)	1141	Unburnt	0.0276
Activity 1 - Walking Track	Walking Track Alignment (5m corridor)	777	Low - burnt understory with unburnt canopy	0.0093
Activity 1 - Walking Track	Walking Track Alignment (5m corridor)	777	Medium - partial canopy scorch	0.0152
Activity 1 - Walking Track	Walking Track Alignment (5m corridor)	777	Non-FESM burnt area	0.0169
Activity 1 - Walking Track	Walking Track Alignment (5m corridor)	777	Unburnt	0.0993
Activity 1 - Walking Track	Walking Track Alignment (5m corridor)	891	Unburnt	0.0135
Activity 1 - Walking Track	Walking Track Alignment (5m corridor)	1084	High - full canopy scorch / partial consumption	0.0277
Activity 1 - Walking Track	Walking Track Alignment (5m corridor)	1084	Low - burnt understory with unburnt canopy	0.1106
Activity 1 - Walking Track	Walking Track Alignment (5m corridor)	1084	Medium - partial canopy scorch	0.0173
Activity 1 - Walking Track	Walking Track Alignment (5m corridor)	1084	Non-FESM burnt area	0.1099

Activity	Name	PCT	FESM Category	Hectares
Activity 1 - Walking Track	Walking Track Alignment (5m corridor)	1084	Unburnt	0.0515
Activity 1 - Walking Track	Walking Track Alignment (5m corridor)	1157	Medium - partial canopy scorch	0.0714
Activity 1 - Walking Track	Walking Track Alignment (5m corridor)	1157	Non-FESM burnt area	0.0879
Activity 1 - Walking Track	Walking Track Alignment (5m corridor)	1157	Unburnt	0.0547
Activity 2 - Accommodation and Facilities	Hegartys Accommodation Clearing	721	Extreme - full canopy consumption	0.0687
Activity 2 - Accommodation and Facilities	Hegartys Accommodation Clearing	721	Low - burnt understory with unburnt canopy	0.2723
Activity 2 - Accommodation and Facilities	Hegartys Accommodation Clearing	721	Non-FESM burnt area	0.2057
Activity 2 - Accommodation and Facilities	Hegartys Accommodation Clearing	721	Unburnt	0.0000
Activity 2 - Accommodation and Facilities	Hegartys Accommodation Thinning	721	Extreme - full canopy consumption	0.0301
Activity 2 - Accommodation and Facilities	Hegartys Accommodation Thinning	721	Low - burnt understory with unburnt canopy	0.2130
Activity 2 - Accommodation and Facilities	Hegartys Accommodation Thinning	721	Non-FESM burnt area	0.0549
Activity 2 - Accommodation and Facilities	Mowarry Accommodation Clearing	891	Unburnt	0.1990
Activity 2 - Accommodation and Facilities	Mowarry Accommodation Thinning	891	Unburnt	0.0249
Activity 2 - Accommodation and Facilities	Mowarry Camping Area Clearing	891	Unburnt	0.1510
Activity 3 - Vehicle and Site Access	Hegartys Carpark Compound Clearing	1157	Non-FESM burnt area	0.0658

Activity	Name	PCT	FESM Category	Hectares
Activity 3 - Vehicle and Site Access	Hegartys Trail ATV Access (5m corridor)	721	Low - burnt understory with unburnt canopy	0.0266
Activity 3 - Vehicle and Site Access	Hegartys Trail ATV Access (5m corridor)	721	Non-FESM burnt area	0.0703
Activity 3 - Vehicle and Site Access	Hegartys Trail ATV Access (5m corridor)	721	Unburnt	0.0013
Activity 3 - Vehicle and Site Access	Hegartys Trail ATV Access (5m corridor)	777	Non-FESM burnt area	0.0202
Activity 3 - Vehicle and Site Access	Hegartys Trail ATV Access (5m corridor)	1141	Non-FESM burnt area	0.1844
Activity 3 - Vehicle and Site Access	Hegartys Trail ATV Access (5m corridor)	1157	Non-FESM burnt area	0.0777
Activity 3 - Vehicle and Site Access	Pulpit Rock Carpark Clearing	721	Non-FESM burnt area	0.0262
Activity 3 - Vehicle and Site Access	Pulpit Rock Carpark Clearing	721	Unburnt	0.1184

5. Vegetation communities

5.1 Plant community types (PCTs) and ecological communities

OEH BioNet Vegetation Classification (VIS) data were used for field mapping purposes.

The native vegetation within the study area was then assigned to Plant Community Types (PCTs) in accordance with the Vegetation Information System Classification (version 2.0) Database (OEH 2019) during the rapid site survey. PCTs were assigned based on the presence of diagnostic species within three strata (top, middle and ground stratum) and other information collected during the field surveys (landscape position, site conditions, vegetation structure).

Seven PCTs were verified to occur within the study area. The PCTs and extent of fire impact in the study area in the 2019/2020 fire (based on FESM data) is summarised below:

PCT	Fire Impacts
Bracelet Honey-myrtle – Coast Tea tree tall shrubland on headlands, South East Corner bioregion (PCT 721).	Severely burnt in some areas Unburnt: 14.51 ha Burnt: 14.13 ha Unmapped: 2.38 ha
Coast Banksia – Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion (PCT 772)	Majority not impacted by fires Unburnt: 6.88 ha Burnt: 0.32 ha Unmapped: 7.01 ha
Coast Grey Box – Mountain Grey Gum - stringybark moist shrubby open forest in coastal gullies, southern South East Corner Bioregion (PCT 777)	Majority not impacted by fires Unburnt: 0.75 ha Burnt: 0.16 ha Unmapped: 2.93 ha
Ironbark – Woollybutt – White Stringybark open forest on coastal hills, South East Corner Bioregion (PCT 891)	Majority not impacted by fires Unburnt: 7.70 ha Burnt: 0.00 ha Unmapped: 0.69 ha
Silvertop Ash – Rough-barked Apple shrubby open forest on the hinterland hills, far southern South East Corner Bioregion (PCT 1157)	Severely burnt Unburnt: 0.51 ha Burnt: 3.10 ha Unmapped: 8.38 ha
Red Bloodwood – Silvertop Ash – White Stringybark heathy open forest on coastal foothills, southern South East Corner Bioregion (PCT 1048)	Severely burnt Unburnt: 1.63 ha Burnt: 6.73 ha Unmapped: 14.63 ha
Scrub She-oak – Swamp Banksia coastal lowland heath, southern South East Corner Bioregion (PCT 1141)	Severely burnt Unburnt: 0.27 ha Burnt: 0.99 ha Unmapped: 0.96 ha

The survey effort is presented in

Figure 5-1. Detailed PCT maps sets are provided in Appendix D.1.

Figure 5-1 Survey effort overview

Prior to the 2019/2020 bushfire, all the mapped PCTs were found to be in very good condition (undisturbed, weed free), including excellent examples of intact, species rich South Coast Heath with varied fire histories (PCT 1141 'Scrub She-oak – Swamp Banksia coastal lowland heath, southern South East Corner'); this PCT has a restricted distribution in NSW along a narrow coastal strip from Bournda south to the Victorian border.

Prior to the 2019/2020 bushfire, the lack of disturbance to the native vegetation was notable within the study area, with some exceptions:

- Evidence of human disturbance (removal of undergrowth and some canopy trees) around the campsites at Hegarty Bay, Mowarry Point, Saltwater and at Green Cape; and at the City Rock and Pulpit Rock car parks.
- Evidence of historical logging along the Hegarty Bay Access trail.
- Severe post-fire weed infestation in the northernmost survey area (south of Boyd Tower).

Surveys following the 2019/2020 bushfire found 56 ha of vegetation was burnt within the study area. While the habitat described in the tables below is prior to the bushfire, they also include an assessment of how much of each PCT was affected by the 2019/2020 bushfire and the severity.

Information pertaining to the PCTs is presented in the sections below.

PCT 721

Bracelet Honey-Myrtle – Coast Tea Tree Tall Shrubland on Headlands, South East Corner Bioregion	
Vegetation Formation	**Heathlands**
Vegetation class	**Coastal Headland Heaths**
Vegetation type	**Plant Community Type (PCT) ID:** 721
	Common Community Name: Bracelet Honey-myrtle - Coast Tea tree tall shrubland on headlands, South East corner bioregion
Approximate extent within the Study area[1]	30.08 ha
Justification for assignment (pre 2019/2020 fire)	Identifying species for this PCT are present in all strata. Common species in each stratum include: *Upper stratum* Bracelet Honey Myrtle (*Melaleuca armillaris* subsp. *Armillaris*) (dominant) Coast Banksia (*Banksia integrifolia*) Black Sheoak (*Allocasuarina littoralis*) *Middle stratum/shrubs* Coast Tea tree (*Leptospermum laevigatum*) Bushy Needlewood (*Hakea decurrens*) Tree Broom Heath (*Monotoca elliptica*) Coastal Westringia (*Westringia fruticosa*) Boobialla (*Myoporum boninense* subsp. *australe*)

[1] See Definitions.

Bracelet Honey-Myrtle – Coast Tea Tree Tall Shrubland on Headlands, South East Corner Bioregion	
	Sea Box (*Alyxia buxifolia*) *Ground stratum* Seaberry Saltbush (*Chenopodium candolleanum*) Shrubby Velvet Bush (*Lasiopetalum macrophyllum*) (in disturbed areas, e.g., after recent fire) Dwarf Zieria (*Zieria littoralis*) Sandhill Sword Sedge (*Lepidosperma concavum*) *Gahnia* spp. (moist sites) Other diagnostic features: • Distinguished by the dominant *M. armillaris*, generally around 2m tall in exposed locations, but often reaching the stature of small trees (6m to 10m) where protected from coastal winds and the absence of recent fires. • Varies from a monoculture of low closed *M. armillaris* scrub ('*Melaleuca* scrub'), characterised by dense foliage in the upper layers and a shaded understorey to an open canopy with a mix of other species, dependent on fire history, exposure and drainage (limited drainage: diverse range of moisture-tolerant sedges and rushes; better drainage: scattered emergent small trees and a mix of shrubs). • Commonly occurs as a dense narrow strip (10-50m wide) along the edge of the coastal cliff above the rocky shore.
Condition types (pre 2019/2020 fire)	The condition types of this PCT can be classified in three broad categories: • **Unburnt, closed *Melaleuca armillaris* scrub with low density ground cover** 2-10m tall senescent *M. armillaris* scrub/forest, shaded ground with very sparse to absent ground cover. Ground stratum species include scattered exposure- and salt-tolerant shrubs along the edge of the *M. armillaris* scrub near the cliff line. Common shrubs include *Westringia fruticosa, Myoporum boninense, Chenopodium candolleanum,* and *Zieria littoralis.*

Bracelet Honey-Myrtle – Coast Tea Tree Tall Shrubland on Headlands, South East Corner Bioregion

PCT 721 – Example of unburnt, closed, senescent *M. armillaris* scrub (2-10m tall), shaded ground with very sparse to absent ground cover. This condition type commonly occurs as a dense narrow strip (10-50m wide) along the edge of the coastal cliff above the rocky shore, as seen here north of Bittangabee Bay.

Bracelet Honey-Myrtle – Coast Tea Tree Tall Shrubland on Headlands, South East Corner Bioregion

PCT 721 – Example of unburnt, closed, senescent *M. armillaris* scrub, with a mix of smaller, salt- and exposure tolerant shrubs scattered in the open along the edge of the cliff line, north of Pulpit Rock.

- **Historically *burnt* (2016), closed *M. armillaris* scrub with low density ground cover** Dominated by *M. armillaris* regrowth scrub (<2m tall), shaded ground with very sparse or absent ground cover.

Bracelet Honey-Myrtle – Coast Tea Tree Tall Shrubland on Headlands, South East Corner Bioregion

PCT 721 – Example of closed *M. armillaris* scrub (<2m tall), burnt 1990-96, shaded ground with very sparse or absent ground cover, north of Saltwater Creek.

- **Unburnt, open *M. armillaris* scrub with shrubby understorey and moderate to dense ground cover** Associated trees (stunted) and common taller shrubs in this condition type include *Banksia integrifolia, Allocasuarina littoralis*, *Allocasuarina verticillata* (Drooping Sheoak), *Leptospermum laevigatum, Monotoca elliptica*, *Hakea decurrens, Kunzea ambigua* (White Kunzea), *Persoonia levis* (Broad-leaved Geebung). Heathy sections include *Allocasuarina verticillata* and *Banksia paludosa.* Common ground cover species (smaller shrubs, sedges and rushes): *Lasiopetalum macrophyllum, Gahnia melanocarpa, Goodenia ovata* (Common Goodenia), *Hibbertia aspera* (Trailing Guinea Flower), *Lepidosperma concavum*.

Bracelet Honey-Myrtle – Coast Tea Tree Tall Shrubland on Headlands, South East Corner Bioregion

PCT 721 – Example of unburnt, open, senescent *M. armillaris* scrub with moderate to dense ground cover, near Leatherjacket Bay.

Bracelet Honey-Myrtle – Coast Tea Tree Tall Shrubland on Headlands, South East Corner Bioregion	
	 PCT 721 – Example of unburnt, open (due to windfall), senescent *M. armillaris* scrub with moderate to dense ground cover, north of Leatherjacket Bay.
Survey Effort	11 days, senior ecologist covering subject land.
Conservation Status	Not associated with a Threatened Ecological Community (TEC)

Bracelet Honey-Myrtle – Coast Tea Tree Tall Shrubland on Headlands, South East Corner Bioregion	
Estimate of percent cleared	A search of the BioNet Vegetation Classification Database indicates that 50% of this PCT has been cleared post European settlement.
2019/2020 bushfire impacts (study area)	Severely burnt in some areas with full consumption of top stratum (*Melaleuca armillaris*). 6.2 ha extreme severity burn. Ten months post-fire there is dense regeneration of ground stratum (80-90% cover), with regrowth dominated by *M. armillaris.* Evidence of the presence of wombats, deer and macropods (footprints and scats). Low quality habitat for ground-cover dependent small mammals and birds. 4.23 ha medium to high severity burn. Ten months post-fire there is 80-100% ground cover, becoming suitable habitat for ground-cover dependent small mammals and birds.  PCT 721 in November 2020 – mapped as extreme bushfire severity
Threatened plant species habitat	This community has potential habitat for *Acacia georgensis* (BC-V, EPBC-V), *Caladenia tessellata* (BC-E, EPBC-V), *Pultenaea pedunculata* (BC-E), *Thesium australe* (BC-V, EPBC-V).
Threatened fauna species	This community has potential habitat for *Calamanthus fuliginosus* (BC-E), *Calyptorhynchus lathami* (BC-V), *Dasyornis brachypterus* (BC-E, EPBC-E), *Pachycephala olivacea* (BC-V), *Pezoporus wallicus wallicus* (BC-V), *Petroica phoenicea* (BC-V), *Hieraaetus morphnoides* (BC-V), *Artamus cyanopterus cyanopterus* (BC-V), *Haliaeetus leucogaster* (BC-V), *Cercartetus nanus* (BC-V), *Isoodon obesulus obesulus* (BC-E, EPBC-E), *Potorous tridactylus* (BC-V, EPBC-V), *Pseudomys gracilicaudatus* (BC-V), *Sminthopsis leucopus* (BC-V), *Miniopterus orianae oceanensis* (BC-V), *Pteropus poliocephalus* (BC-V, EPBC-V).

PCT 772

Coast Banksia – Coast Wattle Dune Scrub of the Sydney Basin Bioregion and South East Corner Bioregion	
Vegetation Formation	**Heathlands**
Vegetation class	**Sydney Coastal Heaths**
Vegetation type	**Plant Community type (PCT) ID:** 772
	Common community name: Coastal foredune wattle scrub
Approximate extent within the study area	7.43 ha
Justification for assignment	Identifying species for this PCT are present in all strata. Common species in each stratum include: *Upper stratum* Coast Banksia (*Banksia integrifolia*) (dominant) Bracelet Honey Myrtle (*Melaleuca armillaris*) Sweet Pittosporum (*Pittosporum undulatum*) Silvertop Ash (*Eucalyptus sieberi*) *Middle stratum* Black Sheoak (*Allocasuarina littoralis*) Coastal Wattle (*Acacia longifolia* subsp. *sophora*) Bushy Needlewood (*Hakea decurrens*) Tree Broom Heath (*Monotoca elliptica*) Coastal Tea tree (*Leptospermum laevigatum*) *Ground stratum* Shrubby Velvet Bush (*Lasiopetalum macrophyllum*) (common in disturbed areas, e.g. after recent fire) Coast Beard-heath (*Leucopogon parviflorus*) Spiny-head Mat-rush (*Lomandra longifolia*) Seaberry Saltbush (*Chenopodium candolleanum*) Dusky Coral Pea (*Kennedia rubicunda*) Knobby club-rush (*Isolepis nodosa*) Other diagnostic features: • Found near the cliff's edge along the exposed coastline, often occurring adjacent to PCT 721 on sites with improved shelter, deeper soils and better access to soil moisture. Stunted Eucalyptus trees (*E. sieberi, E. baxteri*) are found in the most sheltered sections further back from the cliff line. • Contains many of the same middle-and ground stratum species as PCT 721.
Condition types	The condition types of this PCT can be classified in two broad categories: • **Open scrub with low density ground cover (unburnt)** This condition type commonly occurs near the exposed cliff line, adjacent to PCT 721, mostly as a patchy shrub stratum, generally around 2m tall, but developing to the stature of small trees (6m to 10m) where there is some protection from coastal winds. The condition type has a species-poor, sclerophyllous shrub understorey containing similar middle-and ground cover species as PCT 721.

Coast Banksia – Coast Wattle Dune Scrub of the Sydney Basin Bioregion and South East Corner Bioregion

PCT 772 – Example of open scrub condition type; common in areas with high coastal exposure close to the cliffs edge. It typically occurs as an open, patchy, shrub stratum with low density ground cover, seen here north of Pulpit Rock.

- **Low open forest with shrubby understorey (unburnt).**
  This condition type occurs in sheltered locations along the exposed cliff line in locations with better soil and access to soil moisture, and less coastal exposure. Ground cover is highly variable; where the canopy cover is dense and produces copious leaf litter, ground cover is sparse. In gullies near waterways there is generally a dense ground cover of rushes and sedges, rhizomatous ferns, grasses and herbs.

Coast Banksia – Coast Wattle Dune Scrub of the Sydney Basin Bioregion and South East Corner Bioregion

PCT 772 – example of open forest condition type; sheltered, shallow gully near the cliffs edge north Green Cape. Ground cover in this location is a dense mat of Coral Fern (*Gleichenia microphylla*).

Coast Banksia – Coast Wattle Dune Scrub of the Sydney Basin Bioregion and South East Corner Bioregion	
	 PCT 772 – example of low open forest condition type; sheltered, wide gully behind a small, pebbly beach north of Pulpit Rock.
Survey Effort	11 days, senior ecologist covering subject land.
Conservation Status	Not associated with a Threatened Ecological Community (TEC)
Estimate of percent cleared	A search of the BioNet Vegetation Classification Database indicates that 65% of this PCT has been cleared post European settlement.
2019/2020 bushfire impacts (study area)	The majority of this PCT (7.11 ha) was not impacted by the fire. 0.01 ha has been mapped as high severity burn, 0.15 ha as medium severity, and 0.15 ha as low severity. Area of medium to high severity burn provides medium-quality habitat/refugia for ground-cover

Coast Banksia – Coast Wattle Dune Scrub of the Sydney Basin Bioregion and South East Corner Bioregion	
	dependent small mammals and birds
Threatened plant species habitat	*Cynanchum elegans* (BC-E, EPBC-E), *Chamaesyce psammogeton* (BC-E), *Senecio spathulatus* (BC-E), *Caladenia tessellata* (BC-E, EPBC-V), *Angophora inopina* (BC-V, EPBC-V)
Threatened fauna species	*Heleioporus australiacus* (BC-V, EPBC-V), *Litoria aurea* (BC-E, EPBC-V), *Litoria booroolongensis* (BC-E, EPBC-E), *Litoria brevipalmata* (BC-V), *Chalinolobus dwyeri* (BC-V, EPBC-V), *Falsistrellus tasmaniensis* (BC-V), *Micronomus norfolkensis* (BC-V), *Miniopterus australis* (BC-V), *Miniopterus orianae oceanensis* (BC-V), *Myotis macropus* (BC-V), *Nyctophilus corbeni* (BC-V, EPBC-V), *Phoniscus papuensis* (BC-V), *Pteropus poliocephalus* (BC-V, EPBC-V), *Saccolaimus flaviventris* (BC-V), *Scoteanax rueppellii* (BC-V), *Vespadelus troughtoni* (BC-V), *Anthochaera phrygia* (BC-CE, EPBC-CE), *Artamus cyanopterus cyanopterus* (BC-V), *Burhinus grallarius* (BC-E), *Calyptorhynchus lathami* (BC-V), *Chthonicola sagittata* (BC-V), *Circus assimilis* (BC-V), *Climacteris picumnus victoriae* (BC-V), *Daphoenositta chrysoptera* (BC-V), *Dasyornis brachypterus* (BC-E, EPBC-E), *Epthianura albifrons* (BC-V), *Glossopsitta pusilla* (BC-V), *Haematopus longirostris* (BC-E), *Haliaeetus leucogaster* (BC-V), *Hieraaetus morphnoides* (BC-V), *Lathamus discolor* (BC-E, EPBC-CE), *Lophoictinia isura* (BC-V), *Melanodryas cucullata cucullata* (BC-V), *Melithreptus gularis gularis* (BC-V), *Ninox connivens* (BC-V), *Ninox strenua* (BC-V), *Pandion cristatus* (BC-V), *Pomatostomus temporalis temporalis* (BC-V), *Stagonopleura guttata* (BC-V), *Tyto novaehollandiae* (BC-V), *Tyto tenebricosa* (BC-V), *Cercartetus nanus* (BC-V), *Dasyurus maculatus* (BC-V, EPBC-E), *Isoodon obesulus obesulus* (BC-E, EPBC-E), *Petaurus australis* (BC-V), *Petaurus norfolcensis* (BC-V), *Petrogale penicillata* (BC-E, EPBC-V), /*Phascogale tapoatafa* (BC-V), *Planigale maculata* (BC-V), *Potorous tridactylus* (BC-V, EPBC-V), *Sminthopsis leucopus* (BC-V), *Hoplocephalus bitorquatus* (BC-V), *Pseudomys gracilicaudatus* (BC-V), *Pseudomys novaehollandiae* (EPBC-E)

PCT 777

Coast Grey Box – Mountain Grey Gum - stringybark Moist Shrubby Open Forest In Coastal Gullies, Southern South East Corner Bioregion	
Vegetation Formation	**Wet Sclerophyll Forests (Grassy sub-formation)**
Vegetation class	**Southern Lowland Wet Sclerophyll forests**
Vegetation type	**Plant Community type (PCT) ID:** 777
	Common community name: Coast Grey Box - Mountain Grey Gum - stringybark moist shrubby open forest in coastal gullies, southern South East Corner Bioregion
Approximate extent within the study area	3.83 ha
Justification for assignment	Identifying species are present in all strata. Common species within each stratum include: *Top stratum* Mountain Grey Gum (*Eucalyptus cypellocarpa*) Woollybutt (*Eucalyptus longifolia*) Coast Grey Box (*Eucalyptus bosistoana*) *Middle stratum* Black Sheoak (*Allocasuarina littoralis*) Port Jackson Cypress (*Callitris rhomboidea*) Blueberry Ash (*Elaeocarpus reticulatus*) Mock Olive (*Notelaea venosa*) Sweet Pittosporum (*Pittosporum undulatum*) *Ground stratum*

Coast Grey Box – Mountain Grey Gum - stringybark Moist Shrubby Open Forest In Coastal Gullies, Southern South East Corner Bioregion	
	Dianella (*Dianella caerulea*) Prickly Raps Fern (*Doodia aspera*) Gahnia (*Gahnia melanocarpa*) Hop Goodenia (*Goodenia ovata*) Variable swordsedge (*Lepidosperma laterale*) Spiny-head Mat-rush (*Lomandra longifolia*) Bracken Fern (*Pteridium esculentum*) Prickly Rasp Fern (*Doodia aspera*) Other diagnostic features: • Occurs away from the immediate coastal fringe, in sheltered, moist gullies. • Dominated by a tall open canopy of eucalypts, with an open substratum that includes areas with rainforest elements, a mesophyllous shrub layer, and a rich groundcover with ferns in wet gullies.
Condition	The condition types of this PCT can be classified in two broad categories: **1. Tall open forest dominated by *E. cypellocarpa* in sheltered, moist gullies near creeks. Dense ground cover consisting of moisture tolerant species.**

Coast Grey Box – Mountain Grey Gum - stringybark Moist Shrubby Open Forest In Coastal Gullies, Southern South East Corner Bioregion

PCT 777 – example of condition type 1: sheltered, south-facing, moist gully with moisture-tolerating ground cover species, north of Bittangabee Bay)

Coast Grey Box – Mountain Grey Gum - stringybark Moist Shrubby Open Forest In Coastal Gullies, Southern South East Corner Bioregion

PCT 777 – example of condition type 1: Tall, open forest, with dense ground cover. Dominating canopy species *E cypellocarpa,* north of Bittangabee Bay.

2. **Tall open forest dominated by *E. bosistoana*, with *E. cypellocarpa* and *E longifolia* as associated species**, **shrubby understorey and sparse ground cover.**

Coast Grey Box – Mountain Grey Gum - stringybark Moist Shrubby Open Forest In Coastal Gullies, Southern South East Corner Bioregion	
	 PCT 777 – example of condition type 2: Tall open forest, *E bosistoana* and *E longifolia* dominant top canopy species. Drier, sparser sub strata compared with Condition Type 1.
Survey Effort	11 days, senior ecologist covering subject land.
Conservation Status	Not associated with a Threatened Ecological Community (TEC)
Estimate of percent cleared	A search of the BioNet Vegetation Classification Database indicates that 15% of this PCT has been cleared post European settlement.
2019/2020 bushfire impacts (study area)	2.99 ha of this PCT is mapped as unburnt, while the remainder was impacted by low (0.05 ha) to medium severity burn (0.11 ha).
Threatened plant species habitat	*Persicaria elatior* (BC-V, EPBC-V), *Correa baeuerlenii* (BC-V, EPPBC-V), *Rhodamnia rubescens* (BC-CE)
Threatened fauna species	*Heleioporus_australiacus* (BC-V, EPBC-V), *Mixophyes balbus* (BC-E, EPBC-V), *Falsistrellus tasmaniensis* (BC-V), *Micronomus norfolkensis* (BC-V), *Miniopterus orianae oceanensis* (BC-V), *Myotis macropus* (BC-V), *Phoniscus papuensis* (BC-V), *Pteropus poliocephalus* (BC-V, EPBC-V), *Scoteanax rueppellii* (BC-V), *Anthochaera phrygia* (BC-CE, EPBC-CE), *Artamus cyanopterus cyanopterus* (BC-V), *Callocephalon fimbriatum* (BC-V), *Calyptorhynchus lathami* (BC-V), *Daphoenositta chrysoptera* (BC-V), *Glossopsitta porphyrocephala* (BC-V), *Glossopsitta pusilla* (BC-V), *Hieraaetus morphnoides* (BC-V), *Lathamus discolor* (BC-E, EPBC-CE), *Lophoictinia isura* (BC-V), *Ninox connivens* (BC-V), *Ninox strenua* (BC-V), *Pachycephala olivacea* (BC-V), *Tyto novaehollandiae*

Coast Grey Box – Mountain Grey Gum - stringybark Moist Shrubby Open Forest In Coastal Gullies, Southern South East Corner Bioregion	
	(BC-V), *Tyto tenebricosa* (BC-V), *Cercartetus nanus* (BC-V), *Dasyurus maculatus* (BC-V, EPBC-E), *Isoodon obesulus obesulus* (BC-E, EPBC-E), *Petaurus australis* (BC-V), *Petaurus norfolcensis* (BC-V), *Phascogale tapoatafa* (BC-V), *Phascolarctos cinereus* (BC-V, EPBC-V), *Potorous tridactylus* (BC-V, EPBC-V)

PCT 1141

Scrub She-Oak – Swamp Banksia Coastal Lowland Heath, Southern South East Corner Bioregion	
Vegetation Formation	**Heathlands**
Vegetation class	**South Coast Heaths**
Vegetation type	**Plant Community type (PCT) ID:** 1141
	Common community name: Scrub She-oak - Swamp Banksia coastal lowland heath, southern South East Corner Bioregion
Approximate extent within the study area	2.21 ha
Justification for assignment	Identifying species are present in all three strata (upper stratum, middle stratum and ground stratum). Common species include: Upper stratum (unburnt condition type): Black Sheoak (*Allocasuarina littoralis*) Saw Banksia (*Banksia serrata*) Middle stratum (incl. shrubs and emergent trees) Swamp Banksia (*Banksia paludosa*) Silver Banksia (*Banksia marginate*) Swamp Sheoak (*Allocasuarina paludosa*) Bushy Needlewood (*Hakea decurrens*) Finger Hakea (*Hakea dactyloides*) *Darwinia camptostylis* Common Heath (*Epacris impressa*) Coarse Stinkweed (*Opercularia aspera*) Coast Tea tree (*Leptospermum laevigatum*) Prickly Tea tree (*Leptospermum continentale*) Ground stratum *Schoenus brevifolius* *Cyathochaeta diandra* *Lepidosperma concavum* Wire Rush (*Empodisma minus*) Leafy Purple-flag (*Patersonia glabrata*) *Lepidosperma neesii* Guineaflower (*Hibbertia empetrifolia*)
Condition	The condition types of this PCT can be classified in two broad categories: • **South Coast heath - burnt in 2016**. Dense ground cover (<1m), high species diversity. Occurs in the following section: • Approx 1km south-east from Saltwater Creek

Scrub She-Oak – Swamp Banksia Coastal Lowland Heath, Southern South East Corner Bioregion

PCT 1141 – example of condition type 1; South Coast heath burnt in 2016

- **South Coast heath - burnt in** 1977 - 1996**.** Dense ground cover (<2m), high species diversity, with emerging shrubs and trees.

Scrub She-Oak – Swamp Banksia Coastal Lowland Heath, Southern South East Corner Bioregion	
	 PCT 1141 example of condition type 2; north of Bittangabee Bay, South Coast heath burnt in 1990 - 1996
Survey Effort	11 days, senior ecologist covering subject land.
Conservation Status	Not associated with a Threatened Ecological Community (TEC)
Estimate of percent cleared	A search of the BioNet Vegetation Classification Database indicates that 10% of this PCT has been cleared post European settlement.
2019/2020 bushfire impacts (study area)	0.15 ha mapped as low severity burn, 0.15 ha medium severity burn, 0.13 ha as high severity burn and 0.56 ha as extreme severity burn. Approximately 1.23 ha within the study area was not burnt by the 2019/2020 bushfire. Where habitat was impacted by high to extreme severity fire, vegetation recovery 10 months post-fire includes heathland flora 20-30 cm in height, 50-80% cover. Low quality habitat for dense ground-cover

Scrub She-Oak – Swamp Banksia Coastal Lowland Heath, Southern South East Corner Bioregion	
	dependent small mammals, however tending towards suitable foraging habitat for granivorous birds.
Threatened plant species habitat	*Cryptostylis hunteriana* (BC-V, EPBC-V), *Viola cleistogamoides* (BC-E)
Threatened fauna species	*Heleioporus australiacus* (BC-V, EPBC-V), *Litoria littlejohni* (BC-V, EPBC-V), *Falsistrellus tasmaniensis* (BC-V), *Myotis macropus* (BC-V), *Scoteanax rueppellii* (BC-V), *Artamus cyanopterus cyanopterus* (BC-V), *Calamanthus fuliginosus* (BC-E), *Calyptorhynchus lathami* (BC-V), *Daphoenositta chrysoptera* (BC-V), *Dasyornis brachypterus* (BC-E, EPBC-E), *Glossopsitta porphyrocephala* (BC-V), *Hieraaetus morphnoides* (BC-V), *Ixobrychus flavicollis* (BC-V), *Neophema chrysogaster* (BC-CE, EPBC-CE), *Pezoporus wallicus wallicus* (BC-V), *Cercartetus nanus* (BC-V), *Dasyurus maculatus* (BC-V, EPBC-E), *Isoodon obesulus obesulus* (BC-E, EPBC-E), *Potorous tridactylus* (BC-V, EPBC-V), *Sminthopsis leucopus* (BC-V)

PCT 1084

Red Bloodwood – Silvertop Ash – White Stringybark heathy open forest on Coastal Foothills, Southern South East Corner Bioregion	
Vegetation Formation	**Dry Sclerophyll Forest (Shrubby sub-formation)**
Vegetation class	**South East Dry Sclerophyll Forests**
Vegetation type	**Plant Community type (PCT) ID**: 1084
	Common community name: Red Bloodwood – Silvertop Ash – White Stringybark heathy open forest on coastal foothills, southern South East Corner Bioregion
Approximate extent within the study area	23.04 ha
Justification for assignment	Identifying species are present in all three strata (upper stratum, middle stratum and ground stratum). Common species include: Upper stratum: *Eucalyptus sieberi* (dominant) *Eucalyptus bosistoana* Middle stratum: *Allocasuarina littoralis* *Hakea dactyloides* *Kunzea ambigua* *Elaeocarpus reticulatus* *Banksia serrata* *Acacia suaveolens* *Acacia terminalis* *Ricinocarpos pinifolius* *Leptospermum attenuatum* Ground stratum: *Lomandra longifolia* *Pteridium esculentum* *Correa reflexa* *Lepidosperma laterale* **Other diagnostic features:** • Open forest with a well-developed shrub layer and open ground layer. Some sections support

Red Bloodwood – Silvertop Ash – White Stringybark heathy open forest on Coastal Foothills, Southern South East Corner Bioregion	
	relatively tall forest dominated by *E sieberi.* • Occurs on low ridges and dry slopes in the coastal foothills and plains usually below 150 m elevation on metasediments or Tertiary alluvium.

Condition	The condition types of this PCT can be classified in one broad category:
	• **Open forest with a well-developed shrub layer and open ground layer.** Some sites support relatively tall forest dominated by *E sieberi*.
	  • South of Red Sand's Bay
	  • West of Mowarry Point
	  • Activity 3 (Vehicle access):
	  • Hegarty Bay vehicle access trail
	 
	PCT 1084 Red Bloodwood – Silvertop Ash – White Stringybark heathy open forest on coastal foothills, southern South East Corner Bioregion, on Hegarty Bay vehicle access trail.

Red Bloodwood – Silvertop Ash – White Stringybark heathy open forest on Coastal Foothills, Southern South East Corner Bioregion	
	 PCT 1084 Red Bloodwood – Silvertop Ash – White Stringybark heathy open forest on coastal foothills, southern South East Corner Bioregion (with Allocasuarina littoralis dominant here, north of Leatherjacket Bay.
Survey Effort	11 days, senior ecologist covering subject land.
Conservation Status	Not associated with a Threatened Ecological Community (TEC)
Estimate of percent cleared	A search of the BioNet Vegetation Classification Database indicates that 10% of this PCT has been cleared post European settlement.
2020 bushfire impacts	Around 6.73 ha was affected by the 2020 bushfire: approximately 3.81 ha was impacted by low severity fire, 2.15 ha by medium severity fire, 0.77 ha by high severity fire. Approximately 16.31 ha was left unburnt.
Threatened plant species habitat	*Astrotricha sp. Wallagaraugh* (BC-E)
Threatened fauna species	*Heleioporus australiacus* (BC-V, EPBC-V), *Chalinolobus dwyeri* (BC-V, EPBC-V), *Falsistrellus tasmaniensis* (BC-V), *Micronomus norfolkensis* (BC-V), *Miniopterus orianae oceanensis* (BC-V), *Phoniscus papuensis* (BC-V), *Pteropus poliocephalus* (BC-V, EPBC-V), *Scoteanax rueppellii* (BC-V), *Artamus cyanopterus cyanopterus* (BC-V), *Callocephalon fimbriatum* (BC-V), *Calyptorhynchus lathami* (BC-V), *Daphoenositta chrysoptera* (BC-V), *Glossopsitta porphyrocephala* (BC-V), *Hieraaetus morphnoides* (BC-V), *Lophoictinia isura* (BC-V), *Ninox connivens* (BC-V), *Ninox strenua*

Red Bloodwood – Silvertop Ash – White Stringybark heathy open forest on Coastal Foothills, Southern South East Corner Bioregion	
	(BC-V), *Petroica boodang* (BC-V), *Petroica phoenicea* (BC-V), *Tyto novaehollandiae* (BC-V), *Cercartetus nanus* (BC-V), *Dasyurus maculatus* (BC-V, EPBC-E), *Isoodon obesulus obesulus* (BC-E, EPBC-E), *Petaurus australis* (BC-V), *Petaurus norfolcensis* (BC-V), *Phascogale tapoatafa* (BC-V), *Phascolarctos cinereus* (BC-V, EPBC-V), *Pseudomys fumeus* (BC-CE, EPBC-E)

PCT 1157

Silvertop Ash – Rough-Barked Apple Shrubby Open Forest on the Hinterland Hills, Far Southern South East Corner Bioregion	
Vegetation Formation	**Dry Sclerophyll Forest (Shrubby sub-formation)**
Vegetation class	**South East Dry Sclerophyll Forests**
Vegetation type	**Plant Community type (PCT) ID**: 1157
	Common community name: Silvertop Ash – Rough-barked Apple shrubby open forest on the hinterland hills, far southern South East Corner Bioregion
Approximate extent within the study area	11.99 ha
Justification for assignment	Identifying species are present in three strata (upper stratum, middle stratum and ground stratum). Common species include: Upper stratum: *Angophora floribunda* (dominant) *Eucalyptus sieberi* *Eucalyptus longifolia* Middle stratum: *Callitris rhomboidea* *Elaeocarpus reticulatus* *Pittosporum undulatum* *Allocasuarina littoralis* *Acacia longifolia* *Melaleuca armillaris* Condition type on moist soil: *Banksia serrata* *Leptospermum trinervium* Ground stratum: *Calochlaena dubia* *Pteridium esculentum* *Lomandra longifolia* *Goodenia ovata* *Marsdenia rostrata* *Lepidosperma sp.* *Lomandra longifolia* Other diagnostic features: • Open forest with an open shrub layer and groundcover comprising a mixture of grasses, graminoids, herbs and bracken fern. • Landscape position: Occurs on coastal mountain ridges and coastal plateaux up to 800m

Silvertop Ash – Rough-Barked Apple Shrubby Open Forest on the Hinterland Hills, Far Southern South East Corner Bioregion	
	elevation on metasediments between Nadgee and Mt Imlay.
Condition	The condition types of this PCT can be classified in two broad categories: • **Tall, open dry sclerophyll forest, with an open mid-stratum, and sparse, shrubby ground cover.**  PCT 1157 – example of condition type 1; open mid-stratum and sparse ground cover, on Hegarty's Trail. • **Tall, open dry sclerophyll forest with a dense, shrubby understorey with some moisture tolerant elements.**

Silvertop Ash – Rough-Barked Apple Shrubby Open Forest on the Hinterland Hills, Far Southern South East Corner Bioregion	
	 PCT 1157 – example of condition type 2; tall, open forest with shrubby understorey, north of Bittangabee Bay.
Survey Effort	11 days, senior ecologist covering subject land.
Conservation Status	Not associated with a Threatened Ecological Community (TEC)
Estimate of percent cleared	A search of the BioNet Vegetation Classification Database indicates that 5% of this PCT has been cleared post European settlement.
2020 bushfire impacts	Approximately 1.23 ha was impacted by low severity fire, 1.27 ha by medium severity fire, 0.59 ha by high severity fire. Approximately 8.89 ha was left unburnt. In areas of medium fire severity, the canopy had partial canopy scorch of *Eucalyptus longifolia* (dominant) and *Angophora floribunda* (co-dominant). There was full consumption of mid-canopy species (*Allocasuarina littoralis, Pittosporum undulatum, Callitris rhomboidea*), and ground cover consisted of mostly leaf litter and low density ground cover (*Lomandra longifolia, Solanum aviculare*). No suitable habitat for dense ground-cover dependent small mammals and birds. Severe die-back of *Allocasuarina littoralis* was evident, likely a result of drought conditions.
Threatened plant species habitat	None listed
Threatened fauna species	*Heleioporus australiacus* (BC-V, EPBC-V), *Falsistrellus tasmaniensis* (BC-V), *Miniopterus orianae oceanensis* (BC-V), *Scoteanax rueppellii* (BC-V), *Artamus cyanopterus cyanopterus* (BC-V), *Callocephalon fimbriatum* (BC-V), *Calyptorhynchus lathami* (BC-V), *Daphoenositta chrysoptera* (BC-V), *Glossopsitta porphyrocephala* (BC-V), *Hieraaetus morphnoides* (BC-V), *Lophoictinia isura* (BC-V), *Ninox connivens* (BC-V), *Ninox strenua* (BC-V), *Petroica boodang* (BC-V), *Petroica phoenicea* (BC-

Silvertop Ash – Rough-Barked Apple Shrubby Open Forest on the Hinterland Hills, Far Southern South East Corner Bioregion	
	V), *Tyto novaehollandiae* (BC-V), *Cercartetus nanus* (BC-V), *Dasyurus maculatus* (BC-V, EPBC-E), *Isoodon obesulus obesulus* (BC-E, EPBC-E), *Petaurus norfolcensis* (BC-V), *Phascogale tapoatafa* (BC-V), *Phascolarctos cinereus* (BC-V, EPBC-V), *Sminthopsis leucopus* (BC-V)

PCT 891

Ironbark – Woollybutt – White Stringybark Open Forest on Coastal Hills, South East Corner Bioregion	
Vegetation Formation	**Dry Sclerophyll Forest (Shrubby sub-formation)**
Vegetation class	**South East Dry Sclerophyll Forests**
Vegetation type	**Plant Community type (PCT) ID**: 891
	Common community name: Ironbark - Woollybutt - White Stringybark open forest on coastal hills, South East Corner Bioregion
Approximate extent within the study area	8.4 ha
Justification for assignment	Identifying species: Identifying species are present in the top stratum. The site has been cleared in the past and used for grazing. Middle stratum and ground stratum species typical of the PCT are largely missing. Common species include: Top stratum: *Eucalyptus tricarpa* *Eucalyptus longifolia* Middle stratum: *Melaleuca armillaris* *Acacia mearnsii* *Kunzea ambigua* *Exocarpus cupressiformis* *Pittosporum undulatum* *Banksia integrifolia* Ground stratum: *Carex longebrachiata* *Introduced grasse* *Myoporum boninense* *Dichondra repens*
Condition	The condition types of this PCT can be classified in three broad categories: • **Open forest dominated by *E longifolia* on slopes near creeks, with an open mid-storey stratum and very sparse or absent ground cover, mostly leaf litter.**

Ironbark – Woollybutt – White Stringybark Open Forest on Coastal Hills, South East Corner Bioregion

PCT 891 – example of condition type 1; very sparse ground cover, mostly leaf litter, west of Mowarry Point.

- **Pure stands of *E longifolia* on slopes near creeks, with an open mid-storey stratum and very sparse or absent ground cover, mostly leaf litter**.

Ironbark – Woollybutt – White Stringybark Open Forest on Coastal Hills, South East Corner Bioregion

PCT 891 – example of condition type 2; pure stand of *E longifolia,* Leather Jacket Bay.

- **Condition type with removed canopy layer.**

  The condition type is found in only one location; the cleared area at Mowarry Point. The locality has a history of European settlement (whaling station, cattle station) and has been cleared for livestock grazing in the past.

  Canopy trees typical of the PCT are mostly removed at the locality, but a few remnant mature stems (*E. tricarpa, E. longifolia*) occur on the edges of the cleared area, to support the PCT determination. The cleared area is currently dominated by dense tussocks of the perennial sedge *Carex longibrachiata* (80%), and some grazing-tolerant native grasses, which are heavily grazed by a large resident population of Grey Kangaroos *(Macropus giganteus*). Emerging mid-stratum regrowth species consist of early colonisers of disturbed sites, *Acacia mearnsii* (dominant). In sheltered gullies and along shallow watercourses, *Pittosporum undulatum* and *Banskia integrifolia* are common.

Ironbark – Woollybutt – White Stringybark Open Forest on Coastal Hills, South East Corner Bioregion	
	 PCT 891 – example of condition type 3; cleared area dominated by sedges and grazing-tolerant grasses, at Mowarry Point.
Survey Effort	11 days, senior ecologist covering subject land.
Conservation Status	Not associated with a Threatened Ecological Community (TEC)
Estimate of percent cleared	5%
2019/2020 bushfire impacts	This PCT was not directly impacted by the 2019/2020 bushfire.
Threatened plant species habitat	None listed
Threatened fauna species	*Heleioporus australiacus* (BC-V, EPBC-V), *Falsistrellus tasmaniensis* (BC-V), *Micronomus norfolkensis* (BC-V), *Miniopterus orianae oceanensis* (BC-V), *Phoniscus papuensis* (BC-V), *Scoteanax rueppellii* (BC-V), *Anthochaera phrygia* (BC-CE, EPBC-CE), *Artamus cyanopterus cyanopterus* (BC-V), *Callocephalon fimbriatum* (BC-V), *Calyptorhynchus lathami* (BC-V), *Daphoenositta chrysoptera* (BC-V), *Glossopsitta porphyrocephala* (BC-V), *Glossopsitta pusilla* (BC-V), *Hieraaetus morphnoides* (BC-V), *Lophoictinia isura* (BC-V), *Ninox connivens* (BC-V), *Ninox strenua* (BC-V), *Petroica boodang* (BC-V), *Petroica phoenicea* (BC-V), *Tyto*

Ironbark – Woollybutt – White Stringybark Open Forest on Coastal Hills, South East Corner Bioregion	
	novaehollandiae (BC-V), *Tyto tenebricosa* (BC-V), *Cercartetus nanus* (BC-V), *Dasyurus maculatus* (BC-V, EPBC-E), *Isoodon obesulus obesulus* (BC-E, EPBC-E), *Petaurus australis* (BC-V), *Petaurus norfolcensis* (BC-V), *Phascogale tapoatafa* (BC-V), *Phascolarctos cinereus* (BC-V, EPBC-V)

5.2 Groundwater dependent ecosystems

Groundwater Dependent Ecosystems (GDEs) include ecosystems which may rely on the surface expression of groundwater (including surface water ecosystems that may have a groundwater component) and ecosystems which may rely on the subsurface presence of groundwater (including vegetation ecosystems).

The Groundwater Dependent Ecosystems Atlas (BOM, 2018) maps *potential* GDE's within the vicinity of the subject site (Figure 5-2). No *known* Groundwater Dependent Ecosystems occur within the subject site.

No Subterranean GDEs are mapped as having potential to occur in the area.

Two high potential aquatic GDE's are located within the subject site, at Saltwater Creek and Bittangabee Creek.

Numerous locations have varying potential for terrestrial GDEs within the subject site.

The proposal is expected to have negligible impact on GDEs, as there is minimal excavation or ground disturbance that would impact groundwater.

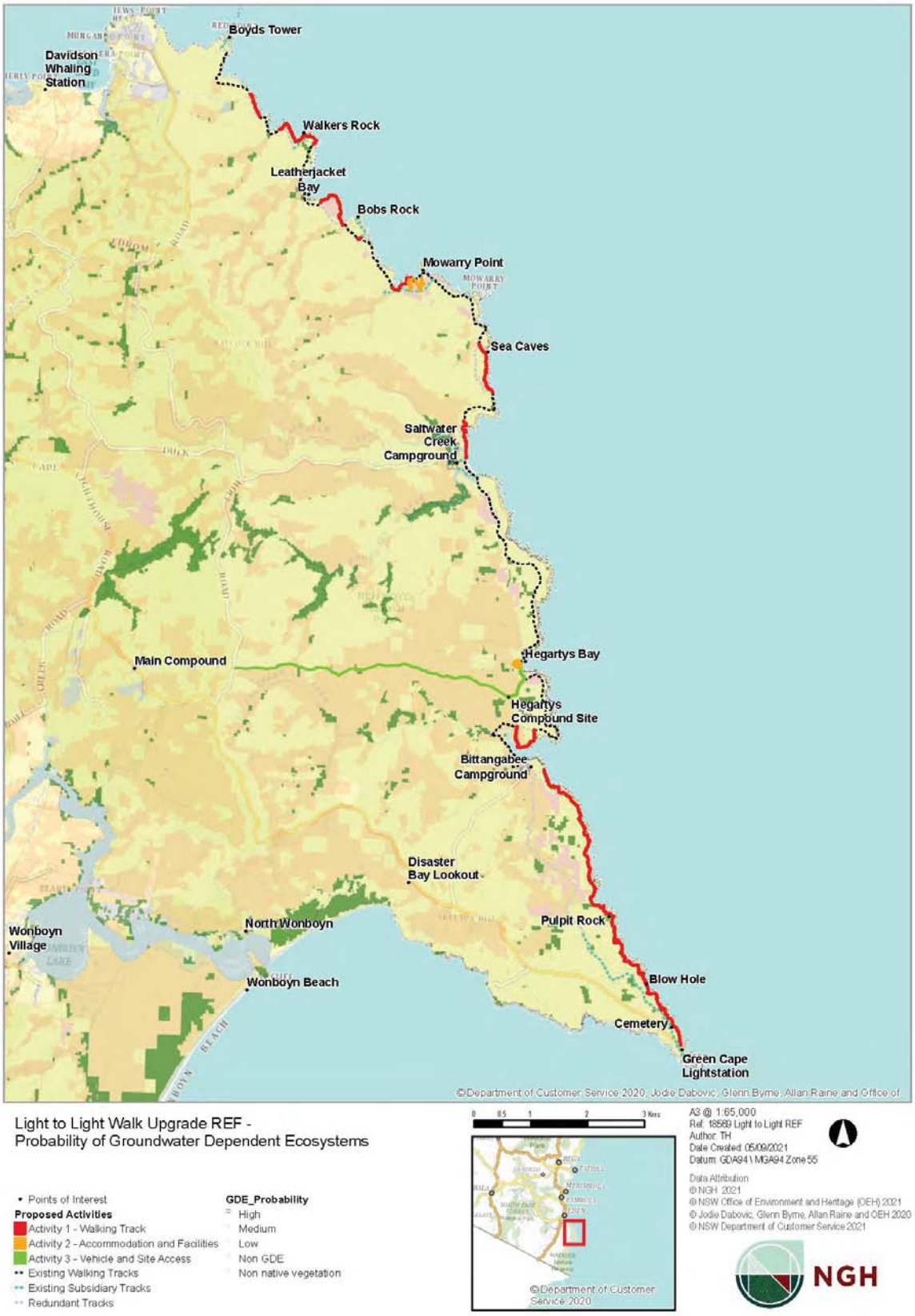

Figure 5-2 Groundwater Dependent Ecosystems at the north end of the subject site.

5.3 Threatened ecological communities

No TECs were identified in the subject land. Refer to Section 5.1

5.4 Threatened aquatic and marine ecological communities

No direct impacts to threatened aquatic or marine ecological communities are anticipated. Waterways in good condition have been identified as high constraints and a suitable buffer applied, specific to Controlled Activity Guidelines, to minimise indirect impacts.

6. Threatened species survey methodology

6.1 Vegetation and habitat assessment

Field surveys were undertaken in December 2018 (17th, 18th, 20th, and 21st), January 2019 (23rd, 24th and 26th), August 2019 (28th and 29th), and post fire surveys in November 2020 (24th and 25th). All surveys were undertaken by a senior ecologist and an assistant. This included senior botanists and zoologists.

The main aims of the field surveys were to gather enough floristic data to determine with confidence the PCTs occurring within the study area, and to assess the condition and habitat quality of the native vegetation. Secondarily, the survey aimed to identify areas of potential habitat for threatened fauna and flora species.

The following areas (hereafter known as 'the study area') were assessed in the field surveys:

- The entire length of the proposed Light to Light track, including the area within 15 metres either side of the flagged proposed track (Activity 1);
- The footprint of the proposed accommodation and pack camping sites Mowarry Point (Activity 2);
- The footprint of the proposed accommodation site Hegartys Bay (Activity 2);
- The vehicle access track to Hegartys Bay (vehicle-based survey) (Activity 3);
- The proposed boardwalk to Hegartys Bay accommodation site from the vehicle access track (Activity 3)
- the Pulpit Rock Carpark area (Activity 3)

It is noted that a wider area was searched (including the Mowarry Point Access Trail) as per the project's original scope. Sightings made within areas outside the current development footprint were retained as they are useful in providing species occurrence information in the wider area however, data collected outside the development footprint was not attributed to the quantification of the development impact.

The proposed walking track route (Activity 1) had previously been marked with flagging tape by NPWS, and the team followed the flagged track for most of the route. Where the flagging tape was missing, maps and data, collected in a GPS unit, were used to detect the centreline of the walking track corridor. In some sections, the field surveys involved navigation through thick, near impenetrable vegetation, rugged terrain and on steep coastal cliffs.

The field survey team collected the following information/data:

- Plant Community Types (PCTs) were determined based on observations of landscape position, structure and floristic composition along the proposed track. Local plant expert Jackie Miles was available for consultation to ensure that the plant species identification and the assigned PCTs were correct.
- An assessment of the general condition/habitat quality of the native vegetation (human disturbance, weeds, evidence of recent fire).
- Observations of significant fauna habitat features within the study area, including:
    - Hollow-bearing trees;
    - Dead, fallen timber with hollows;
    - Waterways, soaks and pools;
    - Scats, tracks and runways for wildlife;
    - Feed trees of the Glossy Black Cockatoo (*Calyptorhynchus lathami*)
    - Feed trees and gliding trees for the Yellow-bellied Glider (*Petaurus australis*)

- Potoroo/bandicoot diggings
- Spotted-tail Quoll scats/latrines (*Dasyurus maculatus*)
- Owl roosts and nests (pellet/whitewash search)
- Presence of invasive weeds and feral animals (foxes, rabbits)

6.2 Targeted surveys

For this assessment, species were identified for assessment as follows:

- The Appendix A Threatened entity evaluation table was used to identify species that could be impacted by the works, should they occur in the study area.
- Where there was potential for adverse impacts, Tests of Significance (ToS') were used to characterise the significance of potential impacts (see Appendix B).
- If it was considered that the species could potential occur on site and a significant impact could result, the species was recommended for targeted survey to confirm presence or absence (or else presence was assumed).

Systematic targeted searches for threatened flora were not carried out as part of the botanical field surveys. However, background searches undertaken prior to the field surveys (desktop survey of records, literature review and local expert knowledge (botanist Jackie Miles)) provided information on suitable habitat for threatened plant species.

Where known suitable habitat was encountered within the study area, the following threatened plant species were searched for:

- Hidden Violet
- Leafless Tongue Orchid
- Tangled Bed Straw
- Matted Bush Pea

The following fauna species to be targeted during the surveys included:

- Long-footed Potoroo
- Long-nosed Potoroo
- Smoky Mouse
- Eastern Chestnut Mouse
- White footed Dunnart
- Southern Brown Bandicoot
- Spotted-tail Quoll
- Green and Golden Bell Frog
- Eastern Bristlebird
- Eastern Ground Parrot

Based on the target species listed above, the targeted field survey program included the following techniques:

- Camera trapping program for the identified ground dwelling mammals
- Nocturnal surveys for the Green and Golden Bell Frog

- Diurnal bird surveys for Eastern Bristlebird and Eastern Ground Parrot

Zoological field surveys by a senior ecologist and ecologist were undertaken on:

- 12th, 13th, 14th and 15th March 2019
- 26th, 27th and 28th March 2019
- 1st and 2nd April 2019
- 15th and 16th April 2019.

The survey methods and locations for each of the above survey types are described further below.

Camera trapping program

A camera trapping program was completed to target the identified ground-dwelling mammal species listed above and was undertaken in accordance with the Federal guidelines for conducting these types of surveys. Whilst cameras were generally placed in positions to evenly cover the majority of the impact areas of the proposed walking track, a higher concentration of cameras were placed within areas of potentially better quality habitat as indicated by white polygons within detailed maps 3, 4, 5, 6, 8, 13, 15, 17, 18 and 20. Typically, cameras were placed about 500 m apart across the linear sections of the walking trail within the study area, while cameras were placed about 100 m apart within the identified habitat polygons stated above.

A total of 59 camera sites were established over the sections of the proposed new walking trail as identified in

Figure 6-1. The cameras were deployed for (a minimum) 14 days of recording and undertaken on two separate survey occasions (due to camera availability) as follows:

- Survey 1: 29[2] cameras deployed from 11-13 March and collected on 26-28 March 2019.
- Survey 2: 30[3] cameras deployed from 1-2 April and collected on 15-16 April 2019

The overall placement of cameras along the proposed walking trail was staggered across the length of the trail from Boyd's Tower to Green Cape Light Station, with cameras placed in both the northern and southern portions of the trail during each survey occasion. This staggered approach was done to take into consideration the changing season/conditions over the course of the survey period.

The cameras used in this study included a combination of Reconyx (18) and Scoutmaster (12) motion-detection infrared cameras. Each camera was programmed to run continuously for 14 days at each site, with the following general operational parameters:

- Both daytime and night-time capture
- Trigger sensitivity was set to High
- A minimum of 3 pictures were captured per trigger at a one-second interval (this was later increased to 5 pictures per trigger for the second survey to try and increase the number of pictures taken to assist in better identification of animals).
- A minimum 15-second delay was set per trigger event.

Each camera trapping site was "baited" by installing a small bait station (comprised of 50 mm diameter PVC vented plumbing end-caps) within the camera view. The bait used was dependant on the target species within

[2] 30 cameras were intended to be deployed but only 29 cameras were set due to one camera malfunctioning

[3] 31 cameras were intended to be deployed but only 30 cameras were set due to one camera malfunctioning

the different habitat types. The broad habitat types and associated bait type for the survey was stratified as follows:

- Camera traps in open and rocky areas were baited with Sardines to target the Spotted-tail Quoll;
- Camera traps in dense ground cover habitat (dry areas and moist areas), were baited with a combination of oats, honey and peanut butter to target other ground dwelling species.

A summary of the overall camera survey program including camera and bait types used at each site is provided in Table 6-1. “Quoll” bait targets all carnivorous species, and “Bandicoot” bait targets all herbivorous species, particularly bandicoots.

Table 6-1 Camera survey program

Camera id	Easting	Northing	Dates deployed	Target species
LC01	5889635	762436	11/03/19 – 26/03/19	Quoll
LC02	5889370	762320	11/03/19 – 26/03/19	Bandicoot
LC03	5876691	767933	12/03/19 – 27/03/19	Bandicoot
LC04	5876425	768299	12/03/19 – 27/03/19	Bandicoot
LC05	5876079	768569	13/03/19 – 28/03/19	Bandicoot
LC06	5875964	768617	13/03/19 – 28/03/19	Quoll
LC07	5875422	768751	13/03/19 – 28/03/19	Quoll
LC08	5874924	768786	13/03/19 – 28/03/19	Bandicoot
LC09	5874819	768815	13/03/19 – 28/03/19	Bandicoot
LC10	5874730	768904	12/03/19 – 27/03/19	Bandicoot
LC11	5874351	768896	13/03/19 – 28/03/19	Quoll
LC12	5874204	769100	12/03/19 – 27/03/19	Bandicoot
LC13	5881913	766970	12/03/19 – 27/03/19	Bandicoot
LC14	5881397	767233	12/03/19 – 27/03/19	Bandicoot
LC15	5880891	767214	13/03/19 – 28/03/19	Bandicoot
LC16	5886750	763983	13/03/19 – 28/03/19	Bandicoot
LC17	5886874	764259	13/03/19 – 28/03/19	Quoll
LC18	5886510	764396	13/03/19 – 28/03/19	Bandicoot
LC19	5886587	764416	13/03/19 – 28/03/19	Bandicoot
LC20	5886363	764509	13/03/19 – 28/03/19	Quoll
LC21	5886345	764757	13/03/19 – 28/03/19	Bandicoot

Camera id	Easting	Northing	Dates deployed	Target species
LC22	5886245	764828	13/03/19 – 28/03/19	Bandicoot
LC23	5885930	764933	13/03/19 – 28/03/19	Bandicoot
LC24	5885539	765170	13/03/19 – 28/03/19	Bandicoot
LC25	5885376	765275	13/03/19 – 28/03/19	Quoll
LC26	5885252	765468	13/03/19 – 28/03/19	Bandicoot
LC27	5871816	770419	13/03/19 – 28/03/19	Bandicoot
LC28	5887998	763508	13/03/19 – 28/03/19	Quoll
LC29	5888043	763343	13/03/19 – 28/03/19	Quoll + Bandicoot
LC30	5885099	766872	01/04/19 – 15/04/19	Bandicoot
LC31	5885038	766742	01/04/19 – 15/04/19	Quoll
LC32	5884442	766989	01/04/19 – 15/04/19	Quoll
LC33	5884371	767008	3/04/19 – 17/04/19	Bandicoot
LC34	5884154	766888	3/04/19 – 17/04/19	Bandicoot
LC35	5883943	766970	01/04/19 – 15/04/19	Bandicoot
LC36	5883714	766957	01/04/19 – 15/04/19	Bandicoot
LC37	5883508	766983	01/04/19 – 15/04/19	Bandicoot
LC38	5874100	769174	02/04/19 – 16/04/19	Bandicoot
LC39	5873782	769231	02/04/19 – 16/04/19	Quoll
LC40	5873508	769359	02/04/19 – 16/04/19	Bandicoot
LC41	5873323	769535	02/04/19 – 16/04/19	Bandicoot
LC42	5873078	769718	02/04/19 – 16/04/19	Quoll
LC43	5872962	769763	02/04/19 – 16/04/19	Bandicoot
LC44	5872780	769938	02/04/19 – 16/04/19	Quoll
LC45	5872690	769989	02/04/19 – 16/04/19	Bandicoot
LC46	5872565	770030	02/04/19 – 16/04/19	Bandicoot
LC47	5872364	770201	02/04/19 – 16/04/19	Quoll
LC48	5872019	770356	02/04/19 – 16/04/19	Bandicoot

Camera id	Easting	Northing	Dates deployed	Target species
LC49	5871932	770397	02/04/19 – 16/04/19	Bandicoot
LC50	5877379	767083	02/04/19 – 16/04/19	Bandicoot
LC51	5877411	767164	02/04/19 – 16/04/19	Bandicoot
LC52	5877457	767261	02/04/19 – 16/04/19	Quoll
LC53	5877147	767560	02/04/19 – 16/04/19	Quoll
LC54	5877150	767558	02/04/19 – 16/04/19	Bandicoot
LC55	5877190	767717	02/04/19 – 16/04/19	Bandicoot
LC56	5877280	767807	02/04/19 – 16/04/19	Bandicoot
LC57	5877375	767850	02/04/19 – 16/04/19	Quoll
LC58	5877375	767977	02/04/19 – 16/04/19	Bandicoot
LC59	5877357	768058	02/04/19 – 16/04/19	Bandicoot

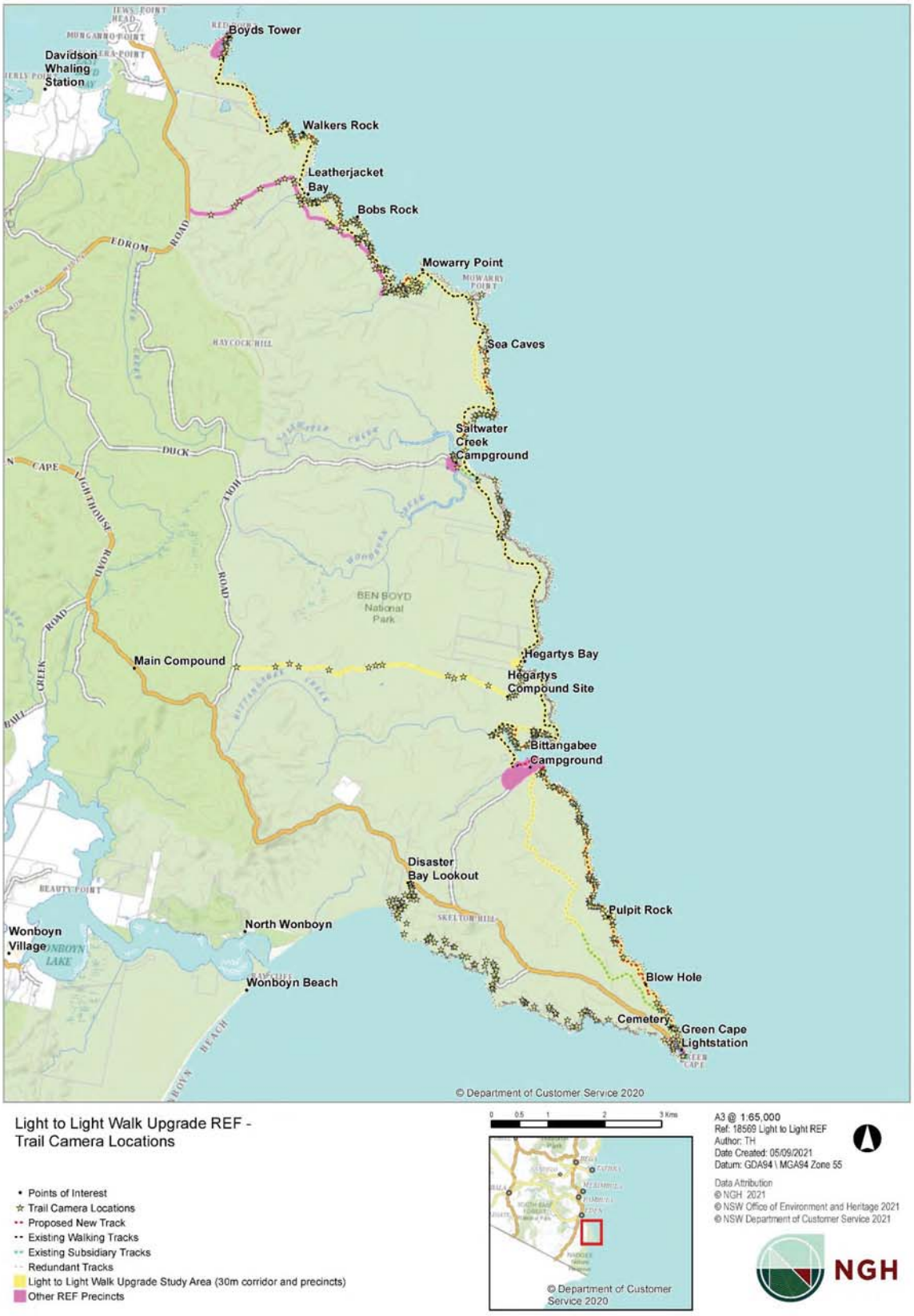

Figure 6-1 Camera Trap Survey Locations

Green and Golden Bell Frog survey program

The Green and Golden Bell Frog survey program was focussed at Saltwater Creek (based on the previous record of the species at this location) and involved the following survey techniques in accordance with the prescribed guidelines for the species[4]:

- Nocturnal spotlighting visual encounter surveys
- Call playback surveys
- Tadpole dipnet surveys.

The surveys were conducted over four nights and during (generally) suitable conditions (i.e. within about one week of rainfall – refer to Table 6-2.)

During each night/survey occasion, a total of up to 500 m (typically broken into 2 x 250 m) streamside transects along riparian habitat was surveyed (where safe/accessible), with one survey transect at each creek/waterway in this area performed; one 250 m transect was conducted along the southern embankment of Saltwater Creek, and another 250 m transect was conducted along the northern embankment of the waterway at the southern end of Saltwater Creek Beach (i.e. south of the campground).

Each survey occasion was conducted by two people for a minimum of one hour and with high-powered handheld torches and headlamps (rated from 800 to 1300 lumens) searching and listening for frogs. During these surveys, a minimum of 10 minutes of call playback (using pre-recorded calls of the species broadcast through a megaphone) was conducted.

During the surveys, time was spent searching for tadpoles to conduct tadpole dipnet surveys at each creek however as explained in the results, no tadpoles of any species were seen, and consequently no tadpoles were able to be captured.

Table 6-2 Green and Golden Bell Frog survey conditions

Survey Date	Time	Temp(^{0}C)	Wind	Rain	Days since rain	Total rain in previous week
11/03/2019	20.00 - 21.00	21	calm	Nil	2 (0.6mm)	5.2mm
12/03/2019	20.00 - 21.00	18	calm	Nil	3 (0.6mm)	1.2mm
13/03/2019	20.00 - 21.00	17	calm	Nil	4 (0.6mm)	1.2mm
26/03/2019	19.45 - 20.45	16	calm	Nil	1 (0.2mm)	60.6mm

Eastern Bristlebird and Eastern Ground Parrot Surveys

The Eastern Bristlebird and Eastern Ground Parrot surveys were conducted generally in accordance with the NSW Government (DEC) *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities* (Working Draft, Nov 2004).

Specifically, the survey technique employed for this study involved the use of the area search method. The guidelines state that for this method, observers walk around an area of pre-determined size and for a pre-determined length of time, typically recommended at 20 minutes for a one hectare search area. For this study, given the narrow linear nature of the proposed development and the very dense habitats encountered, with very limited accessibility or visibility to surrounding (terrestrial) areas outside of the trail alignment, the area search method employed for this study was modified so that surveys were conducted as 20-minute periods of observations within and along the proposed walking trail. This was deemed appropriate as the aim of the study was to identify the presence and potential use of habitats

[4] Survey guidelines for Australia's threatened frogs: Guidelines for detecting frogs listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999* (CoA 2010)

within the proposal area which may be impacted by the development, as opposed to simply aiming to identify whether the species are present in the broader area, which then would have demanded surveys be conducted in other areas outside of the proposed walking trail alignment. Notwithstanding this, incidental observations and opportunistic recordings of birds were made whilst moving through the project area such as when walking along the existing trails to return to vehicles at the completion of setting cameras along a sector of the proposed new track.

A total of 12 20-minute surveys were conducted during the survey program (totalling four hours of combined survey time), with each survey typically conducted during the early morning periods, although some afternoon survey times were also undertaken (primarily due to timing constraints associated with the need to deploy/collect cameras). Due to the dense vegetation throughout the site, in often remote locations, there were no opportunities to undertake late afternoon or early evening surveys (considered optimal along with early morning surveys for the target species) within the proposal area. However, there were some occasions where field staff did walk along parts of the existing trail late in the afternoon when returning to the vehicles from a camera deployment/collection, and during these times, attention was paid to any potential sightings or calls made by either of the target species.

The timing and effort of the bird surveys undertaken within the project footprint are summarised in Table 6-3 below.

Table 6-3 Bird survey effort and location

Bird Survey No.	Date	Time	Loc/Site No	Description/Track Number
1	11/03/2019	16.00	LC1	Track 1 - near Boyd's Tower
2	12/03/2019	08.30	LC3	N end of Track 10 - near Bittangabee Campground
3	12/03/2019	09.30	LC4	along Track 10
4	12/03/2019	11.00	LC7	along Track 10
5	13/03/2019	09.00	LC13	N end of Track 8 - S of Salt Water Ck beach
6	13/03/2019	10.30	LC15	S end of Track 8
7	13/03/2019	14.00	LC20	Midway along Track 3 - S of Leatherjacket Bay
8	13/03/2019	16.00	LC26	Track - near Mowarry campground
9	14/03/2019	11.00	LC29	W end of Track 2
10	1/04/2019	13.30	LC34	Midway along Track 7
11	2/04/2019	12.00	LC49	S end of Track 11 - near lighthouse
12	2/04/2019	15.00	LC50	W end of Track 9 - Bittangabee Bay

6.3 Limitations

Due to the extent of the site full floristic BAM plots were not undertaken. Despite this the surveys undertaken to ground truth mapped PCTs were done in consultation with senior field botanists with extensive local knowledge and is therefore considered robust.

Targeted flora surveys were completed while undertaking PCT and habitat evaluations. This was necessary to ensure that relevant parts of the route were surveyed efficiently.

Timing for Green and Golden Bell Frog surveys were undertaken in early March, just outside the recommended survey period. The threatened species survey and assessment guidelines (DECC 2009) state that surveys should be conducted between August and February, with males mostly calling between September and January. Surveys were, however, undertaken after rainfall as recommended by the guidelines.

For diurnal bird surveys, there were no opportunities to do late afternoon surveys within the survey area, and no practical opportunity for doing area searches outside of the survey area due to the remoteness of the study area and dense vegetation which was difficult to traverse. The timing needed to set remote sensing cameras overrode the ability to expand the search area. It was deemed more optimal to carry out area searches over point-count searches; if the surveyor was stationary whilst in dense vegetation, then they would have been unlikely to see many birds. There was a greater chance of seeing more birds by moving through the site, which would also flush birds as well.

A large fire in January 2020 impacted Ben Boyd National Park. In addition to the impact to native vegetation, there has been extensive fire damage to visitor areas, access roads, walking trails, lookout points, picnic areas and campgrounds. NPWS have been conducting aerial pest control programs following the fire. The majority of surveys undertaken by NGH Consulting were carried out prior to this fire event. As discussed in section 6.1, additional vegetation and habitat surveys were undertaken in November 2020 to assess additional areas included in the updated project design as well as the condition of the overall site post-fire. This was done with reference to bushfire mapping. As such, this biodiversity assessment has given a description of flora and fauna present prior to the fire, but considers the impacts of the proposal on biodiversity after the 2019/2020 fire event.

6.4 Summary

Table 6-4 Targeted threatened species survey summary; survey effort and timing

Target Species	Survey type	PCT	Survey effort	Timing
Viola cleistogamoides	Targeted search	1141	During PCT identification; 11 days.	Dec 2018, Jan 2019, Nov 2020
Cryptostylis hunteriana	Targeted search	1141	During PCT identification; 11 days.	Dec 2018, Jan 2019, Nov 2020
Pultenaea pedunculata	Targeted search	721	During PCT identification; 11 days.	Dec 2018, Jan 2019, Nov 2020
Long-footed Potoroo	Camera Signs		59 cameras/14 nights	11-28 March & 1-16 April 2019
Long-nosed Potoroo	Camera Signs	1141, 777, 772, 721	59 cameras/14 nights	11-28 March & 1-16 April 2019
Smoky Mouse	Camera	1084	59 cameras/14 nights	11-28 March & 1-16 April 2019
Eastern Chestnut Mouse	Camera	772, 721	59 cameras/14 nights	11-28 March & 1-16 April 2019
White footed Dunnart	Camera	1157, 1141, 772, 721	59 cameras/14 nights	11-28 March & 1-16 April 2019
Southern Brown Bandicoot	Camera Signs	772, 721	59 cameras/14 nights	11-28 March & 1-16 April 2019

Target Species	Survey type	PCT	Survey effort	Timing
Spotted-tail Quoll	Camera Signs	772, 777, 891, 1157, 1084, 1141	59 cameras/14 nights	11-28 March & 1-16 April 2019
Green and Golden Bell Frog	Nocturnal – spotlighting call playback	772,	4 nights - 3.3 person hours 1.3 person hours	11-13 & 26 March 2019
Eastern Bristlebird	Diurnal bird survey	721, 772, 1141	12 x 20 minute surveys – 4 person hours	11-14 March & 1-2 April 2019
Eastern Ground Parrot	Diurnal bird survey	721, 1141	12 x 20 minute surveys – 4 person hours	11-14 March & 1-2 April 2019

A full list of flora and fauna species recorded during the surveys is provided in Appendix E and Appendix F.

7. Threatened species survey results

7.1 Threatened flora

No threatened flora species were recorded within the study area, however there are historical records and/or potential habitat within the study area for three species; Leafless Tongue Orchid (*Cryptostylis hunteriana*), Hidden Violet (*Viola cleistogamoides*) and Matted Bush Pea (*Pultenaea pedunculata)*.

Considering the availability of potential habitat, the cryptic nature of these threatened flora species, and the extent of field surveys undertaken, a cautionary approach has been taken and these species are assumed present in the study area. As such a ToS' have been undertaken for these species:

- Leafless Tongue Orchid (*Cryptostylis hunteriana*),
- Hidden Violet (*Viola cleistogamoides*) and
- Matted Bush Pea (*Pultenaea pedunculata)*.

7.2 Threatened fauna

The following threatened fauna were recorded within the study area surveyed (includes incidental observations):

Table 7-1: Recorded threatened fauna

Species	Number of individuals	Location	Notes
Dusky Woodswallow (*Artamus cyanopterus*)	1	Heath west of the Pulpit Rock carpark	
Glossy Black Cockatoo (*Calyptorhynchus lathami*)	3	Mowarry Access trail	Adult pair and juvenile *Allocasuarina littoralis*, is common in this location
Powerful Owl (*Ninox Strenua*)	1	Green Cape Lighthouse Road near the Pulpit Rock turnoff	Juvenile
White-bellied Sea Eagle (*Haliaeetus leucogaster*)	2	Flying overhead	Pair observed on all field survey days
Wedge-tailed eagle (*Aquila audax*)	1	Near the Sea Caves	
Spotted-tail Quoll (*Dasyurus maculatus*)	1 scat	On the rocks near the Sea Caves	
Southern Brown Bandicoot *(Isoodon obesulus obesulus)*	8 sightings	LC41; between Pulpit Rock & Green Cape	8 images recorded, with 1 individual in each image
Long-nosed Potoroo *(Potorous tridactylus)*	24 sightings at 9 locations	LC03; 300m south of Bittangabee Bay LC40, LC41; between Pulpit Rock & Green Cape LC53, LC55, LC56, LC57, LC58 & LC59; on the northern side of Bittangabee Bay	24 images recorded, with 1 individual in each image

7.3 Threatened species habitat

A habitat evaluation was undertaken for all species previously recorded within 3 km of the study area (central route buffered by 3 km either side). Species that had been previously recorded within 300 m of the track were noted.

Based on the habitat observed, and in consideration of local records and consultation with specialists (pers. comm. A. Claridge & J. Miles), the species in Table 7-2 are considered likely to have habitat within the subject site and have the potential to be impacted by the proposal.

A ToS' was undertaken for species where this could equate to greater than low risk of impact on their lifecycle (i.e. important foraging, breeding areas or threats relevant to the works). The ToS' are included in full in Appendix B.

Although a comprehensive Hollow-Bearing tree survey was not undertaken for the study area, when HBT were observed during the survey, these were recorded, as shown in Figure 7-1.

Table 7-2 Threatened species likelihood of impact

Species	Species Status	Likelihood of habitat within the subject site	Likelihood of impact, reasoning	ToS Undertaken
Giant Burrowing Frog (*Heleioporus australiacus*)	BC-V EPBC-V	Present	Unlikely Not detected in targeted surveys	No
Green and Golden Bell Frog (*Litoria aurea)*	BC-E	Very limited suitable habitat within the Study Area	Unlikely Not detected in targeted surveys One old (1979) record from Saltwater Creek	No
Dusky Woodswallow *(Artamus cyanopterus cyanopterus)*	BC-V	Present	Yes – breeding and foraging habitat potentially impacted	Yes - Woodland birds
Striated Fieldwren *(Calamanthus fuliginosus)*	BC-E	Present	Yes – breeding and foraging habitat potentially impacted	Yes - Heathland birds
Gang-gang Cockatoo *(Callocephalon fimbriatum)*	BC-V	Present – breeding habitat	Yes – breeding and foraging habitat potentially impacted	Yes
Glossy Black-Cockatoo *(Calyptorhynchus lathami)*	BC-V	Present	Yes – breeding and foraging habitat potentially impacted	Yes
Varied Sittella *(Daphoenositta chrysoptera)*	BC-V	Present	Yes – breeding and foraging habitat potentially impacted	Yes - Woodland birds
Eastern Bristlebird *(Dasyornis brachypterus)*	BC-E EPBC-E	Present	Yes – breeding and foraging habitat potentially impacted	Yes - Heathland birds
Little Lorikeet *(Glossopsitta pusilla)*	BC-V	Present – breeding and foraging habitat	Yes – breeding and foraging habitat potentially impacted	Yes
Turquoise Parrot *(Neophema pulchella)*	BC-V	Present – breeding and foraging habitat	Yes – breeding and foraging habitat potentially impacted	Yes

Species	Species Status	Likelihood of habitat within the subject site	Likelihood of impact, reasoning	ToS Undertaken
Barking Owl ***(Ninox connivens)***	BC-V	Present – breeding and foraging habitat	Yes – breeding and foraging habitat potentially impacted	Yes - Hollow-dependent forest owls.
Powerful Owl ***(Ninox strenua)***	BC-V	Present – breeding and foraging habitat	Yes – breeding and foraging habitat potentially impacted	Yes - Hollow-dependent forest owls.
Flame Robin ***(Petroica phoenicea)***	BC-V	Present – foraging habitat	Yes – winter foraging habitat available	Yes - Woodland birds
Eastern Ground Parrot ***(Pezoporus wallicus wallicus)***	BC-V	Present – breeding and foraging habitat	Yes – breeding and foraging habitat potentially impacted	Yes - Heathland birds
Sooty Owl ***(Tyto tenebricosa)***	BC-V	Present – breeding and foraging habitat	Yes – breeding and foraging habitat potentially impacted	Yes - Hollow-dependent forest owls.
Masked Owl ***(Tyto novaehollandiae)***	BC-V	Present – breeding and foraging habitat	Yes – breeding and foraging habitat potentially impacted	Yes - Hollow-dependent forest owls.
Eastern Pygmy-possum ***(Cercartetus nanus)***	BC-V	Present	Yes – Hollow-dependent	Yes - Hollow-dependent arboreal mammals
Spotted-tailed Quoll ***(Dasyurus maculatus)***	BC-V EPBC-E	Present	Yes - recorded	Yes - Ground-dwelling mammals
Eastern False Pipistrelle ***(Falsistrellus tasmaniensis)***	BC-V	Present	Yes – recorded and hollow-dependent breeder	Yes - Hollow-dependent bats
Southern Brown Bandicoot (eastern) ***(Isoodon obesulus obesulus)***	BC-E EPBC-E	Present	Yes – recorded, however limited breeding and foraging habitat	Yes - Ground-dwelling mammals
Southern Myotis ***(Myotis macropus)***	BC-V	Present	Yes – possible record, and hollow-dependent	Yes - Hollow-dependent bats
Yellow-bellied Glider ***(Petaurus australis)***	BC-V	Present	Yes – possible record, hollow-dependent breeder	Yes - Hollow-dependent arboreal mammals
Long-footed Potoroo ***(Potorous longipes)***	BC-CE EPBC-E	Present – but limited suitable habitat	Yes	Yes - Ground-dwelling mammals
Long-nosed Potoroo ***(Potorous tridactylus)***	BC-V EPBC-V	Present	Yes – recorded, however limited suitable habitat	Yes - Ground-dwelling mammals
Smoky Mouse, Konoom ***(Pseudomys fumeus)***	BC-CE EPBC-E	Present, but limited	Yes, however limited suitable habitat	Yes - Ground-dwelling mammals
Eastern Chestnut Mouse ***(Pseudomys gracilicaudatus)***	BC-V	Present, but limited	Yes, however limited suitable habitat	Yes - Ground-dwelling mammals
Yellow-bellied Sheathtail Bat ***(Saccolaimus flaviventris)***	BC-V	Present – breeding habitat	Yes – hollow dependent breeder	Yes - Hollow-dependent bats
Greater Broad-nosed Bat ***(Scoteanax rueppellii)***	BC-V	Present – breeding habitat	Yes – hollow dependent breeder	Yes - Hollow-dependent bats

Species	Species Status	Likelihood of habitat within the subject site	Likelihood of impact, reasoning	ToS Undertaken
White-footed Dunnart *(Sminthopsis leucopus)*	BC-V	Present, but limited	Yes, however limited suitable habitat	Yes - Ground-dwelling mammals
Leafless Tongue Orchid *(Cryptostylis hunteriana)*	BC-V EPBC-V	Present	Yes – possible record, cryptic	Yes - Flora
Matted Bush-pea *(Pultenaea pedunculata)*	BC-E	Present	Yes - cryptic	Yes - Flora
Hidden Violet *(Viola cleistogamoides)*	BC-E	Present	Yes - cryptic	Yes - Flora

Figure 7-1 Hollow-bearing trees within the study area

Section 3. Minimisation and impact assessment

8. Avoid and minimise

8.1 Avoid

Locating a project to avoid and minimise impacts on native vegetation and habitat

The assessment was undertaken in a staged manner and avoidance measures were considered as follows:

Stage 1

Surveys 1 December 2018, January 2019: At the end of this survey, a constraints map and advice was provided to NPWS which identified and mapped the following features to avoid where possible (note these included matters additional to biodiversity). Constraints advice was provided to highlight areas to be avoided due to high biodiversity value, high development expenses or not viable. These features included:

- Areas mapped on the OEH Biodiversity Values Mapping database.
- PCT1141 - 'Scrub She-oak – Swamp Banksia coastal lowland heath, southern South East Corner'. May provide threatened species habitat and require targeted surveys and impact assessment.
- Hollow-bearing trees. Potential threatened species habitat and may require targeted surveys and impact assessment.
- Watercourses – these provide higher value habitat (riparian and aquatic) and are more sensitive to impacts (including nutrient input / pollution that may disperse into larger areas of habitat).
- Unstable land close to cliff edge. These areas may pose a safety risk to national park visitors.
- Areas not accessible during high tide. These areas may require installation of structures that may not be in keeping with the landscape character of the Park.

The advice was provided in February 2019 and the constraint mapping is provided in Appendix D.2.

Stage 2

A refined track alignment was prepared that reflected early constraints identification, including biodiversity and also heritage matters being concurrently investigated. The refined layout was verified to avoid the features above to a large extent.

The refined alignment was surveyed to address data gaps in the assessment.

Siting associated with Activities 2 and 3, including locating of building elements, footpaths and the Pulpit Rock carpark, have been refined to best utilise existing disturbed areas to avoid further disturbance. For the most part, extensive APZs have been avoided by enhancing bushfire protection features and identifying appropriate refuge locations in accordance with eco-tourism provisions in *Planning for Bushfire Protection 2019*. The staff building at Hegartys Bay will be constructed as a bushfire refuge and is the only building with a full APZ.

Designing a project to avoid and minimise impacts on native vegetation and habitat

NPWS has adopted a number of guiding design principles, mitigation measures and construction methods to avoid and minimise biodiversity impacts. These include:

- Minimising the impacts of construction in consideration of 'building form' and 'elevated structures' as well as airlifting materials and personnel into construction sites, where appropriate.

- Implement strict weed and pathogen hygiene protocols during construction, maintenance and operation of walking track.
- Avoid the removal of hollow-bearing or mature trees (DBH>50cm) and disturbance of their root zones forest and woodland areas, unless trees pose a significant safety risk and the walking track cannot be realigned to accommodate them.
- Any felled woody debris should be retained on-site to supplement existing coarse woody debris habitat.
- Minimise/avoid the removal or disturbance of coarse woody debris, unless the this poses a significant safety risk and the track cannot be realigned.
- Implement best practice track design, construction and sediment management practices during construction, maintenance and operation.
- Include all new tracks in current track maintenance programs that operate for other infrastructure in the national park, and develop project-specific programs for pathogen, pest plant and animal control and monitoring.

The proposed activity as a priority is to avoid direct impacts, on:

a. *important landscape features such as riparian corridors, important wetlands and estuaries.*

A buffer of 40 m either side of the centreline of riparian corridors was applied, and avoidance of these areas was recommended in order to prevent downstream impacts.

b. *threatened ecological communities*

PCTs aligning with TECs in moderate and good condition were mapped during the constraints phase in order to avoid these sensitive areas. No TECs would be impacted.

c. *areas containing threatened populations*

No threatened populations were assessed as likely to occur within the study area.

d. *threatened flora*

While no threatened flora species were recorded within the survey area, pre-clearing protocols (including avoidance and micrositing requirements within the assessed proposal corridor) and unexpected threatened species finds protocols will be implemented in the construction phase. Further, a buffer (2m for forested and 1m for non-forested areas) on either side of the track has been assessed as an indirect impact area.

e. *essential habitat features associated with threatened fauna.*

The following essential habitat features associated with threatened fauna are located within the study area and would be avoided as a priority: habitat trees, caves crevices and cliffs.

8.2 Minimise

ToS' were undertaken for species considered likely to occur and at risk of adverse impact from the proposal. This process was iterative as follows:

- The Appendix A Threatened entity evaluation table was used to identify species that could be impacted by the works, should they occur in the study area.
- Where there was the potential for adverse impacts, the Appendix B ToS' were used to characterise the significance of potential impacts.

- If it was considered that an impact could result, the species was recommended for targeted survey to confirm presence or absence (or else presence was assumed).
- Based on the results of the targeted survey, species-specific mitigation strategies were developed to address the matters identified in the ToS'.

As well as characterise the significance of impacts to species, ToS' examine aspects of the works that could be targeted to minimise risks. The mitigation measures are detailed in Table 8-1 below. ToS' summaries discuss the impacts on a species by species basis in Section 8.

Training will be provided to all project personnel, including relevant sub-contractors on flora and fauna requirements from this plan through inductions, toolboxes and targeted training. Flora and fauna training requirements will be detailed in the BMP.

Habitat Tree Avoidance

A comprehensive habitat tree inventory has not been undertaken for the study area however when observed during surveys habitat tree locations were recorded. Regardless, during construction all habitat trees are to be avoided. The proposal currently consists of a 30m wide assessment corridor to allow for micro-siting adjustments to be implemented where habitat trees (DBH>50cm) or other valuable habitat features, or cultural sites are identified during the pre-clearing process. The maximum width of this corridor should be utilised where re-routing the path around habitat trees to ensure the greatest distance between the track and tree is implemented.

Table 8-1 Mitigation measures proposed to minimise impacts on native vegetation and habitat

Mitigation measure objective	Mitigation measure	Timing	Duration	Responsibility	Risk of failure	Risk and consequences of residual impacts
General						
Best Biodiversity Management Practises	• A Biodiversity Management Plan (BMP) will be created and include: o Pre-clearing protocol (including avoidance and micro siting requirements around habitat features). o Exclusion zones or other means to clearly demarcate proposal boundaries and protect the adjacent vegetation. o Re-establishment of native vegetation – species, area and method. o Clearing of native vegetation and removal of bush rock. o Unexpected threatened species finds. o Protection of native vegetation will be retained. o Aquatic habitats and riparian zones. o Weed and pathogen management o Pest management actions and procedures o Rehabilitation of disturbed areas and discontinued tracks	Prior to commencement of any works	On-going	NPWS	Low	Inadequate biodiversity managements practices applied

Mitigation measure objective	Mitigation measure	Timing	Duration	Responsibility	Risk of failure	Risk and consequences of residual impacts
	• Training will be provided to all project personnel, including relevant sub-contractors on	Prior to the enactment of the BMP	Duration of the BMP	NPWS	Low	Inadequate implementation of the BMP
Loss of native vegetation and fauna habitat						
Minimise the impacts of habitat removal on native flora and fauna and their habitat	• The detailed design and construction planning has demonstrated it has minimised the extent of clearing within the development footprint, and avoided the loss of known threatened species, hollow-bearing trees, and essential habitat features	Planning phase	Long-term	NPWS	Low	Some of these species and/or features may have gone undetected during the planning phase
	• Pre-clearing surveys will be carried out by an ecologist to identify any threatened flora and fauna species, and specific habitat features that may be impacted by construction works. Habitat features of threatened species will be targeted during pre-clearing surveys so that they can be avoided during construction. These inlcude: o hollow-bearing trees o Glossy Black Cockatoo feed trees o quoll denning habitat and latrine sites o active nests (woodland birds) o Yellow-bellied Glider feed trees	Construction	Long-term	NPWS / Contractor	Low	Direct loss of native flora and fauna habitat including threatened species

Mitigation measure objective	Mitigation measure	Timing	Duration	Responsibility	Risk of failure	Risk and consequences of residual impacts
	o Rocky outcrops					
Reduction in viability of adjacent habitat due to edge effects						
Limit edge effects	• Used existing tracks where possible to limit the extent of clearing	Planning phase	Long-term	NPWS	Low	Restrict the ability of fauna to move across the landscape
Feral predator control	• Project-specific pest management actions will be detailed in the BMP ,and will be appropriately funded and based on the principles of adaptive management. The plan will include provisions for monitoring (e.g. camera traps to detect feral predator densities), evaluation and the use control strategies through baiting or other means, where appropriate.	Construction Operation	Long-term	NPWS	Moderate	Increase in activity/abundance of feral and pest species and higher predation rates on threatened species
Clearing and prevention of overclearing						
Prevent inadvertent clearing of vegetation outside the development footprint	• Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; all groundwork associated with construction and operation of the walking track elements of the proposed activity will be carried out by hand, handheld tools and plant e.g. chainsaws and brush cutters, and a mini excavator if required and with prior approval by the NPWS. Larger machinery may be used for works associated with Activity 2 and Activity 3.	Construction	Long-term	NPWS / Contractor	Moderate	Potential overclearing of habitat outside the development footprint

Mitigation measure objective	Mitigation measure	Timing	Duration	Responsibility	Risk of failure	Risk and consequences of residual impacts
	• Utilise areas already impacted by previous clearing or disturbance for access purposes, stockpiles or the establishment of compound sites. No stockpiling or storage within dripline of any mature trees.	Construction	During construction	NPWS / Contractor	Moderate	Potential to clear valuable unburnt habitat or mature trees.
	• If clearing of vegetation is required outside the subject site these areas will need to be assessed as an addendum to this REF.	Construction	During construction	NPWS / Contractor	Moderate	Potential of over clearing
	• Trees to be retained, including trees adjacent but outside of the subject site, require an adequate tree protection zone (TPZ) for the duration of works. Details for calculating TPZs are provided within *Australian Standard 4970-2009 – Protection of trees within subject site.*	Construction	During construction	NPWS / Contractor	Moderate	Mature trees damaged.
	• If the TPZ cannot be avoided during works, the Structural Root Zones (SRZ) of trees will be retained. Details for calculating the SRZs are provided within Australian Standard 4970-2009 – Protection of trees within subject site.	Construction	During construction	NPWS / Contractor	Moderate	Erosion prevention
Prevent overclearing to ensure there are no indirect impacts to native	• Staff training and site briefing to communicate environmental features to be protected and measures to be implemented	Construction	Long-term	Contractor	Moderate	Impacts to native vegetation or threatened species outside the development footprint despite staff training

Mitigation measure objective	Mitigation measure	Timing	Duration	Responsibility	Risk of failure	Risk and consequences of residual impacts
vegetation and habitat during construction	• Undertake site induction and toolbox talks for ecologically sensitive areas					
Preparation of a vegetation management plan to regulate activity in vegetation and habitat adjacent to the proposed development	• The Biodiversity Management Plan will include protocols for: o Protection of native vegetation and habitat features to be avoided (including micro siting requirements) o Best practice removal and disposal of vegetation o Staged removal of habitat features such as fallen logs (if required) with attendance by an ecologist o Weed management o Unexpected threatened species finds o Exclusion of vehicles through sensitive areas o Fox and cat control during construction and operation, in a manner that will not further endanger native species, in particular the Spotted-tail Quoll and small mammals • Rehabilitation of disturbed areas • Monitoring: The results of the targeted small mammal surveys constitute a valuable and useful base line study of this biodiversity asset along the walking track corridor. The results will be used to plan monitoring and management activities	Pre-construction Construction Operation	Long-term	Contractor	Moderate	Impacts to native vegetation or threatened species for Management Plan not being followed.

Mitigation measure objective	Mitigation measure	Timing	Duration	Responsibility	Risk of failure	Risk and consequences of residual impacts
	such that the biodiversity asset is maintained and where possible enhanced					
Displacement of resident fauna through vegetation clearing and habitat removal						
Minimise damage to fauna and their habitat	• Avoid the removal or modification of any hollow-bearing or mature trees (DBH>50cm) found during pre-clearance surveys in the design and construction of all three activities	Pre-construction	Long-term	NPWS / Contractor	Moderate	Species not detected during pre-clearing surveys may be impacted. Injury to fauna may occur despite following this mitigation measure. Indirect impacts to fauna nearby may occur.
	• Avoid the removal or dead stags • Avoid and minimise disturbance of Eastern Pygmy Possum shelter/denning habitat (woody debris, stumps, hollow logs and dense shrubs) during construction and operation. • If any Yellow-bellied Glider feed trees are found during construction, these will be retained.	Construction	Long-term	NPWS / Contractor	Moderate	Fauna habitat may be impacted
	• Avoid the removal or disturbance of shelter/denning habitat such as woody debris, fallen logs, burrows in the ground, dense shrubs, rock crevices and bush rocks during the construction of the walking track. Any fallen timber and dead wood encountered within the development footprint will be left in situ	Construction	Long-term	NPWS / Contractor	Moderate	Fauna habitat may be impacted

Mitigation measure objective	Mitigation measure	Timing	Duration	Responsibility	Risk of failure	Risk and consequences of residual impacts
	wherever possible or would be relocated to adjacent areas (within the buffer area) of similar habitat to aid in habitat enhancement. If rock removal is unavoidable it is to be removed with suitable machinery so as not to damage the underlying rock or result in excessive soil disturbance.					
Minimise damage to Quoll and their habitat	• Pre-construction surveys must be carried out to inspect for breeding suitability/ denning structures and communal latrine sites and allow for avoidance of these features. • Avoid the removal or modification of bush rocks, large fallen logs and other coarse woody debris in the design and construction of the three activities	Pre-Construction Construction	Long-term	NPWS / Contractor	Moderate	Fauna habitat may be impacted
Minimise damage Ground-dwelling small mammals and their habitat	• Minimise disturbance of ground cover vegetation during the construction of the walking track and other activities. Clearing of groundcover for Activity 1 will not exceed the 1m track width. • Avoid the removal or disturbance of shelter/denning habitat such as woody debris, fallen logs, burrows in the ground, dense shrubs, rock crevices and bush rocks during the construction of the walking track. Pre-construction surveys to					

Mitigation measure objective	Mitigation measure	Timing	Duration	Responsibility	Risk of failure	Risk and consequences of residual impacts
	detect shelter/denning habitat will be conducted by an experienced ecologist.					
	• Due to the restricted distribution of South Coast Heath, any permanent loss or disturbance of this habitat type must be avoided, minimised and mitigated in the planning and construction of the three activities.	Pre-construction Construction	Long-term	NPWS / Contractor	Moderate	Fauna habitat may be impacted
	• If any Glossy Black Cockatoo feed trees are encountered during pre-clearing surveys, these will be retained.	Construction	Long-term	NPWS / Contractor	Low	Feed trees not detected during pre-clearing surveys may be impacted.
	• If active nests of threatened bird species are encountered during pre-construction surveys, works will not be conducted within 200 m of the tree until the nest is no longer active (100m for small woodland birds). • Noisy machinery would not be used within 200 m of an active nest tree to minimise disturbance. • Clear management measures must be set in place for the continuing maintenance to avoid and minimise impacts on breeding habitat of hollow-dependent forest owls.	Construction	Long-term	NPWS / Contractor	Low	If active nests are not detected, the breeding success of threatened bird species would be impacted
	• If an active threatened owl nest is detected, no works using noisy machinery	Construction	Long-term	NPWS / Contractor	Low	If active nests are not detected, the breeding

Mitigation measure objective	Mitigation measure	Timing	Duration	Responsibility	Risk of failure	Risk and consequences of residual impacts
	would be undertaken within 200 m of the nest tree.					success of threatened bird species would be impacted
	• As part of continuing maintenance, clear management measures will be set in place to avoid and minimise impacts on breeding habitat and foraging habitat for threatened species (owls, parrots, small woodland birds, Heathland birds, bats, arboreal mammals, quolls)	Operation	Long-term	NPWS / Contractor	Low	Threatened species breeding and foraging habitat may be impacted if measures are not adhered to.
Loss of threatened fauna and flora						
Prevent impacts to threatened flora and fauna	• Information on the threatened species within the locality will be included in the induction process for applicable personnel. • An unexpected threatened fauna or flora procedure will be developed and if species are discovered, works will stop immediately, and the environment manager notified. An ecologist will then be engaged to determine management actions to avoid or mitigate any potential impact.	Pre-construction Construction	Long-term	Contractor	Moderate	Species not detected during pre-clearing surveys may be impacted.
Prevent indirect impacts to native vegetation and habitat during operation due to	• NPWS staff training and public signs must communicate the importance of remaining on existing tracks, and leaving no trace while in the national park	Operation	Long-term	NPWS	Moderate	Trampling of threatened flora species/populations

Mitigation measure objective	Mitigation measure	Timing	Duration	Responsibility	Risk of failure	Risk and consequences of residual impacts
an increase in human access						
Erosion and sedimentation						
Prevent erosion and sedimentation impacts during construction	• An erosion and sediment control plan will be prepared in conjunction with the final design and implemented. This would include: o Sediment control measures to be in place prior to any vegetation clearing and site leveling and shall be maintained until runoff catchments are stabilised. Sediment controls will be inspected regularly by the relevant contractor and by NPWS staff. o Sediment control measures will also be in place for the storage of any spoil as required. o Construction works involving ground disturbance will not be carried out for the proposed activity during or within two days of heavy rainfall.	Construction	Long-term	Contractor	Moderate	Impacts may occur if erosion and sedimentation control plan not implemented.
Introduction and spread of noxious weeds and pathogens						
Prevent the introduction and spread of noxious weeds and pathogens	• A Weed and Pathogen Management procedure will be developed for the proposal. This will include: o Management protocol for declared priority weeds under the Biosecurity Act 2015 during and after construction	Construction, Operation	Long-term	Contractor	Moderate	Weed encroachment

Mitigation measure objective	Mitigation measure	Timing	Duration	Responsibility	Risk of failure	Risk and consequences of residual impacts
	o Weed hygiene protocol in relation to plant, machinery, and fill o Any occurrences of pathogens such as Myrtle Rust and Phytophthora would be monitored, treated, and reported. o Avoid all use of foreign soil matter for landscaping/mulching. Always use matter from in situ. o Install disinfecting facilities – wash-down bays, footbaths and/or scrubbing stations at primary entrance/exit points for both vehicles/machinery and foot traffic o In priority locations (heath habitat), install signage (e.g. 'Stay on marked tracks') to reduce off-track disturbance and elevate or divert walking tracks to minimise contact with soil, particularly in locations that have the potential to become muddy. o The procedure will be incorporated into the Biodiversity Management Plan.					
Impacts on watercourses						
Maintain aquatic habitat	• All machinery will be free from any fuel and other pollutant residues, with connections and hoses inspected regularly.	Construction, Operation	Long-term	Contractor	Moderate	Weed encroachment

Mitigation measure objective	Mitigation measure	Timing	Duration	Responsibility	Risk of failure	Risk and consequences of residual impacts
	• Contractors will have, and be competent in the use of, petrochemical spill kits for use of any spillage during the construction. The NPWS will be notified of any spills and the action taken to contain them. • Temporary watercourse crossings will be designed to minimise impacts on hydrology, aquatic habitat and fauna by: o Maintaining low-flow conditions o Being designed with consideration of the potential for flooding during construction o Be removed and the area rehabilitated following completion of construction. o These crossings will take into consideration the requirements of the FM Act and Policy and guidelines for fish habitat conservation and management (NSW Department of Primary Industries, 2013).					
Disturbance to marine mammals						
Minimise disturbance to marine mammals (i.e. seals)	Ensure all staff and visitors to the park are aware of laws re. approaching marine mammals (in this case seals). In accordance with the Biodiversity Conservation Regulation 2017 (Clause 2.3).	Construction Operation	Long-term	National Parks	Low	Altered and potentially dangerous behaviours of resident seals. Risks to breeding success.
Prescribed biodiversity impacts						

Mitigation measure objective	Mitigation measure	Timing	Duration	Responsibility	Risk of failure	Risk and consequences of residual impacts
Appropriate landscape plantings of local indigenous species (where possible) within the subject site	• Landscape plantings will be comprised of local indigenous species.	Operation	Regular	Client	Moderate	Plants not surviving

9. Assessment of impacts

9.1 Classifying impacts

Direct and indirect impacts likely to be associated with the works are set out below. This includes a 1 m wide direct impact area for a walking track (Activity 1) with a variable buffer of either 5m for forested (2m either side and 1m for track) or 3m for non-forested areas (1m either side with 1m for track) which will be treated as an indirect impact. See Table 9-1 Table 9-1below.

Table 9-1 Activity impact summary

Activity	Total impact (ha)	Direct Impact (ha)	Indirect Impact (ha)	Study Area (ha)[5]
Activity 1 (walking track)	4.21	1.31	2.90	43.35
Activity 2 (accommodation and facilities)	1.22	1.22	0	12.27
Activity 3 (vehicle track access)	0.30	0.30	0	32.30

Table 9-2 Direct impacts.

Direct impacts	On-site/off-site	Duration	Area/individuals
Pre-construction			
Loss of native vegetation and fauna habitat	Off-site – detailed design and construction planning will minimise the extent of clearing within the subject site	Long-term	n/a
Construction			
Loss of native vegetation and fauna habitat	On-site	Long-term	2.83 ha
Loss of threatened fauna and flora	On-site	Short-term	Risk is considered very low.

[5] For this assessment it is the corridor assessed; 30m wide for the walking track and trails and precinct polygons for Activity 2, provided by NPWS, which provide a suitable buffer for assessment.

Table 9-3 PCT clearing in the subject site and total PCT in the study area.

PCT	Subject site (direct impact) ha	Study area (additional corridor surveyed) ha
Forest (total)	**0.60**	**47.26**
Coast Grey Box - Mountain Grey Gum - stringybark moist shrubby open forest in coastal gullies, southern South East Corner Bioregion (PCT 777)	0.03	3.83
Ironbark - Woollybutt - White Stringybark open forest on coastal hills, South East Corner Bioregion (PCT 891)	0.38	8.40
Red Bloodwood - Silvertop Ash - White Stringybark heathy open forest on coastal foothills, southern South East Corner Bioregion (PCT 1084)	0.06	23.04
Silvertop Ash - Rough-barked Apple shrubby open forest on the hinterland hills, far southern South East Corner Bioregion (PCT 1157)	0.13	11.99
Heath (total)	**2.21**	**39.85**
Bracelet Honey-myrtle - Coast Tea tree tall shrubland on headlands, South East Corner bioregion (PCT 721).	1.89	30.20
Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion (PCT 772)	0.24	7.43
Scrub She-oak - Swamp Banksia coastal lowland heath, southern South East Corner Bioregion (PCT 1141)	0.08	2.22
Total	**2.81**	**87.11**

Note these figures assume that PCTs extent have not changed post fire event.

Table 9-4 Indirect impacts.

Indirect impacts	On-site/off-site	Duration	Relevant Activity Area
Construction			
Overclearing	On-site	Long-term	All activities
Trampling or compaction caused by dragging or piling cleared vegetation in adjacent areas	Adjacent site	Short-term	All activities
Predation by feral animals	On-site	Long-term	All activities
Displacement of resident fauna through vegetation clearing and habitat removal	On-site	Long-term	All activities
Loss of shade/shelter	On-site	Long-term	All activities

Indirect impacts	On-site/off-site	Duration	Relevant Activity Area
Reduction in viability of adjacent habitat due to edge effects	On-site	Long-term	All activities
Erosion and sedimentation	On-site	Long-term	All activities
Introduction and spread of noxious weeds and pathogens	On-site	Long-term	All activities
Disturbance caused by increased human activity	On-site	Long-term	All activities
Disturbance to marine mammals (i.e. seals)	On-site – at seal haul-out at Mowarry Point	Long-term	Seal haul-out at Mowarry Point
Operation			
Displacement of resident fauna through increased human activity	On-site	Long-term	All activities
Disturbance to marine mammals (i.e. seals) due to an increase in human activity	On-site – at seal haul-out at Mowarry Point	Long-term	Seal haul-out at Mowarry Point

9.2 Key threatening processes

The proposed activity may contribute to the following listed key threatening processes (KTPs). The KTPS are managed as per the mitigation measures recommended in Table 8-1

Table 9-5 KTPs relevant to the site.

BC Act	Relevance
Clearing of native vegetation	• The proposed activity will contribute to the unavoidable net loss of 2.53 ha of native vegetation for Activities 1 and 2; in the short term where a new track is replacing an existing one until complete rehabilitation of the existing track to be replaced has been achieved, and permanently where a new track is constructed. A further 0.30 ha would be cleared for Activity 3.
Loss of hollow-bearing trees	• The proposed activity may contribute to indirect impact on hollow-bearing tree and so the KTP loss of hollow-bearing trees is considered. Within the proposed works corridor, there are 51 marked hollow-bearing trees, including mature trees with visible hollows - as well as several recruitment trees (DBH>50cm) - recorded in the following locations (see • Figure 7-1). • In mature wet sclerophyll forest (PCT 777) in the moist, protected gullies south of Disaster Bay. • in mature wet sclerophyll forest (PCT 777) in the sheltered gully in Bittangabee Bay • in the dry sclerophyll forest on the southern-facing slope (PCT 1157) along the northern bank of Bittangabee Bay. • Along the access trail to Mowarry Creek (PCT 777 and PCT 1157)

BC Act	Relevance
	• In mature wet sclerophyll forest (PCT 777) south of Leatherjacket Bay.
Removal of dead wood and dead trees	• Dead wood is present throughout the subject site
Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands	• The proposed activity may contribute to the alteration of flow regimes of streams as several crossings are required. The proposal does not include work in floodplains and wetlands.
Infection of native plants by *Phytophthora cinnamomi*	• The proposed activity may facilitate the spread of *Phytophthora cinnamomi* through the landscape on equipment machinery or boots.
Herbivory and environmental degradation caused by feral deer	• The proposal to realign and reinstate track sections may contribute to increased deer presence by facilitating movement in the landscape; in the short term where a new track realignment replaces an existing one (disturbance and associated with construction work, time lag before old track is rehabilitated).
Predation by the European Red Fox”	• The proposal to realign and reinstate track sections may contribute to increased fox predation pressure by facilitating fox movement in the landscape; in the short term where a new track realignment replaces an existing one (disturbance and associated with construction work, time lag before old track is rehabilitated).
Predation by the Feral Cat *Felis catus*	• The proposal to realign and reinstate track sections may contribute to increased cat predation pressure by facilitating movement through the landscape; in the short term where a new track realignment replaces an existing one (disturbance and associated with construction work, time lag before old track is rehabilitated).
Invasion of native plant communities by exotic perennial grasses	• The proposed activity may contribute to the invasion of native plant communities by exotic grasses
High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	• Not relevant to the project. No aspect of the proposal is considered to increase the likelihood of fire frequency in the study area.

9.3 Impacts to threatened species, populations and their habitat

ToS', set out in Appendix B, characterised the impacts to 31 species.

Taking into consideration the impacts of the 2019/2020 bushfire, suitable breeding and foraging habitat in adjoining habitat remains in some areas, and the limited loss of foraging, nesting, roosting and denning resources caused by the proposal is unlikely to place any of the threatened fauna or flora species at risk of extinction. More mobile species (e.g. birds and bats) are unlikely to rely on burnt areas of the site until vegetation exhibits substantial recovery. However, recovery within 10 months was evident, therefore by the time construction begins, habitat for flora and fauna species at the subject site and in adjacent areas of the national park are likely to be extensive.

Recommendations have been made (see Table 8-1) to ensure impacts are avoided and minimised when they occur to a relevant threatened species (those assessed to have a moderate to high likelihood of occurrence):

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Table 9-6 Impacts to threatened entities

Threatened species	Habitat resources available within subject land	Area of habitat (ha) within subject land or number of features	Area of habitat loss (ha) within subject site or number of features
Flora			
Leafless Tongue Orchid (*Cryptostylis hunteriana*)	PCT 1141	2.22	0.08
Matted Bush Pea (*Pultenaea pedunculata*)	Loamy soils PCT 721	30.2	1.89
Hidden Violet (*Viola cleistogamoides*)	PCT 1141	2.22	0.08
Hollow-dependent forest owls and parrots			
Barking Owl (*Ninox connivens*)	Hollow-bearing trees PCT 772, 777, 1084, 1157, 891	49 54.69	0 0..84
Masked Owl (*Tyto novaehollandiae*)	Hollow-bearing trees PCT 891, 1157, 1084, 777, 772	49 54.69	0 0.84
Powerful Owl (*Ninox strenua*)	Hollow-bearing trees PCT 891, 1157, 1084, 777, 772	49 54.69	0 0.84
Sooty Owl (*Tyto tenebricosa*)	Tree hollows, caves PCT 891, 777, 772	49 19.66	0 0.66
Glossy-black Cockatoo (*Calyptorhynchus lathami*)	Hollow-bearing trees, *Allocasuarina littoralis* and *A. torulosa* PCT 721, 772, 777, 1141, 1084, 1157, 891	49 87.11	0 2.82

Threatened species	Habitat resources available within subject land	Area of habitat (ha) within subject land or number of features	Area of habitat loss (ha) within subject site or number of features
Gang-gang Cockatoo (*Callocephalon fimbriatum*)	Hollow-bearing trees 777, 891, 1084, 1157	49 47.26	0 0.60
Little Lorikeet (*Glossopsitta pusilla)*	Riparian habitat, Hollows in smooth-barked Eucalypts PCT 772, 777, 891	19.66	0.66
Turquoise Parrot (*Neophema pulchella)*	Hollow-bearing trees and logs PCT 1141	49 2.22	0 0.08
Woodland birds			
Dusky Woodswallow (*Artamus cyanopterus cyanopterus*)	Hollow logs PCTs 721, 772, 777, 891, 1157, 1084, 1141	87.11	0 2.82
Varied Sittella (*Daphoenositta chrysoptera)*	Dead branches PCT 772, 777, 891, 1157, 1084, 1141	56.91	0 0.93
Flame Robin *(Petroica phoenicea)*	PCT 891, 1157, 1084, 721	73.63	2.46
Heathland birds			
Striated Fieldwren (*Calamanthus fuliginosus*)	PCT 721,1141	32.42	1.97
Eastern Bristlebird (*Dasyornis brachypterus)*	PCT 721, 772, 1141	39.85	2.21
Eastern Ground Parrot (*Pezoporus* wallicus wallicus)	PCT 721, 1141	32.42	1.97
Hollow-dependent bats			

Threatened species	Habitat resources available within subject land	Area of habitat (ha) within subject land or number of features	Area of habitat loss (ha) within subject site or number of features
Eastern Freetail Bat (*Mormopterus norfolkensis*)	Hollow-bearing trees PCT 772, 777, 891	49 19.66	0 0.66
Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)	Hollow-bearing trees PCT 777, 891, 1141, 1084, 1157	49 49.48	0 0.68
Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)	Hollow-bearing trees PCT 772	49 7.43	0 0.24
Greater Broad-nosed Bat (*Scoteanax rueppellii)*	Hollow-bearing trees PCT 772, 777, 891, 1141, 1084, 1157	49 56.91	0 0.93
Southern Myotis (*Myotis macropus*)	Hollow-bearing trees, Caves PCT 772, 777, 1141	49 13.48	0 0.36
Hollow-dependent arboreal mammals			
Yellow-bellied Glider (*Petaurus australis*)	Hollow-bearing trees PCT 772, 777, 891, 1084	49 42.70	0 0.72
Eastern Pygmy-possum (*Cercartetus nanus*)	Hollow-bearing trees Nectar species PCT 721, 772, 777, 1141, 1084, 1157, 891	>49 87.11	0 2.82
Ground-dwelling small mammals			

Threatened species	Habitat resources available within subject land	Area of habitat (ha) within subject land or number of features	Area of habitat loss (ha) within subject site or number of features
Spotted-tailed Quoll (*Dasyurus maculatus maculatus*)	Hollow-bearing trees, Logs, Caves, rock outcrops, rocky cliff faces PCT 777, 1141, 1084, 1157, 891	49.48	0.68
Long-nosed Potoroo (*Potorous tridactylus*)	Sandy loam soil PCT 721, 772, 777,1141	43.68	2.25
Long-footed Potoroo (*Potorous longipes*)	Fungi	87.11	2.82
Southern Brown Bandicoot (*Isoodon obesulus obesulus*)	Sandy or friable soils, Grass trees (*Xanthorrhoea* spp.) PCT 721, 772, 777, 1141, 1084, 1157, 891	87.11	2.82
Smoky mouse (*Pseudomys fumeus*)	Woody debris, Rocks,Grass trees (*Xanthorrhoea* spp.) PCT 1084	23.04	0.06
Eastern Chestnut Mouse (*Pseudomys gracilicaudatus*)	PCT 721, 772	37.63	2.13
White-footed Dunnart (*Sminthopsis leucopus*)	Hollows, fallen timber, Rock crevices PCT 721, 772, 1141, 1157	51.84	2.34

10. Conclusion

The National Parks and Wildlife Service (NPWS) propose to undertake a series of works within the Ben Boyd National Park along the New South Wales Far South Coast. The proposal consists of three separate activities; Activity 1 – Walking track , Activity 2 – Accommodation and facilities, and Activity 3 – Vehicle and site access. These activities all occur within the

The proposal area contains 6.02 ha of native vegetation that will be impacted either directly or indirectly. Seven Plant Community Types are found within this area, however, none are congruent with the BC Act or EPBC Act listed Threatened Ecological Communities.

A total of 31 threatened species were identified as likely to occur on site and with a potential to be impacted. Each species was addressed in a Test of Significance (BC Act listed species) or Assessment of Significance (EPBC Act listed species). Each assessment concluded that a significant impact is not considered likely considering measures accounted for in the planning of the proposal, the recommended mitigation measures and the relatively small extent of clearing considering the vegetation present within the study area. No threatened species are considered to be at risk of significant impacts. Potential impacts to migratory species were also assessed. Significant impacts are deemed unlikely for any EPBC listed migratory species.

Most of the mitigation measures recommended for the proposal are commonplace and are proven to be effective. With the effective implementation of safeguards and mitigation measures identified in this assessment, risk of impacts to biodiversity can be minimised to negligible levels.

11. Recommendations

Species-specific recommendations developed through the characterisation of significance (as set out in the Five 5-part Tests) have been developed into activity-based mitigation strategies that will be incorporated into a Biodiversity Management Plan. Refer to Table 8-1 for all required mitigation measures that will be implemented in the design, pre-construction, construction and operational stages of the proposal.

The objectives of these mitigation measures include:

- Minimising the impacts of habitat removal on native flora and fauna and their habitat
- Limiting edge effects
- Preventing inadvertent clearing of vegetation outside the development footprint
- Preventing overclearing to ensure there are no indirect impacts to native vegetation and habitat during construction
- Preparing a vegetation management plan to regulate activities in vegetation and habitat adjacent to the proposed development
- Controlling feral predators
- Minimising damage to native fauna and their habitat
- Prevent indirect impacts to native vegetation and habitat during operation due to an increase in human access
- Preventing erosion and sedimentation impacts during construction
- Preventing the introduction and spread of noxious weeds and pathogens
- Maintaining aquatic habitat
- Minimising disturbance to marine mammals (i.e. seals)

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Appendix A Threatened entity evaluation table

The table below evaluate the potential for threatened species, ecological communities and endangered populations that are known to occur within a 10 km radius surrounding the study area which may be affected by the works. Candidate species and communities for evaluation were determined using the following online database search tools:

- NSW OEH Bionet Atlas database for species, populations and communities listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- NSW Department of Primary Industries DPI Fisheries Threatened Species website for species and communities listed under the *Fisheries Management Act 1994* (FM Act); and
- Commonwealth EPBC Act Protected Matters Search Tool and SPRAT database for threatened species and communities listed under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The likelihood of occurrence is based on presence of habitat, proximity of nearest records and mobility of the species. The assessment of potential impact is based on the nature of the proposal, the ecology and sensitivity of the species and its likelihood of occurrence. The evaluation table includes key ecological information about the threatened entity and how the proposal may impact on it. Note that no impacts are foreseen on the marine environment and as such exclusively marine species have been excluded from this table.

The following categories and terms are used:

Presence of habitat:

Present:	Potential or known habitat present in the study area
Absent:	No potential or known habitat present in the study area
Marginal:	Some habitat elements present in the study area, potential affected by site disturbance factors or distant from known distribution range

Likelihood of occurrence

Unlikely:	Species known or predicted within the locality but unlikely to occur in the study area based on habitat quality and/or field investigations
Possible:	Species could occur in the study area based on habitat and distribution range
Present:	Species was recorded during the field investigations, or previous records exist for the study area

Possibility of impact

No:	The proposal would not adversely impact this species or its habitats. No 5-part Test is necessary
Yes:	The proposal could adversely impact this species or its habitats. A 5-part Test may be required.

The distribution and habitat information used in the evaluation has been sourced from species profiles in the online OEH threatened species database, Commonwealth Species Profiles and Threats database (SPRAT) or relevant listing determinations unless otherwise stated.

Acronyms and abbreviations

BC Act	NSW *Biodiversity Conservation Act 2016*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FM Act	NSW *Fisheries Management Act 1994*
CE	Listed as Critically Endangered (species or ecological community)
E	Listed as Endangered
P	Listed as Priority Species
V	Listed as Vulnerable
M	Migratory
SCS	Listed as a Species Credit Species under the BAM
ECS	Listed as an Ecosystem Credit Species under the BAM.

Threatened Ecological Community / Species	Ecology	Threatened Status	Presence of habitat	Likelihood of occurrence	Potential for impact	Significant impact? (5-part test)	Survey required?	Outcome
Ecological Communities								
Araluen Scarp Grassy Forest in the South East Corner Bioregion	Open forest or grassy woodland dominated by Maiden's Gum (*Eucalyptus maidenii*), Yellow Box (E. *melliodora*) and Forest Red Gum (*E. tereticornis*) in the canopy. Rough-barked Apple (*Angophora floribunda*), White Stringybark (*E. globoidea*) and Black Wattle (*Acacia mearnsii*) are common associated overstorey species. An open shrub layer may contain Tree Violet (*Hymenanthera dentata*), Sweet Pittosporum (*Pittosporum undulatum*) and various vines and climbers. The grassy groundlayer is generally sparse, and may contain Weeping Grass (*Microlaena stipoides*), Common Tick-trefoil (*Desmodium var*ians), Creeping Beard Grass (*Oplismenus imbe*cillis), Sickle Fern (*Pellaea falcata*) and Prickly Starwort (*Stellaria pungens*). The structure of the community varies depending on past and current disturbances, particularly clearing, selective firewood harvesting and grazing.	BC-E	Absent (Not found within Study Area)	Unlikely	No	No	No	NA
Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions	Dense to open tree canopy, 5 – 20 m tall. Common tree species include Bangalay (*Eucalyptus botryoides*) and Coast Banksia (*Banksia integrifolia subsp. integrifolia*). Blackbutt (*Eucalyptus pilularis*) and Lilly Pilly (*Acmena smithii*) may occur in more sheltered situations. Swamp Oak (*Casuarina glauca*) may occur on dunes. Shrub stratum may be dominated by sclerophyllous species and/or mesophyllous, species. Groundcover species include Flax-lilies (*Dianella spp.*), *Lepidosperma concavum*, Spiny-headed Mat-rush (*Lomandra longifolia*), Bracken (*Pteridium esculentum*), and grasses including Blady Grass (*Imperata cylindrica*), Weeping Grass (*Microlaena stipoides var. stipoides*) and Kangaroo Grass (*Themeda australis*)	BC-E	Absent (Not found within Study Area)	Unlikely	No	No	No	NA
Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Occurs in the intertidal zone on the shores of estuaries and lagoons that are permanently or intermittently open to the sea. Frequently found as a zone on the landward side of mangrove stands. Plants include *Baumea juncea*, Sea Rush (*Juncus krausii subsp. australiensis*), Samphire (*Sarcocornia quinqueflora subsp. quinqueflora*), Marine Couch (*Sporobolus virginicus*), Streaked Arrowgrass (*Triglochin striata*), Knobby Club-rush (*Ficinia nodosa*), Creeping Brookweed (*Samolus repens*), Swamp Weed (*Selliera radicans*), Seablite (*Suaeda australis*) and Prickly Couch (*Zoysia macrantha*). Occasionally mangroves are scattered through the saltmarsh. Tall reeds may also occur, as well as salt pans.	BC-E EPBC-V	Absent (Not found within Study Area)	Unlikely	No	No	No	NA
Dry Rainforest of the South East Forests in the South East Corner Bioregion	Dominated by Port Jackson Fig *Ficus rubiginosa* which forms a dense canopy to about 10 m tall. Sweet *Pittosporum Pittosporum unudulatum, Kurrajong Brachychiton populneus* and a scattered emergent tree layer of Coast Grey Box *Eucalyptus bosistoana* and Forest Red Gum *E. tereticornis* also occur occasionally. A sparse shrub layer may include Tree Violet *Hymenanthera dentatum* and Mock Olive *Notelea venosa.* The groundlayer is also sparse and includes *Plectranthus graveolans*, *Sigesbeckia orientalis, Pellaea falcata*, and the grass, *Oplismenus imbecillis.*	BC-E	Absent (Not found within Study Area)	Unlikely	No	No	No	NA
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Found in coastal areas subject to periodic flooding and in which standing fresh water persists for at least part of the year in most years. Typically occurs on silts, muds or humic loams. Dominated by herbaceous plants and have very few woody species. Those that usually lack standing water dominated by dense grassland or sedgeland vegetation, often forming a turf less than 0.5m tall and dominated by amphibious plants. If subject to regular inundation and drying, vegetation may include large emergent sedges over 1m tall. As standing water becomes deeper or more permanent, amphibious and	BC-E	Absent (Not found within Study Area)	Unlikely	No	No	No	NA

Threatened Ecological Community / Species	Ecology	Threatened Status	Presence of habitat	Likelihood of occurrence	Potential for impact	Significant impact? (5-part test)	Survey required?	Outcome
	emergent plants become less abundant, while floating and submerged aquatic herbs become more abundant.							
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Occurs as a series of naturally disjunct and localised stands, on a range of landforms which have been influenced by coastal processes including dunes and flats, headlands and sea-cliffs. Typically has tall trees as part of canopy, and contains shrubs, vines, herbs, ferns and epiphytes.	EPBC-CE	Absent (Not found within Study Area)	Unlikely	No	No	No	NA
Lowland Grassy Woodland in the South East Corner Bioregion	Associated with rainshadow areas of the south coast and hinterland of NSW. comprises an open tree canopy, a near-continuous groundcover dominated by grasses and herbs, sometimes with layers of shrubs and/or small trees. Undisturbed stands of the community may have a woodland or forest structure. Small trees or saplings may dominate the community in relatively high densities after partial or total clearing. Also includes 'derived' native grasslands which result from removal of the woody strata from the woodlands and forests.	BC-E EPBC-CE	Absent (Not found within Study Area)	Unlikely	No	No	No	NA
Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions	Dense, open or sparse layer of shrubs with soft-leaved sedges, grasses and forbs. May contain more than trace amounts of *Sphagnum spp*., the hummock peat-forming mosses. Small trees may be present as scattered emergents or absent. Has an open to very sparse layer of shrubs, 1-5m tall, though this layer may be very sparse or absent. Have dense groundcover of sedges, grasses and forbs, except where a dense cover of tall shrubs casts deep shade. Forbs growing amongst the sedges include *Drosera spp*., *Geranium neglectum, Gratiola spp., Mitrasacme serpyllifolia, Ranunculus spp.* and *Viola spp*. Hummocks of *Sphagnum* moss may occur amongst other components of the ground layer.	BC-E EPBC-E	Absent (Not found within Study Area)	Unlikely	No	No	No	NA
River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Comprises river flats of the coastal floodplains. Has a tall open tree layer of eucalypts, which may exceed 40m in height. While the composition of the tree stratum varies considerably, the most widespread and abundant dominant trees *include Eucalyptus tereticornis* (forest red gum), *E. amplifolia* (cabbage gum), *Angophora floribunda* (rough-barked apple) and *A. subvelutina* (broad-leaved apple). A layer of small trees may be present, along with scattered shrubs and groundcover composed of abundant forbs, scramblers and grasses.	BC-E	Absent (Not found within Study Area)	Unlikely	No	No	No	NA
River-flat eucalypt forest on coastal floodplains of Southern New South Wales and Eastern Victoria	This ecological community occurs on alluvial landforms related to coastal river floodplains. Floodplains may be occasionally or more often saturated, water-logged or inundated. The ecological community is typically found below 50 metres above sea-level (m ASL), although it can occur up to 250 m ASL (e.g. on floodplain pockets and plateaus above nick points). The ecological community occurs on alluvial soils of various textures, including silts, clay loams and sandy loams, gravel and cobbles.	EPBC-CE	Absent (Not found within Study Area)	Unlikely	No	No	No	NA
Subtropical and Temperate Coastal Saltmarsh	Mainly associated with the soft substrate shores of estuaries and embayments (sandy and/or muddy) and on some open, low wave energy coasts. consists mainly of salt-tolerant vegetation (halophytes) including: grasses, herbs, sedges, rushes and shrubs. Succulent herbs, shrubs and grasses generally dominate, and vegetation is generally of less than 0.5m. Many species of non-vascular plants are also found in saltmarsh, including epiphytic algae, diatoms and cyanobacterial mats. Characteristic species include *Austrostipa stipoides* (spear grass), Gahnia filum (clumped sedge, can grow up to 1.5 m), *Juncus kraussii* (sea rush), and *Samolus repens* (creeping brookweed, water pimpernel).	EPBC-V	Absent (Not found within Study Area)	Unlikely	No	No	No	NA

Threatened Ecological Community / Species	Ecology	Threatened Status	Presence of habitat	Likelihood of occurrence	Potential for impact	Significant impact? (5-part test)	Survey required?	Outcome
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	Found on the coastal floodplains of NSW. It has a dense to sparse tree layer in which *Casuarina glauca* (swamp oak) is the dominant species northwards from Bermagui. Tree diversity decreases with latitude, and *Melaleuca ericifolia* is the only abundant tree in this community south of Bermagui. Understorey is characterised by frequent occurrences of vines, a sparse cover of shrubs, and a continuous groundcover of forbs, sedges, grasses and leaf litter. Ground stratum varies depending on levels of salinity in the groundwater. Under less saline conditions prominent ground layer plants include forbs. On the fringes of coastal estuaries, where soils are more saline, the ground layer may include the threatened grass species, *Alexfloydia repens*, as well as *Baumea juncea, Juncus kraussii, Phragmites australis, Selliera radicans.*	BC-E	Absent (Not found within Study Area)	Unlikely	No	No	No	NA
Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions	Occurs as an open-forest, woodland or open woodland. May also occur as a secondary grassland where the trees have been removed, but the groundlayer remains. Main tree species are *Eucalyptus pauciflora* (Snow Gum), *E. rubida* (Candlebark), *E. stellulata* (Back Sallee) and *E. viminalis* (Ribbon Gum). Other eucalypt species may occur. A shrub layer may be present and sub-shrubs are common. The ground layer is grassy, with the most common species including *Themeda australis* (Kangaroo Grass), *Poa spp.* (snow-grasses), *Austrostipa spp*. (spear-grasses) and *Rytidosperma spp.* (wallaby-grasses). Sites in high condition have a range of forb (wildflower) species, including Leptorhynchos squamatus (Scaly-buttons), Commonly occurs on valley floors, margins of frost hollows and on footslopes and undulating hills. It occurs between approximately 600 and 1400 m in altitude on a variety of substrates.	BC-E	Absent (Not found within Study Area)	Unlikely	No	No	No	NA
Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions	*Themeda australis* is the dominant species, and it may have a distinctive appearance. *Banksia integrifolia subsp. integrifolia, Westringia fruticosa* and *Acacia sophora*e occurs as an emergent shrub or as a dense cover. Smaller shrubs occur often as prostrate to dwarf forms. Woody species are usually sparsely distributed and may be absent from some stands. *Poa poiformis*-dominated tussock grassland is generally found lower on cliffs and on steeper slopes. Other grasses include *Zoysia macarantha* and *Cynodon dactylon*. A number of threatened species occur in some stands of the community, including *Diuris sp. aff. chrysantha, Pultenaea maritima, Rutidosus heterogama, Thesium australe* and *Zieria prostrata*.	BC-E	Absent (Not found within Study Area)	Unlikely	No	No	No	NA
Fauna								
Frogs								
Giant Burrowing Frog (*Heleioporus australiacus*)	Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based.	BC-V EPBC-V	Present	Unlikely Not detected in targeted surveys	No	No	No Cryptic/may occur	Clear mgt measures to avoid impact
Green and Golden Bell Frog (*Litoria aurea)*	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (Typha spp.) or spikerushes (Eleocharis spp.) Optimum habitat includes unshaded water-bodies free of predatory fish, have a grassy area nearby and diurnal sheltering sites available.	BC-E	Present Very limited suitable habitat within the Study Area	Unlikely Not detected in targeted surveys One old (1979) record from Saltwater Creek	No	No	No Cryptic/may occur	Clear mgt measures to avoid impact
Stuttering Frog (Mixophyes balbus)	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	BC-E EPBC-V	Absent	Unlikely	No	No	No	NA

Threatened Ecological Community / Species	Ecology	Threatened Status	Presence of habitat	Likelihood of occurrence	Potential for impact	Significant impact? (5-part test)	Survey required?	Outcome
	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. Occur along the east coast of Australia from southern Queensland to north-eastern Victoria.		Occurs in foothills and escarpment country not coastal headlands. No suitable habitat within the Study Area					
Birds								
Regent Honeyeater *Anthochaera phrygia*	Inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Large numbers of mature trees, high canopy cover and abundance of mistletoes.	BC-CE EPBC-CE CE	Absent	Unlikely	No	No	No	NA
Flesh-footed Shearwater *Ardenna carneipes*	Marine, and nests on Lord Howe Island in forests on sandy soils from Ned's Beach to Clear Place, with smaller colonies below Transit Hill and at Old Settlement Beach.	BC-V EPBC-J,K J,K	Absent	Unlikely	No	No	No	NA
Dusky Woodswallow *Artamus cyanopterus cyanopterus*	Inhabits dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. Shrublands, heathlands, occasionally in moist forest or rainforest. Farmland, usually at the edges of forest or woodland. Nest sites 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.	BC-V	Present	Present Records at Pulpit Rock and Mowarry Creek access trails	Yes Breeding and foraging habitat occur within the Study Area	No See 5-part Test Woodland birds	No Presence established	Clear mgt measures to avoid impact (timing of construction, pre-construction surveys)
Australasian Bittern *Botaurus poiciloptilus*	Inhabits permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (Typha spp.) and spikerushes (Eleocharis spp.).	BC-E EPBC-E	Absent	Unlikely	No			
Striated Fieldwren *Calamanthus fuliginosus*	Occurs in ground and understorey vegetation, and can be found in swampy, coastal heathlands, tussocky grasslands, low shrubby vegetation and margins of swamps.	BC-E	Present Coastal heathland, tussocky grassland, low shrubby vegetation	Present Records at Saltwater Creek, north of Saltwater Creek. West of Bittangabee Bay, Green Cape, east of City Rock	Yes Breeding and foraging habitat occur within the Study Area	No See 5-part Test Heathland birds	No Cryptic/may occur	Clear mgt measures to avoid impact (timing of construction, pre-construction surveys)
Red Knot *Calidris canutus*	Mainly inhabits 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. Occasionally seen on terrestrial saline wetlands near the coast: lakes, lagoons, pools and pans. Recorded on sewage ponds and saltthe works.	EPBC-E	Absent	Unlikely	No	No	No	NA
Curlew Sandpiper *Calidris ferruginea*	Occurs in littoral and estuarine habitats, intertidal mudflats of sheltered coasts. Occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	BC-E EPBC-CE	Absent	Unlikely	No	No	No	NA
Gang-gang Cockatoo *Callocephalon fimbriatum*	Spring and summer: inhabits tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. Autumn and winter: occurs in 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 occur in sub-alpine Snow Gum woodland and temperate rainforests.	BC-V	Present Breeding habitat (hollow-bearing trees)	Present Records at Bittangabee Bay, Boyds and City Rock	Yes Hollow-dependent breeder	No See 5-part Test Hollow-dependent parrots	No Presence established	Clear mgt measures to avoid impact (avoid impact on HBT, timing of construction, pre-construction surveys)

Threatened Ecological Community / Species	Ecology	Threatened Status	Presence of habitat	Likelihood of occurrence	Potential for impact	Significant impact? (5-part test)	Survey required?	Outcome
Glossy Black-Cockatoo *Calyptorhynchus lathami*	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. In Riverina, hills and rocky rises supporting Drooping Sheoak, also recorded in open woodlands dominated by Belah (Casuarina cristata).	BC-V	Present Breeding habitat (hollow-bearing trees) and foraging habitat	Present Species was recorded along the access trail to Mowarry Pt. during field investigations, and have also been recorded along the track between Bittangabee and Green Cape	Yes Hollow-dependent breeder	No See 5-part Test Hollow-dependent parrots	No Presence established	Clear mgt measures to avoid impact (avoid impact on HBT, timing of construction, pre-construction surveys)
Brown Treecreeper (eastern subspecies) *Climacteris picumnus victoriae*	Occurs in eucalypt woodlands (including Box-Gum Woodland) and dry open forest; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species. 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. Found less commonly in similar woodland habitats on the coastal ranges and plains.	BC-V	Present	Unlikely One record at Bittangabee Bay	No	No	No	NA
Varied Sittella *Daphoenositta chrysoptera*	Occurs in eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	BC-V	Present Breeding and foraging habitat	Likely Records at Saltwater Creek and Bittangabee Bay	Yes Breeding and foraging habitat occur within the Study Area	No See 5-part Test Woodland birds	No	Clear mgt measures to avoid impact (timing of construction, pre-construction surveys)
Eastern Bristlebird *Dasyornis brachypterus*	Inhabits dense, low vegetation including heath and open woodland with a heathy understorey. In northern NSW, habitat occurs in open forest with dense tussocky grass understorey and sparse mid-storey near rainforest ecotone; all of these vegetation types are fire prone.	BC-E EPBC-E	Present Coastal heathland, tussocky grassland, low shrubby vegetation	Possible	Yes Breeding and foraging habitat occur within the Study Area	No See 5-part Test Heathland birds	No Cryptic/May occur	Clear mgt measures to avoid impact (timing of construction, pre-construction surveys)
Antipodean Albatross *Diomedea antipodensis*	Breeds on Antipodes Island, with a small number of pairs breeding on Campbell Island. Breed occurss on ridges, slopes and plateaus of isolated subantarctic islands, usually in vegetation such as grass tussocks.	BC-V EPBC-V	Absent	Unlikely	No	No	No	NA
Gibson's Albatross *Diomedea antipodensis gibsoni*	Marine, pelagic and aerial. In the Antarctic, it occurs in open water. In late summer, it may approach the edge of the pack-ice. On breeding islands, the nests on coastal or inland ridges, slopes, plateaux and plains, often on marshy ground. Nests are sited on moss terraces, in dense tussocks, and often in loose aggregations on the west (windward) side of islands. It prefers open or patchy vegetation (tussocks, ferns or shrubs), and requires nesting areas that are near exposed ridges or hillocks.	EPBC-V	Absent	Unlikely	No	No	No	NA
Southern Royal Albatross *Diomedea epomophora*	Spends most of its time over the open oceans, and only comes to land to breed. Nesting typically occurs on tussock grassland slopes, ridges and plateaus.	EPBC-V	Absent	Unlikely	No	No	No	NA
Wandering Albatross *Diomedea exulans*	Occurs in southern Oceans. Breeding takes place on exposed ridges and hillocks, amongst open and patchy vegetation.	BC-E EPBC-E E	Absent	Unlikely	No	No	No	NA
Northern Royal Albatross *Diomedea sanfordi*	Marine, pelagic and aerial. Habitat includes subantarctic, subtropical, and occasionally Antarctic waters. Nests on flat or gently sloping ground, on slopes, ridges, gullies and plateaux of large islands, and on the summits of islets. Depressions, gullies, lee slopes and vegetation provide shelter for nests. Nests are placed among vegetation that are open enough for adults to easily walk through.	EPBC-E	Absent	Unlikely	No	No	No	NA

Threatened Ecological Community / Species	Ecology	Threatened Status	Presence of habitat	Likelihood of occurrence	Potential for impact	Significant impact? (5-part test)	Survey required?	Outcome
Beach Stone-curlew *Esacus magnirostris*		BC-CE						
White-bellied Storm-Petrel (Tasman Sea) *Fregetta grallaria rallaria*	Marine. In Australia breeds only on offshore islands in the Lord Howe Island group. Nest consists of a chamber usually located amongst large rocks. Vagrant birds occur in coastal NSW waters, particularly after storm events.	BC-V EPBC-V	Absent	Unlikely	No	No	No	NA
Little Lorikeet *Glossopsitta pusilla*	Occurs in open Eucalyptus forest and woodland, also in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used. Isolated flowering trees in open country. Nests in proximity to feeding areas if possible, most typically selecting hollows in the limb or trunk of smooth-barked Eucalypts.	BC-V	Present Breeding habitat (hollow-bearing trees)	Possible	Yes Hollow-dependent breeder	No See 5-part Test Hollow-dependent parrots	No	Clear mgt measures to avoid impact (avoid impact on HBT, timing of construction, pre-construction surveys)
Painted Honeyeater *Grantiella picta*	Occurs in Boree/ Weeping Myall (*Acacia pendula*), Brigalow (*A. harpophylla*) and Box-Gum Woodlands and Box-Ironbark Forests. Feeds on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus *Amyema*.	BC-V EPBC-V	Absent	Unlikely	No	No	No	NA
Sooty Oystercatcher *Haematopus fuliginosus*	Inhabits rocky headlands, rocky shelves, and exposed reefs with rock pools, beaches and muddy estuaries. Forages on exposed rock or coral at low tide. Breeds in spring and summer, almost exclusively on offshore islands, and occasionally on isolated promontories.	BC-V	Present	Present Records at Bittangabee Bay, Saltwater Creek and Green Cape	No Limited suitable foraging and breeding habitat within the Study Area	No	No	NA
Pied Oystercatcher *Haematopus longirostris*	Inhabits intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide. Nests mostly on coastal or estuarine beaches, occasionally use saltmarsh or grassy areas.	BC-E	Present	Present Records at Saltwater Creek	No Limited suitable foraging and breeding habitat within the Study Area	No	No	NA
White-bellied Sea-Eagle *Haliaeetus leucogaster*	Found near large areas of open water including larger rivers, swamps, lakes, and the sea. 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 emergent eucalypts.	BC-V	Present Breeding habitat NOT found within the Study Area (targeted survey was carried out as part of this assessment)	Present Common in the Study Area	No Limited suitable foraging habitat within the Study Area	No	No	NA
Blue Petrel *Halobaena caerulea*	It is circumpolar, ranging from pack ice to 30° S. It breeds on offshore stacks near Macquarie Island. It is also known to breed on a number of other islands in the southern Atlantic and Indian Oceans. On mainland Australia, the species is mainly seen between July and September.	EPBC-V	Absent	Unlikely	No	No	No	NA
Little Eagle *Hieraaetus morphnoides*	Occurs in open eucalypt forest, woodland or open woodland. She oak or Acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch.	BC-V	Present Breeding habitat NOT found within the Study Area (targeted survey carried out as part of this assessment)	Possible	No	No	No	NA
White-throated Needletail *Hirundapus caudacutus*	Arrive in Australia from their breeding grounds in the northern hemisphere in about October each year and leave somewhere between May and August. Are non-breeding migrants in Australia. Breeding takes place in northern Asia.	BC-V EPBC-M	Foraging habitat present. Breeding habitat absent.	Likely	No, minor areas of vegetation clearing will not impact the suitability of this	No	No	

Threatened Ecological Community / Species	Ecology	Threatened Status	Presence of habitat	Likelihood of occurrence	Potential for impact	Significant impact? (5-part test)	Survey required?	Outcome
					vegetation for foraging			
Swift Parrot *Lathamus discolor*	Occurs where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Commonly used lerp infested trees include Inland Grey Box E. *microcarpa*, Grey Box *E. moluccana* and Blackbutt *E. pilularis*.	BC-E EPBC-CE	Absent	Unlikely	No	No	No	NA
Western Alaskan Bar-tailed Godwit *Limosa lapponica bauera*	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, coastal sewage farms and saltthe works, 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. Forages near the edge of water or in shallow water, mainly in tidal estuaries and harbours. Prefer soft mud; often with beds of eelgrass Zostera or other seagrasses. Occasionally they have been known to forage among mangroves, or on coral reefs or rock platforms among rubble, crevices and holes. Usually roosts on sandy beaches, sandbars, spits and also in near-coastal saltmarsh.	BC-V	Absent	Unlikely	No	No	No	NA
Northern Siberian Bar-tailed Godwit *Limosa lapponica menzbieri*		EPBC-CE	Absent	Unlikely	No	No	No	NA
Square-tailed Kite *Lophoictinia isura*	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a 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.	BC-V	Present Breeding habitat NOT found within the Study Area (targeted survey carried out as part of this assessment)	Possible	No	No	No	NA
Southern Giant Petrel *Macronectes giganteus*	Over summer, nests in small colonies amongst open vegetation on Antarctic and subantarctic islands, including Macquarie and Heard Islands and in Australian Antarctic territory.	BC-E EPBC-E	Absent	Unlikely	No	No	No	NA
Northern Giant Petrel *Macronectes halli*	Breeding in Australian territory is limited to Macquarie Island and occurs during spring and summer.	BC-V EPBC-V	Absent	Unlikely	No	No	No	NA
Orange-bellied Parrot *Neophema chrysogaster*	On the mainland, pends winter mostly within 3 km of the coast in sheltered coastal habitats including bays, lagoons, estuaries, coastal dunes and saltmarshes. Inhabits small islands and peninsulas and occasionally saltthe works and golf courses. Birds forage in low samphire herbland or taller coastal shrubland.	BC-CE EPBC-CE	Absent	Unlikely	No	No	No	NA
Turquoise Parrot *Neophema pulchella*	Found in the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland.	BC-V	Present Breeding habitat (hollow-bearing trees)	Possible	Yes Hollow-dependent breeder	No See 5-part	No	Clear mgt measures to avoid impact (avoid impact on HBT, timing of construction, pre-construction surveys)
Barking Owl *Ninox connivens*	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. Hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats.	BC-V	Present Breeding habitat (hollow-bearing trees)	Possible	Yes Hollow-dependent breeder	No See 5-part Test Hollow-dependent forest owls	No	Clear mgt measures to avoid impact (avoid impact on HBT, timing of construction, pre-construction surveys)
Powerful Owl *Ninox strenua*	Occurs in a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. Requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well.	BC-V	Present Breeding habitat (hollow-bearing trees)	Present Species recorded near Pulpit Rock during field investigations	Yes Hollow-dependent breeder	No See 5-part Test Hollow-	No	Clear mgt measures to avoid impact (avoid impact on HBT, timing of construction, pre-construction surveys)

Threatened Ecological Community / Species	Ecology	Threatened Status	Presence of habitat	Likelihood of occurrence	Potential for impact	Significant impact? (5-part test)	Survey required?	Outcome
						dependent forest owls		
Eastern Curlew *Numenius madagascariensis*	Inhabits sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Forages on soft sheltered intertidal sandflats or mudflats, open and without vegetation or covered with seagrass, often near mangroves, on saltflats and in saltmarsh, rockpools and among rubble on coral reefs, and on ocean beaches near the tideline. 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. It occasionally roosts on reef-flats, in the shallow water of lagoons and other near-coastal wetlands.	EPBC-CE, M	Absent	Unlikely	No	No	No	NA
Olive Whistler *Pachycephala olivacea*	Found in wet forests above about 500m. Winter: may move to lower altitudes.	BC-V	Absent	Unlikely	No	No	No	NA
Fairy Prion (southern) *Pachyptila turtur subantarctica*	Breeds on Macquarie Island and a number of other subantarctic islands outside of Australia. In Australia, breeding is recorded on two rock stacks off Macquarie Island and on the nearby Bishop and Clerk Island.	EPBC-V	Absent	Unlikely	No	No	No	NA
Eastern Osprey *Pandion cristatus*	Favours coastal areas, especially the mouths of large rivers, lagoons and lakes. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	BC-V	Present Breeding habitat NOT found within the Study Area; (targeted survey was carried out as part of this assessment)	Present	No	No	No	NA
Scarlet Robin *Petroica boodang*	Inhabits dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. Mature and regrowth vegetation. Occurs in Mallee or wet forest communities, or in wetlands and tea-tree swamps. Habitat usually contains abundant logs and fallen timber.	BC-V	Absent	Unlikely	No	No	No	NA
Flame Robin *Petroica phoenicea*	Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. In winter, migrate to drier more open habitats in the lowlands, in dry forests, open woodlands and in pastures and native grasslands, with or without scattered trees. Occasionally seen in heathland or other shrublands in coastal areas.	BC-V	Present Winter foraging habitat	Possible	Yes Foraging habitat occurs within the Study Area	No See 5-part Test	No	Clear mgt measures to avoid impact (timing of construction, pre-construction surveys)
Eastern Ground Parrot *Pezoporus wallicus wallicus*	Occurs in high rainfall coastal and near coastal low heathlands and sedgelands, generally below 1m in height and very dense (up to 90% projected foliage cover). Nests hidden under overhanging tall, coarse grass, sedge or low, heathy shrubs. The nest is usually screened from above and sides, often with a tunnel in the surrounding dense plants.	BC-V	Present Breeding and foraging habitat (heathland)	Present Recent record from Mowarry Point	Yes	No See 5-part Test	No Cryptic/may occur	Clear mgt measures to avoid impact (timing of construction, pre-construction surveys)
Sooty Albatross *Phoebetria fusca*	Found in subantarctic and subtropical marine waters. Nests on subantarctic islands including Prince Edwards Island, Iles Crozet, Iles des Apotres and Iles Kerguelen. Nests are located amongst vegetation on steep cliffs.	BC-V EPBC-V	Absent	Unlikely	No	No	No	NA
Gould's Petrel, Australian Gould's Petrel Pterodroma *leucoptera leucoptera*	Its principal nesting habitat is located within two gullies characterised by steeply, sloping rock scree with a canopy of Cabbage Tree Palms. Nest predominantly in natural rock crevices among the rock scree and in hollow fallen palm trunks, under mats of fallen palm fronds and in cavities among the buttresses of fig trees.	BC-V EPBC-E	Absent	Unlikely	No	No	No	NA
Providence Petrel *Pterodroma solandri*	Found in marine environments and nest on the tops of Mount Gower and Mount Lidgbird and to a less extent, on the lower slopes of the mountains.	BC-V EPBC-M	Absent	Unlikely	No	No	No	NA
Australian Painted-snipe, Australian Painted Snipe *Rostratula australis*	Occurs in the fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds.	BC-E EPBC-E E	Absent	Unlikely	No	No	No	NA

Threatened Ecological Community / Species	Ecology	Threatened Status	Presence of habitat	Likelihood of occurrence	Potential for impact	Significant impact? (5-part test)	Survey required?	Outcome
Australian Fairy Tern *Sternula nereis nereis*	Nests on sheltered sandy beaches, spits and banks above the high tide line and below vegetation. Has been found in embayments of a variety of habitats including offshore, estuarine or lacustrine (lake) islands, wetlands and mainland coastline. Roosts on beaches at night. Breeds on coral shingle on continental islands or coral cays, on sandy islands and beaches inside estuaries, and on open sandy beaches. They nest in clear view of the water and on sites where the substrate is sandy and the vegetation sparse.	EPBC-V	Present Limited suitable foraging and breeding habitat within the Study Area.	Possible	No areas of potential habitat will be impacted by the proposal.	No	No	NA
Buller's Albatross, Pacific Albatross *Thalassarche bulleri*	Marine and pelagic, inhabiting subtropical and subantarctic waters of the southern Pacific Ocean. Seen over inshore, offshore and pelagic waters. They appear to congregate over currents where water temperature exceeds 16°C. Breeding habitat occurs on subtropical and subantarctic islands and rock stacks in the New Zealand region. Nests are made in a range of inland habitats including: bare substrate or fern and tussock covered cliffs, slopes or ridges; open grassy meadows; summit plateaus under Olearia forest.	EPBC-V	Absent	Unlikely	No	No	No	NA
Northern Buller's Albatross, Pacific Albatross *Thalassarche bulleri platei*	Marine and pelagic species, occuring in subtropical and subantarctic waters of the South Pacific Ocean. Occur over inshore, offshore and pelagic waters and off the coast of south-east Tasmania. Prefers waters of the East Australia Current where sea surface-temperatures are greater than 16.5°C. Breed on subtropical and subantarctic islands and rock stacks in the New Zealand region, on sparsely vegetated slopes, cliff tops and ledges on rocky islands or stacks.	EPBC-V	Absent	Unlikely	No	No	No	NA
Shy Albatross *Thalassarche cauta*	Found in subantarctic and subtropical marine waters. Located on sheltered sides of islands, on cliffs and ledges, in crevices and slopes, nests are used annually and consist of a mound of mud, bones, plant matter and rocks.	BC-V EPBC-V	Present	Possible Records at Boydtown Tower and Green Cape	No Pelagic bird; breeding and foraging habitat do not occur within the Study Area	No	No	NA
White-capped Albatross *Thalassarche steadi*	Marine, occuring in subantarctic and subtropical waters. It reaches tropical areas associated with the cool Humboldt Current off South America. Has been noted in shelf-waters around breeding islands and over adjacent rises. During the non-breeding season, occur over continental shelves around continents. The species occurs both inshore and offshore and enters harbours and bays. Nest on slopes vegetated with tussock and succulents on Auckland Island.	EPBC-V	Absent	Unlikely	No	No	No	NA
Chatham Albatross *Thalassarche eremita*	Marine, occuring in subantarctic and subtropical waters. It reaches tropical areas associated with the cool Humboldt Current off South America (Marchant & Higgins 1990). Has been noted in shelf-waters around breeding islands and over adjacent rises. During the non-breeding season, occur over continental shelves around continents. The species occurs both inshore and offshore and enters harbours and bays. Nest on level or gently sloping ledges, summits, slopes and caves of rocky islets and stacks, usually in broken terrain with little soil and vegetation.	EPBC-E	Absent	Unlikely	No	No	No	NA
Campbell Albatross *Thalassarche impavida*	Are marine sea birds, found in sub-Antarctic and subtropical waters from pelagic to shelf-break water habitats. Are mainly found in the sub-Antarctic. Are specialised shelf feeders, concentrating around breeding islands or over adjacent submarine banks. In winter, they are commonly found in the coastal waters of continents, over up-wellings or boundaries of currents. Breed on Campbell Island. They make their nests on tussock-covered ledges and terraces of cliffs, slopes and hills, overlooking the sea or valleys, and on the summits of rocky islets.	EPBC-V	Absent	Unlikely	No	No	No	NA
Black-browed Albatross *Thalassarche melanophris*	Occur in antarctic, subantarctic, subtropical marine and coastal waters over upwellings and boundaries of currents. Nests annually on a mound of soil	BC-V EPBC-V	Absent	Unlikely	No	No	No	NA

Threatened Ecological Community / Species	Ecology	Threatened Status	Presence of habitat	Likelihood of occurrence	Potential for impact	Significant impact? (5-part test)	Survey required?	Outcome
	and vegetation, on the cliffs or steep slopes of vegetated Antarctic and subantarctic islands.							
Salvin's Albatross *Thalassarche salvini*	Marine species occurring in subantarctic and subtropical waters. Occur in shelf-waters around breeding islands and over adjacent rises. During the non-breeding season, occurs over continental shelves around continents. It occurs both inshore and offshore and enters harbours and bays. Nests on level or gently sloping ledges, summits, slopes and caves of rocky islets and stacks, usually in broken terrain with little soil and vegetation.	EPBC-V	Absent	Unlikely	No	No	No	NA
Hooded Plover *Thinornis rubricollis*	Found on sandy ocean beaches, especially those that are broad and flat, with a wide wave-wash zone and backed by sparsely vegetated sand-dunes. Occasionally found on tidal bays and estuaries, rock platforms and rocky or sand-covered reefs near sandy beaches, and small beaches in lines of cliffs. When on rocks they forage in crevices in the wave-wash or spray zone. Usually breed from August to March on sandy ocean beaches strewn with beachcast seaweed, in a narrow strip between the high-water mark and the base of the fore-dunes.	BC-CE EPBC-V	Present Very limited suitable foraging and breeding habitat within the Study Area (only Saltwater Creek)	Present Record at Saltwater Creek, and multiple records from shorebird program	No	No	No	NA
Hooded Plover (eastern) *Thinornis rubricollis rubricollis*	Mainly occurs on wide beaches backed by dunes with large amounts of seaweed and jetsam, creek mouths and inlet entrances. Nests are found above the high water mark on flat beaches, on stony terraces, or on sparsely vegetated dunes.	BC-CE EPBC-V	Present Very limited suitable foraging and breeding habitat within the Study Area (only Saltwater Creek)	Present Record at Saltwater Creek, and multiple records from shorebird program	No	No	No	NA
Masked Owl *Tyto novaehollandiae*	Found in dry eucalypt forests and woodlands from sea level to 1100 m.	BC-V	Present Breeding habitat (hollow-bearing trees)	Possible	Yes Hollow-dependent	No See 5-part Test	No	Clear mgt measures to avoid impact (avoid impact on HBT, timing of construction, pre-construction surveys)
Sooty Owl *Tyto tenebricosa*	Found in rainforests, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. Nests in very large tree-hollows. 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 (*Pseudocheirus peregrinus*) or Sugar Glider (*Petaurus breviceps*).	BC-V	Present Breeding habitat (hollow-bearing trees)	Possible Record from Mowarry access trail (PCT 1084)	Yes Hollow-dependent	No See 5-part Test	No	Clear mgt measures to avoid impact (avoid impact on HBT, timing of construction, pre-construction surveys)
Mammals								
New Zealand Fur-seal *Arctocephalus forsteri*	Occurs in Australia and New Zealand. Reports of non-breeding animals along southern NSW coast particularly on Montague Island, but also at other isolated locations to north of Sydney. Prefers rocky parts of islands with jumbled terrain and boulders. Feeds principally on cephalopods and fish, but also seabirds and occasionally penguins.	BC-V	Present	Present Haul out site at Mowarry Point	No – No impact is expected on haul out areas.	No	No	NA
Australian Fur-seal *Arctocephalus pusillus doriferus*	Inhabits rocky parts of islands with flat, open terrain.	BC-V	Present	Present Haul out site at Mowarry Point	No – No impact is expected on haul out areas.	No	No	NA
Eastern Pygmy-possum *Cercartetus nanus*	Found in rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath. Woodlands and heath appear to be preferred, except in north-eastern NSW where most frequently encountered in rainforest. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes. Tree hollows are favoured for nesting.	BC-V	Present	Present Records from Saltwater Creek, Leatherjacket, PCT 1084	Yes	No See 5-part Test	No Cryptic/may occur	Clear mgt measures to avoid impact (avoid impact on HBT, timing of construction, pre-construction surveys)

Threatened Ecological Community / Species	Ecology	Threatened Status	Presence of habitat	Likelihood of occurrence	Potential for impact	Significant impact? (5-part test)	Survey required?	Outcome
Spotted-tailed Quoll *Dasyurus maculatus*	Occurs in rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites.	BC-V EPBC-E	Present	Present Detected in camera trap survey Records from Green Cape	Yes	No See 5-part Test Spotted-tail quoll	No	Clear mgt measures to avoid impact (timing of construction, pre-construction surveys)
Eastern False Pipistrelle *Falsistrellus tasmaniensis*	Inhabits moist habitats with trees over 2 m. Generally roosts in eucalypt hollows.	BC-V	Present Hollow breeder	Possible Record from Mowarry access trail, PCT 1084	Yes Hollow-dependent	No See 5-part Test Hollow-dependent bats	No	Clear mgt measures to avoid impact (avoid impact on HBT)
Southern Brown Bandicoot (eastern) *Isoodon obesulus obesulus*	Found in heath or open forest with a heathy understorey on sandy or friable soils.	BC-E EPBC-E	Present	Present Detected in camera trap survey, and recorded by A. Claridge Records from Mowarry access trail, PCT 1084	Yes However, limited breeding and foraging habitat within the Study Area.	No See 5-part Test	Presence established	Clear mgt measures to avoid impact (timing of construction, pre-construction surveys)
Eastern Coastal Free-tailed Bat *Micronomus norfolkensis*	Inhabits dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roosts in tree hollows.	BC-V	Absent	Unlikely	No	No	No	NA
Large Bent-winged Bat *Miniopterus orianae oceanensis*	Their primary roosting habitats are caves.	BC-V	Present	Possible (Records from Mowarry access trail, PCT 777, Leatherjacket Bay)	No	No	No	NA
Southern Myotis *Myotis macropus*	Found close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage.	BC-V	Present Hollow breeder	Possible Record from Mowarry access trail at Leather-jacket Bay (PCT 777)	Yes Hollow-dependent	No See 5-part Test Hollow-dependent bats	No	Clear mgt measures to avoid impact (avoid impact on HBT)
Greater Glider *Petauroides volans*	Shelters in tree hollows.	EPBC-V	Absent	Unlikely	No	No	No	NA
Yellow-bellied Glider *Petaurus australis*	Inhabits tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south.	BC-V	Present	Present Record from Mowarry access trail, Saltwater Creek	Yes - hollow dependent breeder Foraging habitat: No feed trees detected within Study Area during surveys	No See 5-part Test	No	Clear mgt measures to avoid impact (avoid impact on HBT, timing of construction, pre-construction surveys)
Brush-tailed Rock-wallaby *Petrogale penicillate*	Occurs on rocky escarpments, outcrops and cliffs, prefer complex structures with fissures, caves and ledges, often facing north. Browse on vegetation in and adjacent to rocky areas: grasses, forbs, foliage and fruits of shrubs and trees.	BC-E EPBC-V	Absent Missing foraging habitat	Unlikely	No	No	No	NA
Koala *Phascolarctos cinereus*	Found in eucalypt woodlands and forests.	BC-V EPBC-V	Present, but limited	Unlikely	No Limited suitable foraging habitat within the Study Area	No	No	NA

Threatened Ecological Community / Species	Ecology	Threatened Status	Presence of habitat	Likelihood of occurrence	Potential for impact	Significant impact? (5-part test)	Survey required?	Outcome
Golden-tipped Bat *Phoniscus papuensis*	Inhabits rainforest and adjacent wet and dry sclerophyll forest up to 1000m. Tall open forest, Casuarina-dominated riparian forest and coastal Melaleuca forests. Primary roosting habitat are birds nests, branches and sometimes hollows.	BC-V	Present	Possible	No	No	No	NA
Long-footed Potoroo *Potorous longipes*	Found in moist forest types from montane wet sclerophyll forests over 1000m altitude to lowland forests at 150m. High soil moisture content.	BC-CE EPBC-E	Present	Unlikely Not detected in camera trap surveys	Yes However, limited suitable habitat within the Study Area	No See 5-part Test	No Cryptic/may occur	Clear mgt measures to avoid impact (timing of construction, pre-construction surveys)
Long-nosed Potoroo *Potorous tridactylus*	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas. Grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. Sandy loam soil is a common feature.	BC-V EPBC-V	Present	Present Detected in camera trap surveys	Yes However, limited suitable habitat within the Study Area	No See 5-part Test	No Presence established	Clear mgt measures to avoid impact (timing of construction, pre-construction surveys)
Smoky Mouse, Konoom *Pseudomys fumeus*	Inhabits heath habitat on ridge tops and slopes in sclerophyll forest, heathland and open-forest from the coast (in Victoria). Sub-alpine regions up to 1800 m. Ferny gullies. Nesting burrows in rocky localities among tree roots and under the skirts of Grass Trees Xanthorrhoea spp.	BC-CE EPBC-E	Present, but limited	Possible Not detected in camera trap surveys	Yes However, limited suitable habitat within the Study Area	No See 5-part Test	No Cryptic/may occur	Clear mgt measures to avoid impact (timing of construction, pre-construction surveys)
Eastern Chestnut Mouse *Pseudomys gracilicaudatus*	Most common in dense, wet heath and swamps. Optimal habitat appears to be in vigorously regenerating heathland burnt from 18 months to four years previously. Feeds at night via runways through the grassy and sedge understorey, within an area of less than half a hectare.	BC-V	Present, but limited	Possible Not detected in camera trap surveys	Yes However, limited suitable habitat within the Study Area	No See 5-part Test	No Cryptic/may occur	Clear mgt measures to avoid impact (timing of construction, pre-construction surveys)
Grey-headed Flying-fox *Pteropus poliocephalus*	Found in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	BC-V BC-V	Absent Limited foraging habitat, no known roosts	Unlikely	No	No	No	NA
Yellow-bellied Sheathtail Bat *Saccolaimus flaviventris*	Forages in most habitats across its very wide range, with and without trees. Roosts in tree hollows.	BC-V	Present Hollow breeder	Possible	Yes Hollow dependent	No See 5-part Test Hollow-dependent bats	No	Clear mgt measures to avoid impact (avoid impact on HBT)
Greater Broad-nosed Bat *Scoteanax rueppellii*	Found in a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest. Open woodland habitat and dry open forest. Most common in tall wet forest. Usually roosts in tree hollows.	BC-V	Present Hollow breeder	Possible	Yes Hollow dependent	No See 5-part Test Hollow-dependent bats	No	Clear mgt measures to avoid impact (avoid impact on HBT)
White-footed Dunnart *Sminthopsis leucopus*	Occurs in coastal dune vegetation, coastal forest, tussock grassland and sedgeland, heathland, woodland and forest. In NSW, favours vegetation communities with an open understorey structure.	BC-V	Present, but limited	Possible Not detected in camera trap surveys	Yes However, limited suitable habitat within the Study Area	No See 5-part Test	No Cryptic/may occur	Clear mgt measures to avoid impact (timing of construction, pre-construction surveys)
Fish								
Black Rockcod, Black Cod, Saddled Rockcod	Found in warm temperate and subtropical parts of the south-western Pacific and along NSW coast including Lord Howe Island. Found in caves, gutters	EPBC-V	Absent	Unlikely	No	No	No	NA

Threatened Ecological Community / Species	Ecology	Threatened Status	Presence of habitat	Likelihood of occurrence	Potential for impact	Significant impact? (5-part test)	Survey required?	Outcome
Epinephelus daemelii	and beneath bomboras on rocky reefs. Small juveniles are often found in coastal rock pools, and larger juveniles around rocky shores in estuaries. Are usually black in estuaries and banded around clear water reefs.							
Australian Grayling *Prototroctes maraena*	Occurs in freshwater streams and rivers, especially clear gravelly streams with a moderate flow, as well as estuarine areas. Females likely lay eggs in the middle reaches of rivers, where they presumably settle among the gravel of the streambed. The larvae and young juveniles have a marine stage before returning to freshwater rivers during spring when they are about 6 months old. The rest of their life cycle is spent in freshwater.	EPBC-V	Absent	Unlikely	No	No	No	NA
Flora								
Narrabarba Wattle *Acacia constablei*	Occurs on Rhyolite and Aplite rock outcrops with skeletal soils. Often dominant or co-dominant in open shrubland community which also includes Giant Honey-myrtle, Tick Bush, Coastal Zieria and Lance-leaf Platysace. Herbaceous component of the vegetation dominated by Long-leafed Wallaby Grass (Notodanthonia longifolia) and Lepidosperma urophorum.	BC-V EPBC-V	Absent	Unlikely	No	No	No	NA
River Swamp Wallaby-grass, Floating Swamp Wallaby-grass *Amphibromus fluitans*	Found in permanent swamps, needs wetlands which are at least moderately fertile and have some bare ground. Habitats in south-western NSW include swamp margins in mud, dam and tank beds in hard clay and in semi-dry mud of lagoons with Potamogeton and Chamaeraphis species.	BC-V EPBC-V	Absent	Unlikely	No	No	No	NA
Thick-lipped Spider-orchid, Daddy Long-legs *Caladenia tessellata*	Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil. Flowers appear between September and November (but apparently generally late September or early October in extant southern populations).	BC-E EPBC-V	Absent	Unlikely	No	No	No	NA
Correa baeuerlenii	Occurs in riparian sites within forests of various eucalypts, including Silvertop Ash (*Eucalyptus sieberi*), Yellow Stringybark (*E. muelleriana*), Blue-leafed Stringybark *(E. agglomerata*) and Spotted Gum (*Corymbia maculata*), or she-oak woodland. It may also be found in near-coastal rocky sites. Has been recorded between Nelligen (on Nelligen Creek and the Buckenbowra River) and Mimosa Rocks National Park.	BC-V	Absent (not within known distribution)	Unlikely	No	No	No	NA
Leafless Tongue Orchid *Cryptostylis hunteriana*	Known from a range of communities, including swamp-heath and woodland.	BC-V EPBC-V	Present	Possible Record near Mowarry access trail (PCT 777)	Yes	No See 5-part Test Leafless Tongue Orchid	No Cryptic/may occur	Pre-construction surveys. If found – clear management measures to avoid impact
Australian Saltgrass *Distichlis distichophylla*	Only found in coastal situations, except for one existing population at Lake Cargelligo in south western NSW. Damp saline soils. Edges of salt marshes and on low dunes.	BC-E	Absent	Unlikely	No	No	No	NA
Genoplesium rhyoliticum	All of the documented sites where the Rhyolite Midge Orchid occurs have very shallow soil overlying rhyolite rock. Vegetation is often dominated by lichens and/or moss. Other species which may be present include Tick Bush (*Kunzea ambigua*), Giant Honey-myrtle (*Melaleuca armillaris*), Long-leaved Platysace (*Platysace lanceolata)*, Ralston's Leionema (*Leionema ralstonii)* and Tangled Pseudanthus (*Pseudanthus divaricatissimus*). The Rhyolite Midge Orchid is endemic to a narrow strip of NSW south coast. Known from only six sites.	BC-E EPBC-E	Absent (not within known distribution)	Unlikely	No	No	No	NA
Leionema ralstonii	The species is largely confined to dry, rocky habitats. It is most likely to be found in dry shrub communities but can also occur in open forest. Endemic to the coastal ranges of south-east NSW between Eden and Pambula.	BC-V EPBC-V	Absent (not within known distribution)	Unlikely	No	No	No	NA
Persicaria elatior	Grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance. Recorded in south-eastern NSW (Mt Dromedary (an old record), Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton	BC-V	Absent (not within known distribution)	Unlikely, No know localities south of Barragga Bay.	No	No	No	

Threatened Ecological Community / Species	Ecology	Threatened Status	Presence of habitat	Likelihood of occurrence	Potential for impact	Significant impact? (5-part test)	Survey required?	Outcome
	Lakes. In northern NSW it is known from Raymond Terrace (near Newcastle) and the Grafton area (Cherry Tree and Gibberagee State Forests).							
Bodalla Pomaderris *Pomaderris bodalla*	South coast: occurs in moist open forest along sheltered gullies or along stream banks. Upper Hunter valley: occurs in open forest or woodland on open slopes.	BC-V	Absent	Unlikely	No	No	No	NA
Parris' Pomaderris *Pomaderris parrisiae*	Occurs on skeletal soils in rocky shrubland or tall open forest chiefly on escarpment ranges.	BC-V EPBC-V	Absent	Unlikely	No	No	No	NA
Oval-leafed Pseudanthus *Pseudanthus ovalifolius*	Found in the Torrington area of the New England Tablelands and in Ben Boyd National Park (near Eden). South: inhabits coastal dry sclerophyll forest growing in sandy soil. North: inhabits shallow rocky soils and on rocky outcrops of primarily granite.	BC-E	Absent	Unlikely	No	No	No	NA
Alpine Greenhood *Pterostylis alpina*	Found in moist forests on foothills and ranges. Often found on sheltered southern slopes near streams in rich loam.	BC-V	Absent	Unlikely	No	No	No	NA
Green-striped Greenhood *Pterostylis chlorogramma*	Occurs in moist, well-drained soils in open forest and woodland.	EPBC-V	Absent	Unlikely	No	No	No	NA
Matted Bush-pea *Pultenaea pedunculata*	Woodland vegetation, road batters and coastal cliffs. Mostly confined to loamy soils in dry gullies in populations in the Windellama area.	BC-E	Present	Possible	Yes	No See 5-part Test Matted Bush-pea	No Cryptic/may occur	Pre-construction surveys. If found – clear management measures to avoid impact
Spiral Sun-orchid *Thelymitra matthewsii*	Favours open forests and woodlands in well-drained sand and clay loams. It is a post-disturbance coloniser that is usually found in open areas around old quarries and gravel pits, on road verges, disused tracks and animal trails. Has been recorded as growing on gravely soils in disturbed areas of low coastal forest, in swampy soils, on lateritic podsol on gently sloping plateaus or from sand overlying limestone on undulating plain.	EPBC-V	Absent	Unlikely	No	No	No	NA
Austral Toadflax, Toadflax *Thesium australe*	Grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (Themeda australis).	BC-V EPBC-V	Absent	Unlikely	No	No	No	NA
Hidden Violet *Viola cleistogamoides*	At Nadgee Moor the Hidden Violet occurs in heath. Elsewhere it occupies a variety of situations, often in wet sandy coastal heaths. Has been found inland in heathland, woodland with a heathy understorey, and grassy forests.	BC-E	Present	Possible	Yes	No See 5-part Test Hidden Violet	No Cryptic/may occur	Pre-construction surveys. If found – clear management measures to avoid impact
Narrow-leafed Wilsonia *Wilsonia backhousei*	Coast between Mimosa Rocks National Park and Wamberal north of Sydney. Margins of salt marshes and lakes.	BC-V	Absent	Unlikely	No	No	No	NA
Swamp Everlasting, Swamp Paper Daisy *Xerochrysum palustre*	Grows in wetlands including sedge-swamps and shallow freshwater marshes, often on heavy black clay soils. At higher altitudes in NSW it also grows in Sphagnum moss bogs.	EPBC-V	Absent	Unlikely	No	No	No	NA

Appendix B Tests of Significance (BC Act)

Part 1 Section 1.7 of the Environment Planning and Assessment Act 1979 (EP&A Act) gives reference to the Biodiversity Conservation Act 2016 (BC Act) and the five factors which must be considered in deciding whether a development is likely to significantly affect threatened species, populations or ecological communities, or their habitats.

ToS' were undertaken for species considered at risk of adverse impact from the works. Candidate entities were selected in consideration of available habitat, results of targeted surveys and the risks posed by the works. This process was iterative as follows:

- The Appendix A Threatened entity evaluation table was used to identify species that could be impacted by the works, should they occur.
- Where adverse impact was considered likely, the Appendix B ToS' were used to characterise the significance of potential impacts. If it was considered that a significant impact could result, the species was recommended for targeted survey.
- Following the results of the targeted survey and the development of species-specific mitigation strategies, both the Threatened entity evaluation table and ToS' were updated.

The ToS' below now characterise the significance of likely impacts associated with the proposal on the following threatened biota and key threatening processes, in consideration of targeted survey results and feasible mitigation strategies. No species is considered at risk of a significant impact.

Hollow-dependent forest owls

- Barking Owl (*Ninox connivens*)
- Masked Owl (*Tyto novaehollandiae*)
- Powerful Owl (*Ninox strenua*)
- Sooty Owl (*Tyto tenebricosa*)

Hollow-dependent parrots

- Glossy-black Cockatoo (*Calyptorhynchus lathami*)
- Gang-gang Cockatoo (*Callocephalon fimbriatum*)
- Little Lorikeet (*Glossopsitta pusilla*)
- Turquoise Parrot (*Neophema pulchella*)

Woodland birds

- Dusky Woodswallow (*Artamus cyanopterus cyanopterus*)
- Varied Sittella (*Daphoenositta chrysoptera*)
- Flame Robin (*Petroica phoenicea*)

Heathland birds

- Striated Fieldwren (*Calamanthus fuliginosus*)
- Eastern Bristlebird (*Dasyornis brachypterus*)
- Eastern Ground Parrot (Pezopo*rus wallicus wallicus*)

Hollow-dependent bats

- Eastern Freetail Bat (*Mormopterus norfolkensis*)
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)
- Greater Broad-nosed Bat (*Scoteanax rueppellii)*
- Southern Myotis (*Myotis macropus*)

Hollow-dependent arboreal mammals

- Yellow-bellied Glider (*Petaurus australis*)
- Eastern Pygmy-possum (*Cercartetus nanus*)

Ground-dwelling mammals

- Spotted-tailed Quoll (*Dasyurus maculatus maculatus*)
- Long-nosed Potoroo (*Potorous tridactylus*)
- Long-footed Potoroo (*Potorous longipes*)
- Southern Brown Bandicoot (*Isoodon obesulus obesulus*)
- Smoky mouse (*Pseudomys fumeus*)
- Eastern Chestnut Mouse (*Pseudomys gracilicaudatus*)
- White-footed Dunnart (*Sminthopsis leucopus*)

Flora

- Leafless Tongue Orchid (*Cryptostylis hunteriana*)
- Matted Bush Pea (*Pultenaea pedunculata*)
- Hidden Violet (*Viola cleistogamoides*)

HOLLOW-DEPENDENT OWLS: Powerful Owl, Masked Owl, Sooty Owl, Barking Owl

The **Powerful Owl** (*Ninox* strenua) inhabits eucalypt forests and woodlands, gallery rainforest and inland riverine woodland. It often roosts and nests in dense gully eucalypt forest. It feeds mostly on arboreal mammals, especially possums and gliders, some flying-foxes, birds, and large insects. Resident breeding pairs defend exclusive nesting territories within larger, defended home ranges of 400-4000ha, depending on habitat quality and prey densities. Common roost sites are sheltered groves of mid-storey trees, e.g. she-oaks, acacias, paperbarks, and rainforest trees. It requires large hollows for nesting, and many of its prey species are also hollow-dependent. The Powerful Owl is known to utilise urban and suburban areas if suitable nest sites, roost sites and prey are available. The 2019/2020 bushfire likely removed habitat trees within the locality required by this species, and is likely to be responsible for a decline in prey species within the study area. Post-fire response by Powerful Owls has been investigated in Victoria and in NSW. Results have suggested that post-fire recovery can be variable depending on circumstances. Generally, recovery takes more than three years as a result of one or a combination of impacts including death, displacement, loss of hollow-bearing trees and slow arboreal prey recovery (Willig & Atkins 2013; Bain et al. 2014). As a result of the 2019/2020 fire, the availability of both breeding and foraging habitat has been reduced (10.31 ha of habitat burnt to varying degrees).

Masked Owl (*Tyto novaehollandiae*) lives in dry eucalypt forests and woodlands of variable elevations. It is usually a forest dweller but can occur along forest edges including roadsides. Typical diet includes tree- and ground-dwelling mammals, especially rodents. Pairs have large home range of 500-1000 hectares. Masked Owls breed when conditions are favourable which can be any time of the year. They require large tree hollows for roosting and breeding.

Birdlife Australia has estimated that the 2019/20 bushfire event burnt 49 per cent of southern Masked Owl habitat. Locally, 10.31 ha was burnt within the Study Area.

The **Sooty Owl** (*Tyto tenebricosa*) occurs in rainforest, including dry rainforest, as well as moist eucalypt forests with a well-developed mid-storey of trees and shrubs. Prey consists of small ground mammals or arboreal mammals such as the Common Ringtail Possum or Sugar Glider. It roosts by day in the hollow of a tall forest tree or in dense vegetation. Usually nesting commences from January through June but could occur at almost any time of the year depending on location and climatic conditions. The Sooty Owl nests in large tree-hollows or caves. It is known to utilize urban and suburban areas if suitable nest sites, roost sites and prey are available.

As a result of the 2019/2020 bushfire, loss of nesting hollows and depletion of habitat for prey species such as gliders and possums could impact the viability of Sooty Owl populations. A total of 0.48 ha of habitat within the Study Area was burnt int the 2019/21 bushfires.

The **Barking Owl** (*Ninox connivens*) inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. Preferentially hunts small arboreal mammals such as Squirrel Gliders and Common 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. Pairs have large home ranges, often up to 2500ha. Nesting occurs during mid-winter and spring, being variable between pairs and among years. The Barking Owl requires large tree hollows for breeding. As a result of the 2019/2020 fire, the availability of both breeding and foraging habitat has been reduced (10.31 ha of habitat burnt to varying degrees).

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,

Habitat availability/records

Available suitable foraging, roosting and breeding habitat is present within the Study Area, and it could form part of the home range for all four owl species. Breeding habitat, i.e. large hollows, is

uncommon within the walking track corridor due to unsuitable growing conditions for trees (coastal exposure, limited drainage, poor soils), and past logging. However, in locations where growing conditions are favourable (sheltered sites, gullies), a limited number of hollow-bearing mature eucalypts do occur (*E. cypellocarpa, E. longifolia, E. sieberi*). The larger hollows in these mature trees may provide suitable roosting and breeding habitat for large owls. The small to medium sized hollows may harbour arboreal mammals suitable for owl prey (i.e. Common Ringtail Possum**,** Sugar Glider, Dusky Antechinus, Feather-tailed Glider), however given the recent fires the availability of prey is likely to be reduced temporarily.

A OEH BioNet Wildlife Atlas search revealed 75 Powerful Owl records within 10 km of the study area, with one of those records approximately 1 km from the study area. There are multiple records of this species within Ben Boyd NP. There is 1 record of the Sooty Owl, also 1km from the study area. There is 1 record of the Masked Owl 11.5 km south-west of the Study Area, and 1 record of the Barking Owl 11km west of the Study Area.

Impact assessment

- The proposed development will retain hollow-bearing or mature trees (DBH>50cm), i.e. potential owl breeding habitat). The majority of the walking track corridor is located through areas were hollow-bearing trees are at low density. Where mature habitat trees do occur, however, they will be avoided by utilising the maximum offset allowed by track corridor to site the walk.
- Disturbance introduced by increased vehicle access, movements, noise near potential nest trees is considered minimal as no hollow-bearing trees will occur adjacent to the track due to the micro-sitting readjustments as outlined in Section 7.
- Suitable roosting sites (sheltered groves of mid-storey trees, dense vegetation) occur intermittently within the walking track corridor. However, due to the mobility of this species, the low-impact nature of the development (narrow walking track), and the short period of construction, long-term disturbance to their roosting behaviour patterns is unlikely.
- The proposed development will remove only a minor portion of foraging habitat and is not likely to affect owl species such that it would place any local prey populations at risk. The recent fires have already had an impact on both breeding and foraging habitat for owls within the locality, however tracts of unburnt vegetation still remain that contain protected, contiguous and complex forested habitat with an abundance of senescent eucalypts (Ben Boyd National Park). The adjoining habitat also contains hollow dead stags and an abundance of fallen timber, leaf litter and rough-barked eucalypts, suitable foraging and breeding habitat for their prey.
- Caves which could be used for nesting by the Sooty Owl occur on rock faces and cliffs in adjacent areas and these caves will not be affected by the proposal.

Recommendations

- Hollow bearing trees will be avoided. The track location must take the widest distance possible from habitat trees whilst remaining inside the 30m wide track corridor.
- Where the modification of mature or hollow-bearing trees is unavoidable (e.g. removal of limbs for safety reasons), or where construction could indirectly disturb breeding pairs in adjacent trees, pre-construction surveys will minimise potential impacts by preventing disturbance within 100 m of the tree when breeding pairs are present, and no use machinery within 200 m of an active nest tree.
- Clear management measures will be set in place for operational maintenance to avoid and minimise impacts on breeding and breeding habitat of hollow-dependent forest owls.

Considering the limited breeding habitat within the subject site, the ability to avoid potential nest trees through pre-clearing surveys and micro-sitting readjustments, and the very limited loss of foraging resources that will be removed locally, the proposal is unlikely to

affect the lifecycle of local populations of the Powerful Owl, Masked Owl, Sooty Owl or Barking Owl such that the populations of these species will be placed at risk of extinction.
b) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: **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. 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.**
n/a
c) in relation to the habitat of a threatened species or ecological community: **i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and** **ii. 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** **iii. 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) 0.04 ha of potential foraging habitat for forest owls would be removed for the proposal over a distance of the 31 km track. The removal of hollow-bearing or mature trees (DBH >50cm) (breeding habitat) will be entirely avoided in the construction of the proposal. The adjoining habitat in both unburnt areas and some burnt areas (those not severely burnt) contains extensive areas of protected habitat (Ben Boyd National Park) with senescent eucalypts, hollow dead stags, fallen timber, leaf litter and rough-barked eucalypts; suitable foraging and breeding habitat for owl prey. Caves which could be used for nesting by the Sooty Owl occur on rock faces and cliffs in the same adjacent areas and these caves will not be affected by the proposal. ii) Due to the nature of the proposed development (mostly consisting of a narrow walking track), habitat will not become fragmented or isolated from other areas of habitat. All four species of owl are highly mobile and have large home ranges that would not be severed by the proposed development. iii) As hollow-bearing trees will be avoided it is considered that the habitat to be removed does not contain any special or unique features that are vital to the long-term survival of hollow-dependent forest owls. The limited clearing activity is not likely to increase the fragmentation of or isolate important habitat for either hollow-dependent owl species.

GLOSSY-BLACK COCKATOOS

The **Glossy-black Cockatoos** (*Calyptorhynchus lathami*) inhabits eucalypt open forest and woodland with hollow-bearing trees and a mid-storey of *Allocasuarina* spp. It feeds exclusively on she-oak seeds, taken from cones in living trees. Its key food species on the coast are *Allocasuarina littoralis* (Black Sheoak) and *Allocasuarina torulosa* (Forest Sheoak) with some *Allocasuarina distyle* taken. It is reliant on mature, hollow-bearing trees for nesting. A single egg is laid in late January to early June with a longer nestling period than any other *cockatoos* (up to 90 days).

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,

Habitat availability/records

Before the 2019/2020 fire, available suitable foraging habitat was common within the Study Area. Breeding habitat, i.e. mature trees with medium and large hollows, is generally uncommon within the majority of the walking track corridor due to unsuitable growing conditions for trees (coastal exposure, limited drainage, poor soils), and past logging history. However, in locations where growing conditions are favourable (sheltered sites, gullies), a limited number of hollow-bearing mature eucalypts do occur (*E. cypellocarpa, E. longifolia, E. sieberi*). The medium sized hollows may provide suitable roosting and breeding habitat for the Glossy-black Cockatoo.

One incidental observation of Glossy-black Cockatoos (pair with young) was made by the survey team during our field survey visits. The Atlas records the species approximately 3 km from the study area.

As a result of the 2019/2020 fire, the availability of both breeding and foraging habitat has been reduced (25.43 ha of habitat burnt to varying degrees). Casuarinas are likely to take 10-15 years to recover after such a high intensity wildfire. The adjoining habitat contains areas of undisturbed and unburnt forested habitat which contains suitable breeding and foraging habitat for the Glossy Black Cockatoo (Ben Boyd National Park).

Impact assessment

- It is a commitment of this proposal that the removal of mature (DBH >50cm) or hollow-bearing trees will be avoided during construction by adjustment of the path route within the proposed track corridor. Where the modification of mature or hollow-bearing trees is unavoidable (e.g. removal of limbs for safety reasons), or where construction could indirectly disturb breeding pairs in adjacent trees, disturbance will not be undertaken within 200 m of an active nest to reduce breeding impacts.
- Disturbance introduced by increased vehicle access, movements, noise near potential nest trees is considered minimal as no hollow-bearing trees will occur adjacent to the track due to the micro-sitting readjustments as outlined in Section 7.
- Suitable foraging occurs intermittently within the walking track corridor. However, due to the mobility of this species, the low-impact nature of the development (narrow walking tracks and thinning of vegetation), and the short period of construction, long-term disturbance to their feeding behaviour patterns is unlikely.
- The proposed activity will remove a relatively minor portion of foraging habitat (2.82 ha over a distance of 31 km of track and precincts) and is not likely to affect parrot species such that it would place any local populations at risk:
- *Allocasuarina littoralis,* the main feed tree for the Glossy Black Cockatoo, is common in the Study Area. Although no active feed trees were detected within the walking track corridor at the time of the field surveys (visible by the spray of crushed cones at the base of the tree), they are highly likely to occur. If any Glossy Black Cockatoo feed trees are found during the construction of the walking track, these will be identified during the pre-clearing survey and retained.

Recommendations

- Hollow-bearing or mature trees (>50cm DBH) within the proposal corridor will be avoided during clearing for the proposal.
- Where pre-clearing surveys have identified breeding pairs which may be indirectly disturbed during construction activities, construction will not occur within 200 m of the breeding tree until the end of the breeding season.
- If any active Glossy Black Cockatoo feed trees are found during the construction of the proposal, these will be retained.
- As part of the continuing maintenance, clear management measures will be set in place to avoid and minimise impacts on breeding habitat and foraging habitat for hollow-dependent parrots.

Considering the loss of very limited sections of foraging resources and avoidance of hollow-bearing trees, the proposal is unlikely to affect the lifecycle of a local population of Glossy-black Cockatoo such that the population of this species will be placed at risk of extinction.

b) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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. **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.**

n/a

c) in relation to the habitat of a threatened species or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

ii. 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

iii. **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) Due to the nature of the proposed development (narrow walking track, upgraded existing facilities and access widening), the removal of hollow bearing or mature trees (breeding habitat) will be entirely avoided.

The proposal will result in the removal (clearing, construction of walking path) of 2.82 ha (over the 31 km track and precincts) of woodland habitat containing *Allocasuarina littoralis,* a Glossy-black Cockatoo feed tree which is common in the study area. If active feed trees (obvious by the fall of crushed cones at their base) or large clusters of potential feed trees are detected during pre-clearing surveys, they will be avoided during construction of the walking path by rerouting the path within the proposal corridor. The extent of suitable foraging habitat to be modified is minor compared to the larger scale intact habitat adjoining the study area.

ii) Due to the nature of the proposed development (mostly consisting of a narrow walking track), the area of habitat will not become fragmented or isolated from other areas of suitable habitat. Due to

the 2019/2020 bushfires, habitat within the study area is currently fragmented and patchy, however, this species is highly mobile and occupy large areas with localised movements to access areas of quality foraging habitat.

iii) Due to the avoidance of hollow-bearing trees and active feed trees, the removal of 2.82 ha of Glossy Black Cockatoo habitat is unlikely to impact the long-term survival of this species. The limited clearing activity is not likely to increase the fragmentation of or isolate important habitat for the Glossy Black Cockatoo.

GANG-GANG COCKATOO

The **Gang-gang Cockatoo** (*Callocephalon fimbriatum*) inhabits eucalypt open forests and woodlands with an acacia understorey. In summer it occupies moist highland forest types, and in winter it moves to more open types at lower elevations. Eucalypt trees and acacia shrubs are used for foraging. The species requires tree hollows for nesting and sometimes for roosting. A clutch of usually two eggs is laid in spring to summer.

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.

Habitat availability/records

Available suitable foraging habitat was limited within the Study Area prior to being burnt. The 2019/20 bushfire burnt 23 per cent of the Gang-gang Cockatoos core habitat, and it's estimated that 10 per cent of the entire population was killed in the fires. Breeding habitat, i.e. mature trees with small, medium and large hollows, is generally uncommon within the majority of the walking track corridor due to unsuitable growing conditions for trees (coastal exposure, limited drainage, poor soils), and past logging history. However, in locations where growing conditions are favourable (sheltered sites, gullies), a limited number of hollow-bearing mature eucalypts do occur (*E. cypellocarpa, E. longifolia, E. sieberi*). The small to medium sized hollows may provide suitable roosting and breeding habitat for this species.

OEH BioNet Wildlife Atlas shows several records of Gang-gang cockatoos occurring within 300m of the Study Area.

As a result of the 2019/2020 fire, the availability of both breeding and foraging habitat has been reduced (9.99 ha of habitat burnt to varying degrees). The adjoining habitat contains areas of undisturbed and unburnt forested habitat with a suitable breeding and foraging habitat for this species (Ben Boyd National Park).

Impact assessment

- The removal of mature (DBH>50cm) or hollow-bearing trees will be avoided during construction by rerouting the walking path within the proposal corridor to avoid important features.
- Disturbance introduced by increased vehicle access, movements, noise near potential nest trees is considered minimal as no hollow-bearing trees will occur adjacent to the track due to the micro-sitting readjustments as outlined in Section 7.
- Suitable foraging habitat occurs within the walking track corridor. However, due to the mobility of this species, the low-impact nature of the development (narrow walking track and thinning of vegetation), and the short period of construction, long-term disturbance to their foraging behaviour patterns is considered unlikely.
- The proposed activity will remove only a minor portion of foraging habitat and is not likely to affect this species such that it would place any local populations at risk. Only limited sections of

the planned walking track contain the preferred foraging habitat of the Gang-gang Cockatoo (*Eucalyptus* woodland and *Acacia* scrub).

Recommendations

- Avoid the removal or modification of any hollow-bearing or mature trees (>50cm DBH) during construction.
- In suitable breeding habitat (i.e. in the vicinity of mature trees with small, medium and large hollows), if breeding pairs are detected, construction will take place outside of the breeding season.
- As part of the continuing maintenance, clear management measures will be set in place to avoid and minimise impacts on breeding habitat and foraging habitat for the Gang-gang Cockatoo

The avoidance of breeding habitat, and loss of very limited sections of potential foraging resources is unlikely to affect the lifecycle of local populations of Gang-gang Cockatoos such that the population of this species will be placed at risk of extinction.

b) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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. **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.**

n/a

c) in relation to the habitat of a threatened species or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

ii. 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

iii. **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) Due to the nature of the proposed development; a narrow walking track and precinct work, the removal of hollow bearing or mature trees with a DBH>50cm (breeding habitat) will be entirely avoided

The proposal will result in the removal (clearing) of 0.60 ha of woodland habitat which contains foraging habitat.

ii) Due to the nature of the proposed development (narrow walking track on the coastal shoreline), the area of habitat will not become fragmented or isolated from other areas of Gang-gang Cockatoo habitat. Due to the 2019/2020 bushfires, habitat within the study area is currently fragmented and patchy. This species is highly mobile with a large home range

iii) The habitat to be removed does not contain any special or unique features that are vital to the long-term survival of the Gang-gang Cockatoo. The limited clearing activity is not likely to increase the fragmentation of or isolate important habitat for the species.

TURQUOISE PARROT

The **Turquoise Parrot** (*Neophema pulchella*) occurs on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Usually seen in pairs or small groups. 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. Nests in tree hollows, logs or posts, from August to December. Hollows tend to be small diameter (10x7 cm) but deep (0.5 m) and located 1.5-3 m above ground. Its small, isolated populations are particularly susceptible to sudden catastrophes such as disease and natural disasters (e.g. fires). Dead trees and stumps, favoured for nesting by Turquoise Parrots, are susceptible to destruction by fire.

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,

Habitat availability/records

Available suitable foraging habitat is limited within the Study Area. Breeding habitat, i.e. mature trees with small hollows are generally uncommon within the majority of the walking track corridor due to unsuitable growing conditions for trees (coastal exposure, limited drainage, poor soils), and past logging history. However, in locations where growing conditions are favourable (sheltered sites, gullies), a limited number of hollow-bearing mature eucalypts do occur (*E. cypellocarpa, E. longifolia, E. sieberi*). The small to medium sized hollows may provide suitable roosting and breeding habitat for the Turquoise Parrot.

As a result of the 2019/2020 fire, the availability of both breeding and foraging habitat has been reduced (0.99 ha of habitat burnt to varying degrees), however there are still areas of adjoining habitat which contain undisturbed and complex forested habitat with a suitable breeding and foraging habitat for this species (Ben Boyd National Park).

Impact assessment

- Removal of mature or hollow-bearing trees will be avoided during construction by rerouting the walking path within the proposal corridor to avoid important features.
- Disturbance introduced by increased vehicle access, movements, noise near potential nest trees is considered minimal as no hollow-bearing trees will occur adjacent to the track due to the micro-sitting readjustments as outlined in Section 7.
- The proposed activity will remove only a minor portion of foraging habitat (0.08 ha over the 31 km track) and is not likely to affect the Turquoise Parrot such that it would place any local populations at risk.
- Prior to the 2019/2020 bushfire, only limited sections of the planned walking track and precinct work contained the preferred foraging habitat of the Turquoise Parrot (grasses, forbs, herbaceous plants). This habitat may expand due to postfire revegetation.

Recommendations

- Avoid the removal or modification of any hollow-bearing or mature trees (>50cm DBH) in the design and construction of the walking track.
- In suitable breeding habitat (i.e. in the vicinity of mature trees with small hollows), if breeding pairs are detected during pre-construction surveys, construction within 100 m of the nest will take place outside of the breeding season.
- As part of the continuing maintenance, clear management measures will be set in place to avoid and minimise impacts on breeding habitat and foraging habitat for the Turquoise Parrot.

The avoidance of breeding habitat, and the loss of very limited sections of foraging resources is unlikely to affect the lifecycle of a local Turquoise Parrot population such that the species will be placed at risk of extinction.
b) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: **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. **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.**
n/a
c) in relation to the habitat of a threatened species or ecological community: **i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and** **ii. 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** iii. **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) Due to the nature of the proposed development (narrow walking track and upgrading site facilities and access), the removal of hollow bearing or mature trees (breeding habitat) can be entirely avoided The proposal will result in the removal (clearing, construction of walking path) of 0.08 ha (over the 31 km track and precincts) of preferred woodland habitat (PCT 1141). ii) Due to the nature of the proposed development (narrow walking track on the coastal shoreline), the area of habitat will not become further fragmented or isolated from other areas of Turquoise Parrot habitat. Due to the 2019/2020 bushfires, habitat within the study area is currently fragmented and patchy. This species is highly mobile with a large home range iii) The habitat to be removed does not contain any special or unique features that are vital to the long-term survival of the Turquoise Parrot. The limited clearing activity is not likely to increase the fragmentation of or isolate important habitat for this species.

LITTLE LORIKEET
The **Little Lorikeet** (*Glossopsitta pusilla*) occupies moist lowland forest habitat, especially in the vicinity of flowering or fruit-bearing vegetation. 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. Nomadic movements are common, influenced by season and food availability. Nests in hollows in the limb or trunk of smooth-barked Eucalypts (May to September). 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*.

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,

Habitat availability/records

Available suitable foraging habitat for the Little Lorikeet is limited, but present within the Study Area. Breeding habitat, i.e. mature trees with small hollows, is generally uncommon within the majority of the walking track corridor due to unsuitable growing conditions for trees (coastal exposure, limited drainage, poor soils), and past logging history. However, in locations where growing conditions are favourable (sheltered sites, gullies), a limited number of hollow-bearing mature eucalypts do occur (*E. cypellocarpa, E. longifolia, E. sieberi*). The small hollows may provide suitable roosting and breeding habitat for the Little Lorikeet.

Prior to the 2019/2020 bushfire, the adjoining habitat contained vast areas of undisturbed and complex forested habitat with an abundance of suitable breeding and foraging habitat for this species (Ben Boyd National Park), 0.48 ha of habitat within the study area was burnt during the 2019/20 bushfires.

Impact assessment

- The removal of mature (DBH>50cm) or hollow-bearing trees will be avoided during construction by rerouting the walking path within the proposal corridor to avoid important features.
- Disturbance introduced by increased vehicle access, movements, noise near potential nest trees is considered minimal as no hollow-bearing trees will occur adjacent to the track due to the micro-sitting readjustments as outlined in Section 7.
- The proposed activity will remove only a minor portion of foraging habitat (0.08 ha) and is not likely to affect the Little Lorikeet such that it would place any local populations at risk.
- Only limited sections of the planned walking track contain the preferred foraging habitat of the Little Lorikeet (moist lowland forest habitat).

Recommendations

- Avoid the removal or modification of any mature hollow-bearing trees in the design and construction of the walking track.
- In suitable breeding habitat (i.e. in the vicinity of mature trees with small hollows), and if breeding pairs are detected during pre-construction surveys, construction will take place outside of the breeding season (May to September).
- As part of the continuing maintenance, clear management measures will be set in place to avoid and minimise impacts on breeding habitat and foraging habitat for the Little Lorikeet.

The avoidance of breeding habitat, and the loss of limited sections of foraging resources is unlikely to affect the lifecycle of local populations of Little Lorikeet such that the species will be placed at risk of extinction.

b) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: **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. **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.**
n/a
c) in relation to the habitat of a threatened species or ecological community: **i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and** **ii. 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** iii. **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) Due to the nature of the proposed development; narrow walking track and precinct work, the removal of mature hollow bearing trees (breeding habitat) can be entirely avoided The proposal will result in the removal (clearing, construction of track and precincts) of 0.08 ha (over the 31 km track) of preferred woodland habitat (PCT 1141). ii) Due to the nature of the proposed development (narrow walking tracks and minor expansion of cleared areas), the area of habitat will not become further fragmented or isolated from other areas of Little Lorikeet habitat. Due to the 2019/2020 bushfires, habitat within the study area is currently fragmented and patchy. This species is highly mobile with a large home range. iii) The habitat to be removed does not contain any special or unique features that are vital to the long-term survival of the Little Lorikeet. The limited clearing activity is not likely to increase the fragmentation of or isolate important habitat for this species.

VARIED SITTELLA
The **Varied Sittella** (*Daphoenositta chrysoptera*) inhabits mainly eucalypt forest and woodlands, often in areas containing rough-barked and mature woodland areas containing dead branches probing crevices for arthropods. Nests are built deep from bark and cobwebs and often found high in living the canopy. These nests are often used to breed in successive years.
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,
Habitat availability/records Areas with the breeding and foraging habitat characteristics preferred by Varied Sittella are generally uncommon within the walking track corridor, due to coastal exposure and the dominance of low diversity, closed scrub vegetation (senescent *Melaleuca armillaris*) with limited or absent ground cover. Areas of rough-barked and mature woodland vegetation, suitable habitat for the Varied Sittella, occur along the Hegarty access trail. The 2019/2020 bushfire affected adjoining

habitat which contained contiguous and complex forested habitat with an abundance of suitable breeding and foraging habitat for this species (Ben Boyd National Park), 11.3 ha of habitat within the study area was burnt during the 2019/20 bushfires.

OEH BioNet Wildlife Atlas records shows 36 records of Varied Sittella within 10 km of the study area; one of those records is within a few km of the Study Area.

Impact assessment

- Areas with the breeding and foraging habitat characteristics preferred by this species are generally uncommon within the activity footprint. A total of approximately 0.93 ha (over the 31 km track and precincts) of suitable woodland bird habitat (heathland ecotones, open dry sclerophyll forest and woodland with an open, shrubby understorey) will be removed to accommodate the walking track and access trail widening.
- Disturbance introduced by increased vehicle access, movements, noise near potential nest trees is considered minimal as no mature trees (>50cm DBH) will occur adjacent to the track due to the micro-sitting readjustments as outlined in Section 7.

Recommendations

- Avoid and minimize the removal and disturbance of breeding (nesting) and foraging habitat (shrubby understory, fallen woody debris, stumps, hollow logs) during construction by rerouting the walking path within the proposal corridor to avoid important features.
- In areas of suitable habitat, pre-construction surveys for active nests will be conducted. If nests are found works will be postponed until nestlings fledge as a mitigating measure.
- As part of the continuing maintenance, clear management measures will be set in place to avoid and minimize impacts on breeding habitat and foraging habitat for small woodland birds.

Considering the minimal impacts associated with the proposal for this species, the proposed development or activity is unlikely to have an adverse effect on the life cycle of the Varied Sittella such that a viable local population 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 action proposed:

- **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. **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.**

n/a

c) in relation to the habitat of a threatened species or ecological community:

- **i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and**
- **ii. 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**
- iii. **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) The proposal will result in the removal of 0.93 ha (over the 31 km track and precincts) of suitable habitat for the Varied Sittella.

ii) Due to the limited scale of the development and the location of the walking track (the edge of the coastal shoreline), habitat will not become further fragmented or isolated from other areas of Varied Sittella habitat. Due to the 2019/2020 bushfires, habitat within the study area is currently fragmented and patchy.

iii) The habitat to be removed does not contain any special or unique features critical to the long-term survival of the Varied Sittella. The limited clearing activity is not likely to increase the fragmentation of or isolate important habitat for this species.

DUSKY WOODSWALLOW

The **Dusky Woodswallow** (*Artamus cyanopterus*) primarily inhabits dry, open eucalypt forests and woodlands with an open or sparse understorey with a 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. Primarily eats invertebrates. It can be resident year-round or migratory, depending on location and local climatic conditions. Nest sites vary greatly, and may occur in shrubs or low trees, living or dead, horizontal or upright forks in branches, spouts, hollow stumps or logs, or behind loose bark.

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,

Habitat availability/records

Most breeding activity of the Dusky Woodswallow occurs on the western slopes of the Great Dividing Range. Areas with potential breeding and foraging habitat characteristics preferred by Dusky Woodswallow are generally uncommon within the walking track corridor, due to coastal exposure and the dominance of low diversity, closed scrub vegetation (senescent *Melaleuca armillaris*) with limited or absent ground cover. However, some sections of the track traverse suitable habitat for the Dusky Woodswallow (heathland ecotones, open dry sclerophyll forest and woodland with an open, shrubby understorey). The 2019/2020 bushfires burnt areas of adjoining habitat which contained contiguous and complex forested habitat with an abundance of suitable breeding and foraging habitat for the Dusky Woodswallow (Ben Boyd National Park).

OEH BioNet Wildlife Atlas records shows one record of Dusky Woodswallow approximately 60m from the walking corridor. There are 30 records within 10 km of the study area. Our survey team recorded one incidental observation of Dusky Woodswallow foraging in the heathland near Pulpit Rock, approx. 400 m west of the walking track corridor. Prior to the fires there was likely to be a low abundance of the species in the area, and in its current state, habitat within the study area is very unlikely to provide sufficient habitat for the Dusky Woodswallow. Therefore, potential affects to the species population from the proposal are considered low.

Impact assessment

- Areas with the breeding and foraging habitat characteristics preferred by the Dusky Woodswallow are currently uncommon within the activity footprint. A total of approximately 2.82 ha (over the 31 km track and precincts) of suitable woodland bird habitat (heathland ecotones, open dry sclerophyll forest and woodland with an open, shrubby understorey) may be removed to accommodate the walking track, accommodation, and access trail widening.
- Disturbance introduced by increased vehicle access, movements, noise near potential nest trees is considered minimal as no hollow-bearing trees will occur adjacent to the track due to the micro-sitting readjustments as outlined in Section 7.
- Suitable foraging habitat occurs within the walking track corridor. However, due to the mobility of this species, the low-impact nature of the development (narrow walking track and thinning of

vegetation), and the short period of construction, long-term disturbance to their foraging behaviour patterns is considered unlikely.

- Given the low impacts associated with the proposal, the large areas of habitat available in the locality (even in burnt areas where a mosaic of vegetation recovery occurs) and the mobility of these birds, the proposal is unlikely to have a significant impact on the Dusky Woodswallow.

Recommendations

- Avoid and minimize the removal and disturbance of breeding (nesting) and foraging habitat (shrubby understory, fallen woody debris, stumps, hollow logs) during construction of the walking track.
- In areas of suitable habitat, pre-construction surveys for active nests will be conducted. If nests are found works within 100 m of the nest will be postponed until nestlings fledge as a mitigating measure.
- As part of the continuing maintenance, clear management measures will be set in place to avoid and minimise impacts on breeding habitat and foraging habitat for this species.

Given that the study area is unlikely to provide breeding habitat, the proposed development or activity is unlikely to have an adverse effect on the life cycle of the Dusky Woodswallow such that a viable local population 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 action proposed:

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. **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.**

n/a

c) in relation to the habitat of a threatened species or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

ii. 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

iii. **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) The proposal will result in the removal of 2.82 ha (over the 31 km track and precincts) of potential foraging habitat for the Dusky Woodswallow.

ii) Due to the limited scale of the development and the location of the walking track (the edge of the coastal shoreline), habitat for the Dusky Woodswallow will not become fragmented or isolated.

iii) The habitat to be removed does not contain any special or unique features critical to the long-term survival of the Dusky Woodswallow. The limited clearing activity is not likely to increase the fragmentation of or isolate important habitat for the Dusky Woodswallow.

FLAME ROBIN

The **Flame Robin** (*Petroica phoenicea*) breeds in upland tall moist eucalypt forests and woodlands, and migrate to drier more open habitats in winter, including dry forests, open woodlands and in pastures and native grasslands, occasionally in heathland or other shrublands in coastal areas. Flying insects are often taken in the air and it sometimes gleans 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. Breeds in spring to late summer.

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,

Habitat availability/records

Areas with the breeding and foraging habitat characteristics preferred by the Flame Robin are generally uncommon within the walking track corridor, due to coastal exposure and the dominance of low diversity, closed scrub vegetation (senescent *Melaleuca armillaris*) with limited or absent ground cover. Some sections of the track traverse suitable habitat for the Flame Robin (heathland ecotones, open dry sclerophyll forest and woodland with an open, shrubby understorey).

OEH BioNet Wildlife Atlas records reveal that the Flame Robin has only been recorded once approximately 6 km from the study area. This suggests a low abundance of the species in the area, and therefore potential impacts to the species population from the proposal are considered low.

Impact assessment

- The study area does not contain preferred breeding habitat, which is in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Areas with the foraging habitat characteristics preferred by the Flame Robin are generally uncommon within the walking track corridor. A total of approximately 2.46 ha (over the 31 km track and precincts) of suitable foraging habitat (heathland ecotones, open dry sclerophyll forest and woodland with an open, shrubby understorey) may be removed to accommodate the walking track, accommodation and access trail widening.
- Due to the 2019/2020 bushfire potential foraging habitat has been reduced across the study area by 10.82 ha.

Recommendations

- Avoid and minimise the removal and disturbance of foraging habitat (shrubby understory, fallen woody debris, stumps, hollow logs) during construction of the walking track.
- If breeding pairs are detected during pre-construction surveys, construction within 100 m of the active nest will be delayed until the end of the breeding season.
- As part of the continuing maintenance, clear management measures will be set in place to avoid and minimize impacts on foraging habitat for Flame Robin.

Given the avoidance of breeding and foraging habitat, the proposed development or activity is unlikely to have an adverse effect on the life cycle of Flame Robin such that a viable local population 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 action proposed:

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. **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.**
n/a
c) in relation to the habitat of a threatened species or ecological community: **i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and** **ii. 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** iii. **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) The proposal will result in the removal 2.46 ha of suitable habitat for the Flame Robin. ii) Due to the limited scale of the development and the location of the walking track (the edge of the coastal shoreline), habitat for the Flame Robin will not become fragmented or isolated. Due to the 2019/20 bushfires, habitat within the study area is currently fragmented and patchy. iii) The habitat to be removed does not contain any special or unique features critical to the long-term survival of the Flame Robin. In its current state, habitat within the study area is unlikely to be important to the long-term survival of the species. The limited clearing activity is not likely to increase the fragmentation of or isolate important habitat for the Flame Robin.

EASTERN GROUND PARROT
The Eastern Ground Parrot (*Pezoporus wallicus*) occurs in high rainfall coastal areas in coastal low heaths with dense ground cover. This vegetation type is generally <1m in height and very dense (up to 90% projected foliage cover). The habitat provides abundant and diverse food (mostly seeds), adequate cover and suitable roosting and nesting opportunities for the Ground Parrot, which spends most of its time on or near the ground. Home ranges are typically 10 ha (larger for juveniles) and overlapping with other birds. Breeding takes place from September to December. Whilst dense ground cover habitat provides effective protection, birds are subject to predation in open areas within it, which can occur naturally or caused by human activity. Given the recent fires, the Eastern Ground Parrot is unlikely to recolonise heathland habitat within the study area until the heathland structure is more closed (Gill *et al.* 1999). In Tasmania, the species recolonised sites approximately one year post-fire, when the estimated minimal projective foliage cover of 30% was attained at most sites (Bryant 1994; Chaudhry 2010). In Western Australia they have also been reported to inhabit utilise recently burnt sites when directly adjoined to unburn habitat with established populations (Burbidge 1989; Burbidge *et al.* 2007; Chaudhry 2010)
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,
Habitat availability/records The Eastern Ground Parrot requires thick ground layer vegetation for nesting and breeding. This habitat type occurs only intermittently within the walking track corridor, commonly restricted to shorter sections (100-200m lengths); the majority of the proposed track is located within the thin

strip (10-20m wide) of low-diversity, senescent *Melaleuca* scrub near the edge of the exposed coastline (PCT 721). This corridor of coastal scrub, which has a closed canopy, sparse ground cover, and high exposure, has limited habitat value for the Eastern Ground Parrot. It is referred to in the following dot points as "senescent habitat". In localities where suitable heathland habitat does occur, it differs from the unsuitable habitat described above by the presence of 1) low (<1m), high density, diverse coastal heath ('South Coast Heath'), 2) tussocky grassland (limited to Mowarry Point), 3) open woodland with moderate to dense heathy groundcover (<1 m), or 4) open woodland with low shrubby undergrowth).

The walking track corridor intersects heathland habitats with varying fire histories, and it is expected that the local abundance of this species varies according to the time since the last fire. Ground Parrots, for example, can re-colonise burnt habitat after 1-2 years and – in the absence of fire - reach maximum densities after 15-20 years, after which habitat quality decreases as the canopy closes over and becomes senescent. One would expect higher densities of heathland birds in long un-burnt habitats, but which have not become senescent (2-20 years post fire). Examples of such long un-burnt heathland habitats along the walking track corridor are found between Bittangabee Bay and Hegarty Bay (burnt in 1991-1995), contrasting with sections of burnt areas near the Cape (Pulpit Rock – Green Cape – City Rock) (burnt in 2013-2014). The 2019/2020 fire impacted large areas of suitable heath habitat within Ben Boyd National Park (15.12 ha within the Study Area), however recovery is evident since the fire, and by the time construction begins (January 2022), may again be suitable for this species.

OEH BioNet Wildlife Atlas shows several Eastern Ground Parrot records within 300 m the study area. It has also been recorded at Mowarry Point.

Impact assessment

- A total of approximately 1.97 ha of suitable habitat would be removed as part of this development (over the 31 km track and precincts). In the context of the larger areas of similar habitat available in the locality, the extent of this loss is considered to be insubstantial.
- This loss of South Coast Heath with varying fire histories is undesirable due to the relatively high breeding and foraging values of the diverse heathland habitat, and the scarcity of this habitat type following the 2019/2020 bushfire. However, in the context of the location of the proposed track at the edge of this habitat, and the expected natural recovery and rehabilitation of the old track (with similar habitat) over time, this loss is not considered significant.
- There are added risks associated with the cumulative pressures of re-establishing home ranges after recent fires (relevant in the 2014 Green Cape fire and the 2019/2020 fire) and the possibility of increased predator ingress associated with a new walking track. The additional predator ingress by either introduced or native species caused by this proposal will be insignificant in comparison.
- The development of the new track will see a net loss in available heathland habitat in the short term. In the longer term (5-10 years), however, when the rehabilitation of the old track is complete, there will be a net gain in available high quality heathland habitat.
- Construction of the walking track will not increase the likelihood of wildfire or the ability to manage fuel loads to minimise risk to the environment.

Recommendations

- Due to the restricted distribution of South Coast Heath, any permanent loss or disturbance of this habitat type is undesirable and will be avoided and minimised during construction by rerouting the walking path within the proposal corridor to avoid important features.
- Pre-construction surveys for active nests will be conducted. If nests are found, works within 100 m of the nest will be postponed until nestlings fledge.

- Fox and cat control will be incorporated into the ongoing management and maintenance of the walking track in a manner that will not further endanger native species.
- As part of the continuing maintenance, clear management measures will be set in place to avoid and minimise disturbance of breeding habitat and foraging habitat for the Eastern Ground Parrot.

Given the recovery of vegetation since the 2019/2020 fire, and the avoidance of habitat features, the proposed activity is unlikely to have an adverse effect on the life cycle of the Eastern Ground Parrot such that viable local populations are likely to be placed at risk of extinction. The species is unlikely to recolonise the study area for at least another 2 years.

b) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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. 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.

Not applicable.

c) in relation to the habitat of a threatened species or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

ii. 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

iii. 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) The development of the new track will see a net loss in available heathland bird habitat in the short term (1.97 ha). In the longer term (5-10 years), however, when the rehabilitation of the old track is complete, there may be a net gain in available heathland bird habitat. Considering the availability and extent of suitable heathland habitat in the locality, the short-term loss of heathland bird habitat is not such that it would be considered a significant loss.

ii) Due to the low impact nature of the proposed development (narrow walking track), its location at the edge of the coastline (the majority of the proposed track is located within the thin strip (10-20m wide) of low-diversity scrub near the exposed coastal cliff's edge), and the mobility of this species, habitat will not become fragmented or isolated from other similar habitat as a result of the proposed development.

iii) Considering the availability and extent of suitable heathland habitat in the locality, the limited clearing activity associated with the walking track, and the limited impacts associated with its use (foot traffic), is not likely to impact on important habitat for the Eastern Ground Parrot. However, due to the restricted distribution of South Coast Heath, any permanent loss or disturbance of this habitat type is highly undesirable and will be avoided and minimised during construction of the walking path.

STRIATED FIELDWREN

The Striated Fieldwren (*Calamanthus fuliginosus*) inhabits ground and understorey vegetation normally associated with coastal heath, tussocky grassland and low shrubby vegetation fringing swamps. It forages through the undergrowth on insects and seeds. Nests are hidden on the ground under tussocks and shrubs. The species has an extended breeding season (eggs have been recorded in NSW between July and January) and may raise two broods per season. It is considered to be an early successional species in heath (Smith 1985, 1987; Chaudhry 2010).

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,

Habitat availability/records

Heathland birds all require thick ground layer vegetation for nesting and breeding. Prior to the 2019/2020 bushfire, this habitat type occurred only intermittently within the walking track corridor, restricted to shorter sections (100-200m lengths); the majority of the proposed track and precintcs was located within the thin strip (10-20m wide) of low-diversity, senescent *Melaleuca* scrub near the edge of the exposed coastline (PCT 721). This corridor of coastal scrub had a closed canopy, sparse ground cover, and high exposure, with limited habitat value for heathland birds. It is referred to in the following dot points as “senescent habitat”. In localities where suitable heathland habitat does occur, it differs from the unsuitable habitat described above by the presence of; 1) low (<1m), high density, diverse coastal heath (‘South Coast Heath’), 2) tussocky grassland (limited to Mowarry Point), 3) open woodland with moderate to dense heathy groundcover (<1 m), or 4) open woodland with low shrubby undergrowth).

The walking track corridor intersects heathland habitat which have been significantly burnt during the 2019/2020 bushfires (15.12 ha within the Study Area). One would expect higher densities of heathland birds in long un-burnt habitats, but which have not become senescent (2-20 years post fire). Examples of such long un-burnt heathland habitats along the walking track corridor are found between Bittangabee Bay and Hegarty Bay (burnt in 1991-1995), contrasting with sections of burnt areas near the Cape (Pulpit Rock – Green Cape – City Rock) (burnt in 2013-2014).

OEH BioNet Wildlife Atlas shows 1 record of Striated Fieldwren, approx. 500 m from the study area.

Impact assessment

- A total of approximately 1.97 ha (over the 31 km track) of suitable habitat (PCT 721, 1141) would be removed as part of this development.
- The low impacts associated with the proposal loss of South Coast Heath are unlikely to have a significant impact on the Striated Fieldwren. Together with the additional impacts to heathland habitat as a result of the 2019/2020 bushfire, the location of the proposed track at the edge of this habitat, and the expected natural recovery and rehabilitation of the old track (with similar habitat) over time, impacts are not considered to be significant.
- There may be an added short-term risk associated with the cumulative pressures of re-establishing home ranges after recent fires (e.g. 2019/2020 bushfire and 2013/14 Green Cape fire) and the possibility of increased predator ingress associated with a new walking track. additional predator ingress by either introduced or native species caused by this proposal will be insignificant in comparison.
- The proposal will see a net loss in available heathland habitat in the short term. In the longer term (5-10 years), however, when the rehabilitation of the old walking track is complete, there will be a net gain in available high quality heathland habitat.
- Construction of the walking track and other activities will not increase the likelihood of wildfire or the ability to manage fuel loads to minimize risk to the environment.

Recommendations

- Due to the restricted distribution of South Coast Heath, any permanent loss or disturbance of this habitat type will be avoided and minimised during construction of the walking path.
- Pre-construction surveys for active nests would be conducted. If nests are found, works would be postponed within 100 m of the nest until nestlings fledge.
- Fox and cat control will be incorporated into the ongoing management and maintenance of the walking track in a manner that will not further endanger native species.
- As part of the continuing maintenance, clear management measures will be set in place to avoid and minimise disturbance of breeding habitat and foraging habitat for the Striated Fieldwren.

Given the avoidance of breeding habitat and habitat features, the proposed activity is unlikely to have an adverse effect on the life cycle of the Striated Fieldwren such that a viable local population 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 action proposed:

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. 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.

n/a

c) in relation to the habitat of a threatened species or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

ii. 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

iii. 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) The development of the new track will see a net loss in available Striated Fieldwren habitat in the short term (1.97 ha). In the longer term (5-10 years), however, when the rehabilitation of the old walking track is complete, there will be a net gain in available heathland bird habitat.

ii) Due to the low impact nature of the proposed development (narrow walking track), its location at the edge of the coastline (the majority of the proposed track is located within the thin strip (10-20m wide) of low-diversity scrub near the exposed coastal cliff's edge), and the mobility of this species, Striated Fieldwren habitat will not become fragmented or isolated from other similar habitat as a result of the proposed development.

iii) The limited clearing activity associated with the walking track and other activities, and the limited impacts associated with its use (foot traffic), is not likely to impact on important habitat for the Striated Fieldwren. However, due to the restricted distribution of South Coast Heath, any permanent loss or disturbance of this habitat type is highly undesirable and will be avoided and minimised during construction of the walking path.

EASTERN BRISTLEBIRD

The Eastern Bristlebird (*Dasyornis brachypterus*) inhabits a broad range of plant communities, with low, dense, ground- or understorey vegetation. The species spends most of its time in dense vegetation, rarely appearing in the open or flying. It feeds mostly on invertebrates, but also on seeds, earthworms, fungi and occasionally nectar. The species' distribution has contracted to three disjunct populations in south-eastern Australia, with only two confirmed populations in the south (Nadgee NR in NSW, Croajingolong NP, in Victoria (<380 birds)). It breeds from August to February.

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,

Habitat availability/records

Thick ground layer vegetation for nesting and breeding occurs only intermittently within the walking track corridor, commonly restricted to shorter sections (100-200m lengths); the majority of the proposed track is located within the thin strip (10-20m wide) of low-diversity, senescent *Melaleuca* scrub near the edge of the exposed coastline (PCT 721). This corridor of coastal scrub, which has a closed canopy, sparse ground cover, and high exposure, has limited habitat value for heathland birds. It is referred to in the following dot points as "senescent habitat". In localities where suitable heathland habitat does occur, it differs from the unsuitable habitat described above by the presence of 1) low (<1m), high density, diverse coastal heath ('South Coast Heath'), 2) tussocky grassland (limited to Mowarry Point), 3) open woodland with moderate to dense heathy groundcover (<1 m), or 4) open woodland with low shrubby undergrowth).

The walking track corridor intersects heathland habitats with varying fire histories, and it is expected that the local abundance of heathland bird species varies according to the time since the last fire. One would expect higher densities of heathland birds in long un-burnt habitats, but which have not become senescent (2-20 years post fire). Examples of such long un-burnt heathland habitats along the walking track corridor are found between Bittangabee Bay and Hegarty Bay (burnt in 1991-1995), contrasting with sections of recently burnt areas near the Cape (Pulpit Rock – Green Cape – City Rock) (burnt in 2013-2014). Within the Study Area 15.44 ha of habitat was burnt in the 2019/20 fires.

The Eastern Bristlebird has not been recorded within 5km of the subject site.

Impact assessment

- A total of approximately 2.21 ha of suitable habitat (PCT 721,772, 1141) would be removed as part of this development.
- This loss of South Coast Heath with varying fire histories is undesirable due to the relatively high breeding and foraging values of the diverse heathland habitat. However, in the context of the larger areas of remaining heathland available in the locality, the location of the proposed track at the edge of this habitat, and the expected natural recovery and rehabilitation of the old track (with similar habitat) over time, this loss is not considered significant.
- There may be an added short-term risk associated with the cumulative pressures of re-establishing home ranges after recent fires (relevant in the 2019/2020 bushfire and the 2013/2014 fire near Green Cape) and the possibility of increased predator ingress associated with a new walking track. However, the study area at present (February 2019) is already criss-crossed by numerous trails, tracks, unformed and unmapped passageways as well as known, mapped and permanently maintained tracks. The additional predator ingress by either introduced or native species caused by this proposal will be very limited.

- The development of the new track will see a net loss in available heathland habitat in the short term. In the longer term (5-10 years), however, when the rehabilitation of the old walking track is complete, there will be a net gain in available high quality heathland habitat .
- Construction of the walking track and other activities will not increase the likelihood of wildfire or the ability to manage fuel loads to minimize risk to the environment.

Recommendations

- Due to the restricted distribution of South Coast Heath, any permanent loss or disturbance of this habitat type is undesirable, and will be avoided, minimised and mitigated in the planning and construction of the walking path.
- Pre-construction surveys for active nests will be conducted. If nests are found, construction works within 100 m of the nest will be postponed until nestlings fledge.
- Fox and cat control will be incorporated into the ongoing management and maintenance of the walking track in a manner that will not further endanger native species.
- As part of the continuing maintenance, clear management measures will be set in place to avoid and minimise disturbance of breeding habitat and foraging habitat for heathland birds.

Given the avoidance of breeding habitat and habitat features, the proposed activity is unlikely to have an adverse effect on the life cycle of the Eastern Bristlebird such that a viable local population 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 action proposed:

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. 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.

n/a

c) in relation to the habitat of a threatened species or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

ii. 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

iii. 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) The proposal will see a net loss in available heathland bird habitat in the short term (2.44 ha). In the longer term (5-10 years), however, when the rehabilitation of the old walking track is complete, there may be a net gain in available heathland bird habitat. Considering the availability and extent of suitable heathland habitat in the locality, the short-term loss of heathland bird habitat is not such that it would be considered a significant loss.

ii) Due to the low impact nature of the proposed development, its location at the edge of the coastline (the majority of the proposed track is located within the thin strip (10-20m wide) of low-diversity scrub near the exposed coastal cliff's edge), and the mobility of these species, heathland bird habitat will not become fragmented or isolated from other similar habitat as a result of the proposed development.

iii) Considering the limited clearing activity associated with the walking track, the limited impacts associated with its use (foot traffic), and the lack of species records within the study area, the proposal is not likely to impact on important habitat for the Eastern Bristlebird. However, due to the restricted distribution of South Coast Heath, any permanent loss or disturbance of this habitat type is highly undesirable and will be avoided and minimised during the construction of the walking path.

HOLLOW-DEPENDENT BATS

The **Eastern Freetail Bat** (*Mormopterus ridei*) occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. They roost mainly in tree hollows but also roost under bark and in man-made structures. Within the Study Area 0.48 ha of habitat was burnt in the 2019/20 fires.

The **Eastern False Pipistrelle** (*Falsistrellus tasmaniensis*) prefers moist habitats, with trees taller than 20m. They generally roost in eucalypt hollows but has also been found under loose bark on trees or in buildings. Within the Study Area 10.98 ha of habitat was burnt in the 2019/20 fires.

The **Yellow-bellied Sheath-tail Bat** (*Saccolaimus flaviventris*) occupies most wooded habitats, including both wet and dry sclerophyll forest, mallee and Acacia shrubland, desert, and open woodland. They are a hollow-roosting species and tend to be found in proximity of adequate old-growth trees. Within the Study Area 0.32 ha of habitat was burnt in the 2019/20 fires.

The **Greater Broad-nosed Bat** (*Scoteanax rueppellii*) forages in open woodland habitat and dry open forest, which suits the direct flight of this species as it searches for beetles and other large, slow-flying insects. They usually roost in tree hollows and have also been found in buildings. Females congregate at maternity sites (inside hollow bearing trees). Within the Study Area 11.3 ha of habitat was burnt in the 2019/20 fires.

The **Southern Myotis** (*Myotis macropus*) forages over streams and pools catching insects and small fish by raking their feet across the water surface. Southern Myotis roost in groups of 10-15 close to water in caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage.

An ecological disturbance such as wildfire may initiate torpor use due to a decrease in consumable energy and changes in ambient temperature due to alterations in buffered microclimates (Alencar *et al.* 2015; Doty *et al.* 2016). Thus, bats may use torpor to manage the constraints associated with food and water shortage. The incidence of wildfire significantly changes the structure of an insect community (York 1999; Swengel 2001; Moretti *et al.* 2004). Fire can increase foraging habitat for microbats by decreasing vegetative clutter (Owen *et al.* 2004; Loeb and Wal-drop 2008; Womack *et al.* 2013) and therefore results in increased activity and efficiency of insect detection (Doty *et al.* 2016). Fire can create hollows or increase hollow diameter, however fires can also destroy hollows and reduce the availability of roosting habitat (Doty *et al*. 2016). Doty *et al*. (2016) found that surviving microbats respond favour-ably to a post-wildfire resource pulse. Some recolonizing insects prefer post-fire vegetation or increase in abundance post-fire (Swengel 2001). Lacki *et al*. (2009) found a 34 % increase in microbat prey items 3 months following a prescribed fire, similar to a finding of increased post-wildfire microbat prey abundance (Doty *et al.* 2016). Within the Study Area 1.47 ha of habitat was burnt in the 2019/20 fires.

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,

Habitat availability/records

OEH BioNet Wildlife Atlas reveals confirmed records of all five hollow-dependent microbat species within 300m of the Study Area (walking track corridor). Therefore, in taking the precautionary approach, all five species are presumed to occur within the Study Area and assessed accordingly.

Impact assessment

- The Study Area contains only a limited number of mature eucalypts (*E. cypellocarpa, E. longifolia, E. sieberi*) with may provide small, medium and large sized hollows suitable as roosting habitat for hollow-dependent bats. The removal of mature (DBH>50cm) or hollow-bearing trees can be avoided during construction.
- Disturbance introduced by increased vehicle access, movements, noise near potential roosting trees is considered minimal as no hollow-bearing trees will occur adjacent to the track due to the micro-sitting readjustments as outlined in Section 7.
- Suitable foraging habitat occurs within the walking track corridor. However, due to the mobility of this species, the low-impact nature of the development (narrow walking track and thinning of vegetation), and the short period of construction, long-term disturbance to their foraging behaviour patterns is considered unlikely.
- The proposed walking track and precincts are located within a mosaic of burnt and unburnt native vegetation, within Ben Boyd National Park. The footprint area of the proposal constitutes a small fraction (<1%) of this reserved area. Recently burnt habitat has the potential to provide better foraging habitat for microbats due to a decrease in vegetative density and an increase in insect abundance. Overall, the loss of foraging habitat within burnt areas and limited roosting habitat within unburnt habitat is not considered significant considering the movement ability of these species.

Recommendations

- Avoid the removal or modification of mature or hollow-bearing trees, including dead stags, in the construction of the walking track by rerouting the walking path within the proposal corridor to avoid important features.
- Incorporate clear management measures in the continuing maintenance of the walking track to avoid and minimise impacts on roosting habitat for hollow-dependent microbats.

While some indirect impacts may occur to roosting microbats during construction, direct impacts to breeding habitat will be avoided and as such the proposed development or activity is unlikely to have an adverse effect on the life cycle of hollow-dependent bats such that viable local populations are likely to be placed at risk of extinction.

b) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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. 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.

n/a

c) in relation to the habitat of a threatened species or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

ii. 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

iii. 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) The proposed development will remove <1.00 ha of foraging habitat (for any of the listed species) and is not likely to affect bat species such that it would place any local populations at risk.

The proposal is located within a mosaic of burnt and unburnt native vegetation dedicated to nature conservation. The footprint area of the proposal constitutes a tiny fraction (<1%) of this reserved area.

ii) The action proposed will not cause significant impact with regards to fragmentation or isolation of habitat for either five bat species. Habitat is already somewhat fragmented due to the 2019/2020 bushfire.

iii) The habitat to be removed does not contain any special or unique features that are vital to the long-term survival of the five species of bat. The limited clearing activity is unlikely to increase the fragmentation of or isolate important habitat for any microbat species.

YELLOW-BELLIED GLIDER

The **Yellow-bellied Glider** (*Petaurus australis*) feeds primarily on plant and insect exudates, including nectar from flowers, sap from wounds or excisions in the outer bark of trees, honeydew and manna exudates from sap-sucking insects, primarily Psyllids. Sap is extracted by incising the trunks and branches of favoured food trees, often leaving a distinctive 'V'-shaped scar. It lives in family groups of 2-6 individuals which den communally in hollows in large trees. The Yellow-bellied Glider is very mobile and the family groups occupy large home ranges between 20 to 85 ha to encompass dispersed and seasonally variable food resources. The species is most uncommon in the northern and southern extremities of its range (far north Queensland and southern Victoria). In the centre of its range, where the Study Area lies, it remains relatively common.

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,

Habitat availability/records

OEH BioNet Wildlife Atlas searches reveal 134 records of the Yellow-bellied Glider within 10 km of the walking track corridor. No feed trees (trees with the distinctive v-notch feed marks) were recorded during the field investigations (pre-fire). However, there is potential forest and woodland habitat for this species and is therefore presumed to occur within the Study Area and assessed accordingly.

Impact assessment

- Breeding habitat for the Yellow-bellied Glider, i.e. mature trees with small, medium and large hollows, is generally uncommon within the majority of the walking track corridor due to unsuitable growing conditions for trees (coastal exposure, limited drainage, poor soils), and past logging history. However, in locations where growing conditions are favourable (sheltered sites, gullies), a limited number of hollow-bearing mature eucalypts do occur (*E. cypellocarpa, E. longifolia, E. sieberi*). The medium and large sized hollows may provide suitable breeding ha Disturbance introduced by increased vehicle access, movements, noise near potential nest trees is considered minimal as no hollow-bearing trees will occur adjacent to the track due to the micro-sitting readjustments as outlined in Section 7.
- Suitable foraging habitat occurs within the walking track corridor. However, due to the mobility of this species, the low-impact nature of the development, and the short period of construction, long-term disturbance to their foraging behaviour patterns is considered unlikely.
- Prior to the 2019/2020 bushfire, adjoining habitat consisted of vast areas of undisturbed and complex forested habitat with an abundance of suitable breeding and foraging habitat for the species (Ben Boyd National Park). A total of 7.21 ha of habitat was burnt during these fires. Despite this, the proposed activity will remove only a minor portion of existing breeding and

foraging habitat and is not likely to affect the Yellow-bellied Glider such that it would place any local populations at risk.

Recommendations

- Avoid the removal or modification of any hollow-bearing, mature trees (>50cm DBH) or feed trees during the construction by rerouting the walking path within the proposal corridor to avoid important features.
- If any feed trees are found during construction, these will be retained.
- As part of the continuing maintenance, clear management measures will be set in place to avoid and minimise impacts on breeding habitat and foraging habitat for the Yellow-bellied Glider.

Given the avoidance of mature trees and feed trees, and the low impacts generated by the proposal, the proposed activity is unlikely to have an adverse effect on the life cycle of the Yellow-bellied Glider such that viable local populations are likely to be placed at risk of extinction.

b) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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. 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.

n/a

c) in relation to the habitat of a threatened species or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

ii. 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

iii. 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) The proposed activity will remove 0.72 ha of the available breeding and foraging habitat for the Yellow-bellied Glider and is not likely to affect this mobile species such that it would place any local populations at risk. Hollow-bearing trees (breeding habitat) will not be removed by the activities that constitute this proposal.

ii) Due to the nature and location of the proposed development (narrow walking track on the edge of the coastal shoreline and associated precincts and access upgrades), habitat will not become fragmented or isolated from other areas of habitat. Habitat is already somewhat fragmented due to the 2019/2020 bushfire.

iii) The habitat to be removed contains a small area of foraging and breeding habitat for the Yellow-bellied Glider, however the 2019/2020 fire is likely to have reduced the number of individuals present within the locality. The limited clearing activity is not likely to increase the fragmentation of or isolate important habitat for this species.

EASTERN PYGMY POSSUM

The **Eastern Pygmy Possum** (*Cercartetus nanus*) is a tiny (15 to 43 grams) active climber, with an almost bare, prehensile (capable of curling and gripping) tail. It inhabits shrubby vegetation in a wide variety of habitats, from open heaths or shrubland habitats to wet or dry sclerophyll forest and into the moister rainforest habitats. It feeds on nectar and pollen, especially from *Banksia, Eucalyptus* and *Callistemon* species. It also feeds on insects and will eat soft fruits when food from flowers is not available. It is largely a solitary animal, and shelters 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. During winter, in temperate parts of its range (Study Area), it spends time in torpor (inactive, with slowed body functions to conserve energy). Distribution is patchy, and they are usually low in numbers where they are found. Population size is difficult to ascertain due to the cryptic, nocturnal nature of the species, its apparent active avoidance of capture in live traps, and the difficulty of correctly identifying the species from images collected on motion activated cameras due to its diminutive size and similarity to other small mammals.

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,

Habitat availability/records

OEH BioNet Wildlife Atlas searches reveal 85 records of the Eastern Pygmy Possum occurring within 10 km of the walking track corridor. There is potential forest and woodland habitat for this species and it is presumed to occur within the Study Area.

Impact assessment

- Breeding habitat for the species includes tree hollows, but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks. Such habitat is currently only present in unburnt patches along the length of the walking track corridor.
- The proposed activity will remove 2.82 ha of suitable breeding and foraging habitat that remains after the 2019/2020 fire and is not likely to affect the Eastern Pygmy Possum such that it would place any local population at risk of extinction. There will be significant vegetation recovery by the time construction begins, which will enable individuals to emigrate back into burnt patches.

Recommendations

- Avoid the removal or modification of any hollow-bearing or mature trees (>50cm DBH) in the design and construction of the walking track.
- Avoid and minimise disturbance of Eastern Pygmy Possum shelter/denning habitat (woody debris, stumps, hollow logs and dense shrubs) during construction and maintenance.
- As part of the continuing maintenance, clear management measures will be set in place to avoid and minimise impacts on breeding habitat and foraging habitat for the Eastern Pygmy Possum.

Given the avoidance of breeding and shelter habitat, and the low impacts of the proposal, the proposed activity is unlikely to have an adverse effect on the life cycle of the Eastern Pygmy Possum such that a viable local population would be placed at risk of extinction.

b) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: **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. 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.**
n/a
c) in relation to the habitat of a threatened species or ecological community: **i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and** **ii. 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** **iii. 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) The proposed activity will remove 2.82 ha of available breeding and foraging habitat for the Eastern Pygmy Possum. Breeding habitat is rare along the walking track corridor. ii) Due to the nature and location of the proposed development (narrow walking track on the edge of the coastal shoreline with associated precinct and access upgrades), Eastern Pygmy Possum habitat will not become fragmented or isolated from other areas of habitat. Habitat is already somewhat fragmented due to the 2019/2020 bushfire. iii) The habitat to be removed, and the low impact construction methods to be employed are unlikely to threaten the long-term survival of the species. The limited clearing activity is not likely to increase the fragmentation of or isolate important habitat for this species.

THE SPOTTED-TAIL QUOLL

The **Spotted-tail Quoll** (*Dasyurus maculatus*) occupies a range of habitat types, including rainforest, open forest, woodland, coastal heath, farmland, plantations and the edges of rural villages and towns. The species is a scansorial carnivore, hunting on the ground and in trees where it feeds on a wide variety of prey, including mammals, birds, reptiles, invertebrates, and carrion. Near farms it preys on poultry and has consequently been persecuted by Europeans in the past, which has led to population decline in settled areas. In natural habitats, medium-sized mammals constitute the bulk of the diet. Within the Study Area, suitable prey species detected on camera traps in a targeted survey that was part of this assessment included the Southern Brown Bandicoot, Long-nosed Bandicoot, Long-nosed Potoroo, Common Brushtail Possum, and Common Ringtail Possum.

Recorded den sites include rock crevices, hollow logs, hollow tree buttresses, tree hollows, woody debris, dense clumps of vegetation, caves and boulder tumbles, under buildings, and underground burrows, including those of rabbits and wombats. The Spotted-tail Quoll typically occurs at low densities, as adults are solitary and occupy large home ranges: 50ha (females) and 3500ha (males). Given these parameters, the construction of the walking track and its maintenance may intersect with the home range of 1-2 males and <5 females (in litt. C Belcher 2019). Camera traps have detected male quolls at Ben Boyd National Park (Green Cape light station and Disaster Bay) (DPIE 2017).

An important feature of the life cycle of the Spotted-tail Quoll is the use of communal latrine sites to enable reproductive interactions as indicated by scents that reveal the presence of females in

oestrous. Communal latrine sites are usually found on flat rocks among boulder fields, rocky cliff-faces, on very large (>1 m DBH) fallen logs, or on flat boulders, along rocky stream beds or banks. These latrines are visited by multiple individuals and can be recognised by the accumulation of the very characteristic faeces, which are elongate, bound together by hair and 'twisty-shaped'.

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,

Habitat availability/records

The walking track corridor provides suitable foraging and breeding habitat all along its course for this highly mobile predator. Based on knowledge of Spotted-tail Quoll home range sizes, the Study Area may form part of the home range of 1-2 males and <5 females.

The OEH BioNet Wildlife Atlas reveals a record of Spotted-tail Quoll occurring 14 km west of the study area. Camera trap surveys carried out as part of this assessment did not confirm its presence in the Study Area (see Appendix G). However, one possible scat was found on a rocky outcrop north of Pulpit Rock during our field investigations. No active den sites or communal 'latrine sites' were detected within the proposed walking track corridor.

The 2019/2020 bushfire impacted 10.98 ha of potential habitat for this species within the study area, however previous studies have found that large wildfires have not necessarily resulted in the extinction of a local population (Dawson 2005; Begg *et al*. 1981). Dawson (2005) found that a population of quolls at Kosciusko National Park recovered within 18 months to levels proximate with, and even exceeding, those observed prior to the fire. He found that immigration, rather than in situ recruitment, was largely responsible for the relatively rapid recovery of the population.

Impact assessment

- Given this species large, overlapping home ranges, any individuals potentially occurring within the Study Area could form part of an important population. The proposed development will permanently remove or disturb up to 0.68 ha of habitat across a range of coastal forest and heathland vegetation communities.
- This level of disturbance is unlikely to affect foraging, dispersal or gene flow of Spotted-tail Quoll, given this species dispersal ability.
- Critical to the survival of the Spotted-tail Quoll are large patches of forest with adequate denning resources and relatively high densities of medium-sized mammalian prey. Rocky outcrops, coastal cliffs and caves are common along the walking track, and some of the least exposed sections may provide suitable denning resources for the species. Prior to the 2019/2020 fire there was a limited number of large fallen logs, dead stags and mature, hollow bearing trees in locations along the track where growing conditions are favourable (sheltered sites, gullies).
- A number of apparently healthy quoll populations continue to exist in some commercially (selectively) logged forests (Belcher 2000; A. Glen pers. comm.), indicating that the species exhibits a level of tolerance to some habitat disturbance.
- There are recent records (2019, 2014) of the Spotted-tail Quoll from Eden, 20 km south of the subject site and Tura Beach, 40 km north of the subject site (Shields, pers. obs., OEH BioNet Database) indicating tolerance for some level of human presence.
- At present, there is no deterrent for feral predator ingress into the subject site. There is a network of natural trails and means of ingress through the entire area for feral cats and foxes. However, post-fire, there is a commitment to undertake fox and cat control.

Recommendations

- Pre-construction surveys will inspect for breeding suitability/ denning structures and communal latrine sites and the track will avoid these areas.
- Avoid the removal or modification of bush rocks, mature (DBH>50cm) or hollow-bearing trees, including dead stags, large fallen logs and other coarse woody debris during construction of the walking track.
- Incorporate clear management measures in the continuing maintenance of the walking track to avoid and minimise impacts on breeding habitat for the Spotted-tail Quoll.

Considering the mobility of this species and their adaptability after fire, the loss of 0.68 ha of foraging and breeding habitat is not considered significant. By the time construction begins there will be a mosaic of post-fire vegetation recovery throughout the locality which will enable this species to return to areas impacted by the 2019/2020 fire. The proposed development or activity is unlikely to have an adverse effect on the life cycle of the Spotted-tail Quoll such that viable local populations are likely to be placed at risk of extinction.

b) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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. 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.

n/a

c) in relation to the habitat of a threatened species or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

ii. 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

iii. 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) The proposed activity will remove 0.68 ha of available breeding and foraging habitat for the Spotted-tail Quoll.

ii) Due to the limited scale of the development and the location of the walking track (the edge of the coastal shoreline), habitat for the species will not become further fragmented or isolated. Due to the 2019/2020 bushfire, habitat for the Spotted-tail Quoll is already currently fragmented.

iii) Habitat within unburnt areas are likely to comprise important habitat that is important to the long-term survival of the species, however by the time construction begins areas of burnt habitat are likely to be utilised by this species. No active den sites or communal 'latrine sites' were detected within the proposed walking track corridor during our site investigations. The limited clearing activity is not likely to increase the fragmentation of or isolate important habitat for this species.

SOUTHERN BROWN BANDICOOT

The **Southern Brown Bandicoot** (*Isoodon obesulus*) is generally only found in heathland or open forest with a heathy understorey on sandy or friable soils. It feeds on a variety of ground-dwelling invertebrates and underground-fruiting fungi. Searches for food often create distinctive conical holes in the soil. Males have a home range of approximately 5-20 ha whilst females forage over smaller areas of about 2-3ha. The Southern Brown Bandicoot shelters during the day in a shallow

depression in the ground covered by leaf litter, grass or other plant material. Nests may be located under Grass trees (*Xanthorrhoea* spp.), dense shrubs, or in rabbit burrows.

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,

Habitat availability/records

The Southern Brown Bandicoot has a preference and dependence on densely vegetated, ground cover habitat. Within unburnt areas, such habitat is common along the walking track corridor (tussocky grassland, open woodland with dense to shrubby understorey and coastal heathland w different fire histories). However, suitable habitat occurs only intermittently and in short sections relative to the dominant and less suitable habitat type, i.e. low diversity, closed scrub vegetation (senescent *Melaleuca armillaris*) with limited or no ground cover close to the rocky shoreline. Along the vehicle access trails, however, in the dry schlerophyll forest communities (PCT 1084 and PCT 1157), good quality habitat for ground-cover dependent small mammals has been severely reduced due to the bushfire of 2019/2020.

The OEH BioNet Wildlife Atlas identifies 290 Southern Brown Bandicoot records within 10 km of the study area.

Targeted surveys (camera traps) carried out as part of this assessment confirmed the presence of Southern Brown Bandicoot, which indicates that this species regularly uses suitable habitat within the walking track corridor (see Appendix G).

Following the 2019/2020 bushfire, 32.25 ha of unburnt habitat is currently available within the Study area for the Southern Brown Bandicoot. Studies have found that this species experiences high probabilities of extinction, and low probabilities of colonisation for up to 18-months post-fire (Smith 2013). Smith (2013) found that post-fire, bandicoots did not make use of unburnt vegetation patches.

Impact assessment

- Given the extent of the 2019/2020 bushfires, and the importance of habitat within unburnt patches, development within those unburnt patches has the potential to have an adverse negative effect on the life cycle of the Southern Brown Bandicoot. However, once there is suitable recovery of vegetation within burnt patches and in the broader locality, the proposal is unlikely to have an adverse negative effect on the life cycle of the species.
- There may be an added short-term risk associated with the cumulative pressures of re-establishing home ranges after recent fires (relevant in the recently burnt areas near Green Cape) and the possibility of increased predator ingress which will occur if a new path was to be cleared into a pristine area which previously had no tracks, trails or roads. However, the study area at present (February 2019) is already criss-crossed by numerous trails, tracks, unformed and unmapped passageways as well as known, mapped and permanently maintained tracks. The additional predator ingress by either introduced or native species caused by this proposal will be very limited. It is a commitment of the project to undertake fox and cat management.
- Construction of the walking track will not increase the likelihood of wildfire or the ability to manage fuel loads to minimize risk to the environment.

Recommendations

- Avoid or minimise disturbance of ground cover vegetation during the construction of the walking track.
- Avoid the removal or disturbance of shelter/denning habitat such as woody debris, fallen logs, burrows in the ground, dense shrubs, rock crevices and bush rocks during the construction of

the walking track. Pre-construction surveys to detect and avoid shelter/denning habitat will be conducted by trained individuals.

- Fox and cat control will be incorporated into the ongoing management and maintenance of the walking track in a manner that will not further endanger native species.
- Incorporate clear management measures in the continuing maintenance of the walking track to avoid and minimise impacts on ground cover vegetation and shelter/denning habitat.
- Monitoring: The results of the targeted small mammal surveys completed to make this assessment of impact constitute a valuable and useful base line study of this biodiversity asset along the walking track corridor. The results will be used to plan monitoring and management activities such that the biodiversity asset is maintained and where possible enhanced.

The minor loss of foraging and breeding habitat is not considered significant considering the mobility of this species, the low impacts associated with the proposal, and the rapid recovery of groundcover vegetation at recently burnt sites. The proposed development or activity is unlikely to have an adverse effect on their life cycles such that viable local populations are likely to be placed at risk of extinction.

b) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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. 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.

n/a

c) in relation to the habitat of a threatened species or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

ii. 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

iii. 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) A maximum of 2.82 ha of all vegetation would be removed to accommodate proposed activities.

ii) Due to the nature and limited scale of the development (narrow walking track), its planned use (foot traffic), and the location (the edge of the coastal shoreline), the development is unlikely to cause significant impact with regards to fragmentation or isolation of habitat for the Southern Brown Bandicoot. Habitat is currently already fragmented due to the 2019/2020 bushfire, and there is a mosaic of vegetation recovery throughout the locality.

iii) Unburnt habitat is likely to contain important habitat for this species, however, by the time construction begins there will be a mosaic of vegetation recovery throughout burnt areas which will again be available for use by the Southern Brown Bandicoot. The limited clearing activity is not likely to increase the fragmentation of or isolate important habitat for this species.

POTOROOS

The **Long-nosed potoroo** (*Potorous tridactylus*) inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of the habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. Sandy loam soil is a common feature. Underground fungi are a large component of the diet. The Long-nosed Potoroo also eats roots, tubers, insects and their larvae and other soft-bodied animals in the soil. It often digs small holes in the ground in a similar way to bandicoots. Individuals are mainly solitary, non-territorial and have home range sizes ranging between 2-5ha.

The **Long-footed Potoroo** (*Potorous longipes*) inhabits a variety of vegetation classes from shrubby dry forest to warm temperate rainforest and wet forest. Sites on sheltered aspects with moist soils, supporting a mixed species overstorey and a dense understorey, are characteristic of preferred habitat. The Long-footed Potoroo depends on fungi as a food source (>90% of their diet), with invertebrates and plant material making up the remainder. This species has a very restricted distribution and is no-where abundant. There is very limited knowledge of the effects of fire, logging and other disturbances and the species is vulnerable to introduced predators.

Smith (2013) found that after fire, Long-nosed Potoroos made use of unburnt vegetation patches, with extinction and colonisation probabilities post-fire linked to the presence of these patches. Unburnt refuges of intact vegetation apparently provided essential post-fire habitat for long-nosed potoroos. Unburnt vegetation patches were used exclusively for nesting by potoroos, at least up to16 months after fire. During active foraging times potoroos used unburnt patches more than 45% of the time. Smith (2013) suggests that unburnt patches function as refuges by providing key resources (e.g. appropriate nesting sites, protection from predators) to allow ongoing survival. Fire regime will have a complex impact on habitat structure and food availability (see action 5.1) and fire events have the obvious potential to kill individual potoroos and destroy colonies (NRE 2000).

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,

Habitat availability/records

Potoroos have a preference and dependence on densely vegetated, ground cover habitat. Such habitat is not uncommon along the walking track corridor (tussocky grassland, open woodland with dense to shrubby understorey and coastal heathland with different fire histories). However, suitable habitat occurs only intermittently and in short sections relative to the dominant and less suitable habitat type, i.e. low diversity, closed scrub vegetation (senescent *Melaleuca armillaris*) with limited or no ground cover close to the rocky shoreline. Along the vehicle access trails, however, in the dry sclerophyll forest communities, good quality habitat for these species has been reduced due to the Bushfires of 2019/20.

The OEH BioNet Wildlife Atlas records within 10 km of the study area include 295 Long-nosed Potoroo, and no records of the Long-footed Potoroo.

Targeted surveys (camera traps) carried out as part of this assessment confirmed the presence of Long-nosed Potoroo, which indicates that this species regularly uses suitable habitat within the walking track corridor (see Appendix G). The Long-footed Potoroo was not detected in the camera trap surveys. This absence could be the result of a true absence, or difficulties in detection. Taking the precautionary approach, therefore, the Long-footed Potoroo is presumed to occur within the Study Area and is included in this assessment.

Impact assessment

- Given the extent of the 2019/2020 bushfires, and the importance of habitat within unburnt patches, development within those unburnt patches has the potential to have an adverse negative effect on the life cycle of the Long-nosed and Long-footed Potoroos. However, considering that construction would not take place until at least 18 months after the fire, it is

likely that potoroos would be utilising burnt patches where there is suitable recovery of vegetation. Given the low impacts associated with the proposal, there is unlikely to be an adverse negative effect on the life cycle of the species.

- As the proposed walking trail will mainly be utilised during the day it is considered to have minimal direct impact on foraging behaviour of these species.
- There may be an added short-term risk associated with the cumulative pressures of re-establishing home ranges after recent fires (relevant in the recently burnt areas in 2020 and the Green Cape fire in 2013/14) and the possibility of increased predator ingress which will occur if a new path was to be cleared into an unburnt area which previously had no tracks, trails or roads. However, the study area at present (December 2020) is already criss-crossed by numerous trails, tracks, unformed and unmapped passageways as well as known, mapped and permanently maintained tracks. The additional predator ingress by either introduced or native species caused by this proposal will be very limited in comparison to that which exists after the 2019/2020 bushfire. Fox and cat control is a commitment of the project.
- Construction of the walking track and other activities will not increase the likelihood of wildfire or the ability to manage fuel loads to minimise risk to the environment.

Recommendations

- Avoid or minimise disturbance of ground cover vegetation during the construction of the walking track.
- Avoid the removal or disturbance of shelter/denning habitat such as woody debris, fallen logs, burrows in the ground, dense shrubs, rock crevices and bush rocks during the construction of the walking track. Pre-construction surveys to detect shelter habitat will be conducted by trained individuals.
- Fox and cat control will be incorporated into the ongoing management and maintenance of the walking track in a manner that will not further endanger native species.
- Incorporate clear management measures in the continuing maintenance of the walking track to avoid and minimise impacts on ground cover vegetation and shelter habitat.
- Monitoring: The results of the targeted small mammal surveys completed to make this assessment of impact constitute a valuable and useful base line study of this biodiversity asset along the walking track corridor. The results will be used to plan monitoring and management activities such that the biodiversity asset is maintained and where possible enhanced.

Given that there will be a degree of vegetation recovery in the study area and the broader locality by the time construction begins, it is unlikely that the proposal would have an adverse effect on their life cycles such that viable local populations are likely to be placed at risk of extinction.

b) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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. 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.

n/a

c) in relation to the habitat of a threatened species or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

ii. 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

iii. 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) A maximum of 2.82 ha of all vegetation will be cleared to accommodate proposed activities.

ii) Due to the nature and limited scale of the development (narrow walking track), its planned use (foot traffic), and the location (the edge of the coastal shoreline), the development is unlikely to cause significant impact with regards to fragmentation or isolation of habitat for potoroos. Habitat is currently already fragmented due to the 2019/2020 bushfire.

iii) Unburnt patches would be considered habitat that is vital to the long-term survival of the Long-nosed and Long-footed Potoroo. However, considering that a degree of vegetation recovery is expected by mid to late 2021 (18 months post-fire), the limited clearing activity is not likely to increase fragmentation or isolate important habitat for either species.

WHITE-FOOTED DUNNART

The **White-footed Dunnart** (*Sminthopsis leucopus*) is found in a range of different habitats across its distribution along the southern NSW and Victorian coast, including dune vegetation, coastal forest, tussock grassland and sedge land, heathland, woodland and forest. It is patchily distributed across these habitats and, where present, typically occurs at low densities. Feeds on a variety of ground-dwelling invertebrates and, occasionally, small lizards. Home ranges are small (80-100m^2). The breeding season occurs from August-September. It shelters in bark nests in hollows under standing or fallen timber, burrows in the ground, piles of logging debris, dense shrubs and rock crevices. Populations of terrestrial mammals usually decline immediately after a fire (Pardon *et al.* 2003; Recher etal. 2009; Doty *et al.* 2016). Wilson & Aberton (2006) recorded the White-footed Dunnart at a higher percentage of sites 6-15 years post-fire age, thus supporting evidence that it prefers mid-succession habitats. After a severe wildfire in Victoria it was absent from burnt sites for 3 years, indicating that recolonisation came from the unburnt refuges.

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,

Habitat availability/records

The White-footed Dunnart has been found in a diversity of habitats. In Mumbulla State Forest (north of the study area) Lunney *et al.* (1987) found that it used sites with sparse groundcover and was almost entirely restricted to recently highly disturbed sites, mainly recently-graded road edges, log dumps and burnt, logged forest on ridges and mid-slopes. It is considered to prefer an early regeneration niche (0-3 years) and had disappeared by the mid-seral stage (3-10 years) in this forest (Wilson & Aberton 2006). However, this is not the case at all sites and its habitat needs are not fully understood.

Suitable habitat within the study area occurs within PCT 721, 772, 1141, and 1157, and includes hollow logs and rocky crevices. The OEH BioNet Wildlife Atlas reveals three White-footed Dunnart records within 10 km of the study area.

Targeted surveys (camera traps) carried out as part of this assessment did not detect the White-footed Dunnart during camera trap surveys. This absence could be the result of a true absence, or difficulties in detection or identification due to the diminutive size of the species involved, similarities

in superficial appearance, and poor image quality. Taking the precautionary approach, therefore, this species is presumed to occur within the Study Area and is included in this assessment.

Impact assessment

- Given the extent of the 2019/2020 bushfires, and the importance of habitat within unburnt patches, development within those unburnt patches has the potential to have an adverse negative effect on the life cycle of the White-footed Dunnart. However, given that construction would take place 18 months post-fire, and that there would be a mosaic of vegetation recovery by that time, the proposal is unlikely to have an adverse negative effect on the life cycle of the species.
- There may be an added short-term risk associated with the cumulative pressures of re-establishing home ranges after recent fires (relevant in the recent 2019/2020 bushfire and the 2013/14 Green Cape fire) and the possibility of increased predator ingress which will occur if a new path was to be cleared into an unburnt area which previously had no tracks, trails or roads. However, the study area at present (February 2019) is already criss-crossed by numerous trails, tracks, unformed and unmapped passageways as well as known, mapped and permanently maintained tracks. The additional predator ingress by either introduced or native species caused by this proposal will be very limited in comparison to that which exists after the 2019/2020 bushfire. There is a commitment to undertake cat and fox control within the study area.
- As the proposed walking trail will mainly be utilised during the day, it is considered to have minimal direct impact on foraging behaviour of this species.
- Construction of the walking track and other activities will not increase the likelihood of wildfire or the ability to manage fuel loads to minimize risk to the environment.

Recommendations

- Avoid or minimize disturbance of ground cover vegetation during the construction of the walking track, accommodation and access trails.
- Avoid the removal or disturbance of shelter/denning habitat such as woody debris, fallen logs, burrows in the ground, dense shrubs, rock crevices and bush rocks during the construction of the walking track. Pre-construction surveys would be conducted to detect and avoid shelter habitat and will be conducted by trained individuals.
- Fox and cat control will be incorporated into the ongoing management and maintenance of the walking track in a manner that will not further endanger native species.
- Incorporate clear management measures in the continuing maintenance of the walking track to avoid and minimise impacts on ground cover vegetation and shelter/denning habitat.
- Monitoring: The results of the targeted small mammal surveys completed to make this assessment of impact constitute a valuable and useful base line study of this biodiversity asset along the walking track corridor. The results will be used to plan monitoring and management activities such that the biodiversity asset is maintained and where possible enhanced.

Given that there will be a degree of vegetation recovery in the study area and the broader locality by the time construction begins, it is unlikely that the proposal would have an adverse effect on the life cycle of the White-footed Dunnart such that a viable local population would be placed at risk of extinction.

b) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: **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. 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.**
n/a
c) in relation to the habitat of a threatened species or ecological community: **i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and** **ii. 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** **iii. 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) A maximum of 2.34 ha of all vegetation would be cleared to accommodate the proposed activities. ii) Due to the nature and limited scale of the development (narrow walking track), its planned use (foot traffic), and the location (the edge of the coastal shoreline), the development is unlikely to cause significant impact with regards to fragmentation or isolation of habitat for the White-footed Dunnart. Habitat is currently already fragmented due to the 2019/2020 bushfire. iii) Unburnt patches that contain refugia habitat (dense ground vegetation, logs etc.) would be considered habitat that is vital to the long-term survival of this species. However, considering that a degree of vegetation recovery is expected by mid to late 2021 (18 months post-fire), the limited clearing activity (with avoidance of refugia habitat) is not likely to increase fragmentation or isolate important habitat for the species.
SMALL RODENTS
The **Smoky Mouse** (*Pseudomys fumeus*) has a relatively wide but disjunct distribution, populations are small and fragmented, and there appear to have been local extinctions in several areas. Capture sites range from near sea level to at least 1800 m. The Smoky Mouse occurs in a variety of vegetation communities, ranging from coastal heath to dry ridgeline forest, sub-alpine heath and, occasionally, wetter gullies. Except for the wetter sites, a consistent feature of habitats is the diversity of heath and bush-pea species present, combined with potential shelter sites in the form of woody debris or rocks. A known population occurs in the Nullica area, north-east of Ben Boyd National Park. One study has found that a 30 m fire break is unlikely to act as a barrier to movement. However, the presence of fire breaks may expose individuals to a higher rate of predation when they cross large areas unprotected by vegetation cover (Macak & Menkhorst 2016). In response to fire, the Smoky Mouse seems to have a relatively low reproductive potential and appears to be most abundant in relatively stable habitats, with access to well-developed, diverse, heathy understoreys (DSE 2003). The **Eastern Chestnut mouse** (*Pseudomys gracilicaudatus*) is mostly found, in low numbers, in heathland and is most common in dense, wet heath and swamps. Optimal habitat appears to be in vigorously regenerating recently burnt heathland. The Eastern Chestnut Mouse feeds at night via runways through the grassy and sedge understorey. Home range >0.5ha. It has a broad diet of grass stems, invertebrates, fungi and seeds. Up to three litters from spring to autumn; which allows rapid build-up of numbers in years following fire. The Eastern Chestnut Mouse is a fire specialist inhabitant of early successional heathland (Pereoglou 2011). A study by Pereoglou (2011) found that Eastern Chestnut Mouse individuals preferentially selected multiple aboveground shelter sites

characterised by tall, dense vegetation with structural features present. The eastern chestnut mouse was ephemeral and non-gregarious in its refuge use. Refuge sites were found to be taller, denser vegetation compared to the surrounding habitat. Sites with multiple structures, such as *Xanthorrhea*, *Gymnoschoenus* (buttongrass) and the collapsed dead shrubs were also often selected. Refugia were highly flammable. Their findings implied that land management will ensure retention of vegetation structure on the ground layer and dense habitat patches in burned areas to assist with population viability. The ability of refugial populations to survive in unburnt patches would be a critical factor affecting population persistence (Pereoglou *et al.* 2011).

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,

Habitat availability/records

These native rodents have a preference for densely vegetated, ground cover habitat. Such habitat is common along the walking track corridor (tussocky grassland, open woodland with dense to shrubby understorey and coastal heathland with different fire histories). However, suitable habitat occurs only intermittently and in short sections relative to the dominant and less suitable habitat type, i.e low diversity, closed scrub vegetation (senescent *Melaleuca armillaris*) with limited or no ground cover close to the rocky shoreline. Along the vehicle access trails, however, in the dry sclerophyll forest communities (PCT 1084 and PCT 1157), good quality habitat for these small rodents is relatively common.

There are no Smoky Mouse or Eastern Chestnut Mouse records within 10 km of the study area according to the OEH BioNet Wildlife Atlas.

These threatened rodent species were not detected in the camera trap surveys. This absence could be the result of a true absence, or difficulties in detection or identification due to the diminutive size of the species involved, similarities in superficial appearance, and poor image quality. Taking the precautionary approach, therefore, both are presumed to occur within the Study Area and included in this assessment.

Impact assessment

- Given the extent of the 2019/2020 bushfires, and the importance of habitat within unburnt patches, development within those unburnt patches has the potential to have an adverse negative effect on the life cycle of these threatened rodent species. However, once there is suitable recovery of vegetation within burnt patches and in the broader locality, the proposal is unlikely to have an adverse negative effect on the life cycle of the species.
- There may be an added short-term risk associated with the cumulative pressures of re-establishing home ranges after recent fires (relevant in the recent 2019/2020 bushfire and the 2013/14 Green Cape fire) and the possibility of increased predator ingress which will occur if a new path was to be cleared into an unburnt area which previously had no tracks, trails or roads. However, the study area at present (February 2019) is already criss-crossed by numerous trails, tracks, unformed and unmapped passageways as well as known, mapped and permanently maintained tracks. The additional predator ingress by either introduced or native species caused by this proposal will be very limited in comparison to that which exists after the 2019/2020 bushfire. Cat and fox control is a commitment of the proposal.
- Construction of the walking track and other activities will not increase the likelihood of wildfire or the ability to manage fuel loads to minimise risk to the environment.

Recommendations

- Avoid or minimise disturbance of ground cover vegetation during the construction of the walking track.

- Avoid the removal or disturbance of shelter habitat such as woody debris, fallen logs, burrows in the ground, dense shrubs, rock crevices and bush rocks during the construction of the walking track. Pre-construction surveys to detect and avoid shelter habitat will be conducted by trained individuals.
- Fox and cat control will be incorporated into the ongoing management and maintenance of the walking track in a manner that will not further endanger native species.
- Incorporate clear management measures in the continuing maintenance of the walking track to avoid and minimise impacts on groundcover vegetation and shelter habitat.
- Monitoring: The results of the targeted small mammal surveys completed to make this assessment of impact constitute a valuable and useful base line study of this biodiversity asset along the walking track corridor. The results will be used to plan monitoring and management activities such that the biodiversity asset is maintained and where possible enhanced.

Given that there will be a degree of vegetation recovery in the study area and the broader locality by the time construction begins, it is unlikely that the proposal would have an adverse effect on their life cycles such that viable local populations are likely to be placed at risk of extinction.

b) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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. 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.

n/a

c) in relation to the habitat of a threatened species or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

ii. 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

iii. 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) A maximum of 2.82 ha of all vegetation may be cleared to accommodate the proposed activities.

ii) Due to the nature and limited scale of the development (narrow walking track), its planned use (foot traffic), and the location (the edge of the coastal shoreline), the development is unlikely to cause significant impact with regards to fragmentation or isolation of habitat for ground dwelling small mammals. Habitat is currently already fragmented due to the 2019/2020 bushfire.

iii) Unburnt patches that contain refugia habitat (dense ground vegetation, logs etc.) would be considered habitat that is vital to the long-term survival of these native rodents. However, considering that a degree of vegetation recovery is expected by mid to late 2021 (18 months post-fire), the limited clearing activity (with avoidance of refugia habitat) is not likely to increase fragmentation or isolate important habitat for either species.

LEAFLESS TONGUE ORCHID

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,

Habitat availability/records

At present (December 2020), there are no known viable populations of the Leafless Tongue Orchid (*Cryptostylis hunteriana*) in the vicinity of the proposed new walking track. However, there are a small number of old records of the species in the region, one of them from Mowarry Track between Leatherjacket Bay and Mowarry Point (cited in Keith and Ashby, 1992). Keith and Ashby also cite a collection from Nadgee (D. Jones, pers. comm.) and six records of the species from East Gippsland. The bulk of the distribution of this species is north of Ulladulla. Clark *et al.* (2004) found that some indicator species at sites within the Shoalhaven Region include *Lomandra filiformis, Pimelea linifolia, Xanthosia tridentata, Lomandra obliqua, Lambertia formosa, Dampiera stricta, Hakea dactyloides*. Only *Hakea dactyloides* was observed during NGH Consulting surveys in PCTs 1084 and 1141.

According to the OEH BioNet Atlas there is one (1) old record of this species (20 individuals) within 10 km of the study area.

Impact assessment

- The Leafless Tongue Orchid occurs in a variety of habitats but most frequently on sandy soils of low fertility and in heath or heathy woodland or forest (J. Miles, pers. obs.). While the habitat along some of the proposed track route is suitable (PCT 1141), the low numbers of records of the species (despite the intensity of use of the existing track in similar habitat) suggest that there is a low likelihood of it occurring along the route.
- Potential for increased predation frequency by herbivorous pest if a Leafless Tongue Orchid population is found along an access path. This risk would be mitigated by rerouting the path away from any plants. The width of the proposal corridor will provide ample room to adjust the path which would provide a large buffer of vegetation between any plants and the access path.
- The flowering period on the south coast is December-January (August to February throughout its range between central Queensland and Victoria, Jones, 2006). Since the field work for the proposal was done in this period, the species will have been detectable at the time. Because of its regional rarity and the fact that the timing of the survey was suitable for its detection, the likelihood of its presence along the new track route is considered low.
- The NPWS fire response database (2003) indicates that this species resprouts after fire and would reach reproductive maturity in under two years after fire. It also suggests that it would not be particularly sensitive to either too frequent or too infrequent fire, being able to establish and grow both after disturbance and in mature vegetation. Bell (2001) suggests that the persistence of *Cryptostylis hunteriana* may be threatened by severe fires during the species flowering period (Dec-Jan). Considering the fire history of sites known by Bell (2001), searches may best be undertaken between 12 and 36 months after a fire.

Considering the low impacts associated with the proposal, it is unlikely that the proposal would have an adverse effect on the life cycle of the Leafless Tongue Orchid such that viable local populations are likely to be placed at risk of extinction.

b) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: **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. 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.**
n/a
c) in relation to the habitat of a threatened species or ecological community: **i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and** **ii. 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** **iii. 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. 0.08 ha of PCT 1141 would be removed for the proposal. 1.95 ha of this habitat within the subject area was burnt in January 2020. ii. As there are no clear habitat preferences for this species, which is particularly cryptic, it is estimated that potential habitat could become further fragmented as a result of the proposal. iii. Given the surrounding habitat, the mosaic of burnt areas as a result of the 2019/2020 bushfire, and the narrow band of vegetation removal required for this proposal, the areas to be impacted are unlikely to be important to the long-term survival of this species.

MATTED BUSH-PEA

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,

Habitat availability/records

There is a single known population of about a dozen plants of the Matted Bush-pea (*Pultenaea pedunculata*) on Green Cape, on the edges of the existing Lighthouse to Lighthouse track south of the Pulpit Rock road, where it appears that the presence of the track and its maintenance by occasional slashing of the edges has been advantageous for the species. It was still present in the same location after the 2014 fire on Green Cape but did not appear to have taken advantage of the fire to expand its population in the immediate vicinity of the known occurrence (J. Miles, pers. obs.).

Other occurrences of this species in the region are from sparse scrub on coastal cliffs at White Rock in Bournda National Park, in forest west of Tathra (Andrew Morrison, Bega Valley Shire Council, pers. comm.), at various roadside locations between Tathra and Bermagui (Stuart Cameron, pers. comm.) and in forest south of Aragunnu (J. Miles, pers. obs.).

All the known locations in the region are very close to the coast, although it also occurs further inland on the Southern Tablelands. The common feature in most locations where it occurs appears to be the presence of bare ground and a lack of competition from other vegetation. Where it occurs in forest, the understorey is generally very sparse. Where it occurs on road verges it is often in areas of bare gravel. In the Windellama area south-east of Goulburn it favours bare soil on the edges of erosion gullies (J. Miles, pers. obs.). It was not detected during the field work, and although quite an inconspicuous plant, it is a subshrub which is present year-round, though most visible when flowering in September-October. The likelihood of there being an undetected population along the proposed new track route is very low (J. Miles, pers. comm.).

Pultenaea spp. are considered to be fire sensitive. Post-fire studies have found them to regenerate solely by seed (Lang *et al.* 2009). Auld *et al.* (2020) have assessed other threatened Pultenaea species and for all of them, medium to long-term recommendations are to avoid unburnt parts of a species range (i.e. no burning or clearing or logging in that habitat) in order to avoid putting all the species at risk at once.

Impact Assessment

- Potential for increased predation frequency by herbivorous pest if a population is along an access path. This risk would be mitigated by rerouting the path away from any plants discovered in preclearance survey. The width of the proposal corridor will provide ample room to adjust the path which would provide a large buffer of vegetation between any plants and the access path.
- Far from putting a local population at risk of extinction, the disturbance associated with the proposal is likely to stimulate recruitment in this species.
- One possible impact on the known Green Cape population would be the reduction in foot traffic and maintenance activities along the existing track through the heath, which could have a deleterious effect on this population. It would be preferable for this track to be kept open for those visitors who wish to explore the heath on Green Cape. There has been a previous instance where protection from disturbance actually eliminated this species (J. Miles, pers. obs.).

The proposed development or activity is unlikely to have an adverse effect on the life cycle of the Matted Bush Pea such that viable local populations are likely to be placed at risk of extinction.

b) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: **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. 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.**
n/a
c) in relation to the habitat of a threatened species or ecological community: **i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and** **ii. 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** **iii. 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. The species prefers sparse understorey scrub. 0.08 ha of suitable habitat is to be cleared for the proposal. ii. Potential habitat would become further fragmented as a result of the proposal, but due to the narrow width of the track, areas of potential habitat would not become isolated from other areas. iii. Given the surrounding potential habitat that will recover post-fire, and this species preference for disturbed areas, the proposal is unlikely to threaten the long term survival of this species.

B.1.1 HIDDEN VIOLET

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,

Habitat availability/records

The Hidden Violet (*Viola cleistogamoides*) is another species which favours disturbance. There are numerous records from the area south of Eden, mostly in coastal heath but some on road verges through forest between the Princes Highway and the coast (J. Miles, pers. obs.). In heath it tends to be found as only scattered individuals in areas where other vegetation is sparse, such as track edges or heath with very high coastal exposure. Its population has been observed to expand from an occasional plant to hundreds of plants following fire, both on Green Cape and in the heath south of Saltwater Creek. In addition to heath, it also appeared in burnt *Melaleuca armillaris* scrub around the edges of Green Cape, but did not persist very long in this type of vegetation (J. Miles, pers. obs.). It has also been found on road verges after logging and track construction.

The Hidden Violet is an extremely small and inconspicuous species and could have been overlooked during the survey of the route. Populations appear to spend much of their time in the soil seed bank, rather than as visible plants, as judged by its response to fire and mechanical disturbance. This species tends to proliferate for a few years after fire, followed by a decline. It flowers in summer.

Impact Assessment

Far from putting a local population at risk of extinction, the disturbance associated with the proposal is likely to stimulate recruitment in this species, if its seed is present in the soil seed bank. It is very robust to disturbance. There have been 2168 individuals recorded within 10 km of the subject site (OEH BioNet Atlas).

The proposed development or activity is unlikely to have an adverse effect on the life cycle of the Hidden Violet such that viable local populations are likely to be placed at risk of extinction.

b) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- **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. 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.**

n/a

c) in relation to the habitat of a threatened species or ecological community:

- **i. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and**
- **ii. 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**
- **iii. 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. The species is occurs in heath habitat which will largely be avoided. 0.08 ha of PCT 1141 will be removed. The track deviates from the existing population which occurs along the current track.

ii. The narrow width of the track is unlikely to cause a fragmentation issue for this species. Habitat for this species will not be isolated as a result of the proposal.

iii. Given the surrounding habitat (both burnt and unburnt), the abundance of this species within the national park, and that this species can benefit from some disturbance (including fire), the areas to be impacted are not considered important to the long-term survival of this species.

AREAS OF OUTSTANDING BIODIVERSITY VALUE

d) 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)

There are no listed areas of 'outstanding biodiversity value' within the subject site or study area.

KEY THREATENING PROCESSES

e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

In the following, the key threatening processes considered relevant to the development have been addressed. The threatening processes considered are:

- Clearing of native vegetation
- Loss of hollowing-bearing trees
- Removal of dead wood and dead trees
- Increased weed infestations
- Introduction of plant and soil borne pathogens
- Increased access for pest animals (foxes, deer, feral pigs, rabbits, and wild dogs)
- High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition

Clearing of native vegetation

The clearing of native vegetation is considered a major contributor to the loss of biodiversity. In the listing determination, the NSW Scientific Committee found that 'clearing of any area of native vegetation, including areas less than two hectares in extent, may have significant impacts on biological diversity'.

2.82 ha of vegetation would be cleared and an addition 2.90 ha considered indirectly impacted by the activities. The narrow minimal clearing proposed width of the track the that is proposed, disturbance, extensive surrounding intact habitat (currently both burnt and unburnt) and potential to rehabilitate the redundant areas of track suggest this will process will be manageable for the long-term project.

Loss of Hollow-bearing Trees

Hollow-bearing trees are rare within the development corridor. It is anticipated that impacts on all the mature and hollow- bearing trees can be avoided during planning and construction by rerouting the track within the proposed track corridor after pre-clearance surveys of the walking track. The proposal is not likely to contribute to this key threatening process.

Removal of dead wood and dead trees

Dead wood and dead trees provide essential habitat for a wide variety of native animals and are important to the functioning of many ecosystems. The removal of dead wood can have a range of environmental consequences, including the loss of habitat (as they often contain hollows used for shelter by animals), disruption of ecosystem process and soil erosion.

Minimal loss of disturbance of dead wood or trees is expected from this proposal. Avoiding and/or relocating stands of dead wood is a commitment of the proposal. The proposal is not likely to contribute to this key threatening process.

Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands

The proposed walking track will cross multiple streams however the impact is considered minimal as the proposal will not contribute to any interruption of stream flows. Impacts are not expected from the other two activities as they are expansions of existing features and so no additional stream or wetland interruptions are expected.

Infection of native plants by *Phytophthora cinnamomi*

Phytophthora cinnamomi is a soil borne pathogen belonging to the water mould group (Oomycetes). The reproductive structures that spread *P. cinnamomic* form on vegetative mycelia in soil and plant roots in warm, moist conditions. Reproduction and infection occur entirely within soil or plants and there is no airborne transmission of the pathogen. The extent of *P. cinnamomi* impact within NSW is generally unknown. It does not appear to be causing the dramatic widespread vegetation loss that has been observed in other southern Australian states. However, the pathogen is having a significant local impact on native vegetation in several widely spaced parts of eastern NSW, and these impacts are primarily on understorey plant species.

The spread of *P. cinnamomi* occurs through movement of spores which may swim to new hosts or be dispersed over large distances in flowing water, such as storm runoff. Some spread within a site may be by mycelial growth from infected roots to roots of healthy plants. Consequently, propagules of *P. cinnamomi* may be dispersed by any activity that moves soil, water or plant material – this includes activities such as bushwalking, off road vehicle use, road building and maintenance, especially when this is undertaken during the infective southern spring.

In NSW, infection by *P. cinnamomi* has been identified as a threat to several listed ecological communities and species, including the *Pultenea penduculata* (Matted Bushpea), which is known to occur in the heathland habitats in the Study Area. The heathland habitat also support a number of common species that are NOT currently threatened in NSW but known (or strongly suspected) to be susceptible to infection by *P. cinnamomi* (e.g. *Aotus ericoides, Astroloma humifusu, Banksia serrata, Brachyloma daphnoides, Correa reflexa, Crowea exalata, Epacris impressa, Grevillea lanigera, Hakea ulicina, Kennedia prostrata, Leucopogon esquamatus, Monotoca elliptica, Patersonia sericea, Phyllanthus hirtellus, Xanthorrhoea resinifera) (J Miles, ALCW 15 September 2019).*

It is strongly recommended to:

- Avoid all use of foreign soil matter for landscaping/mulching. Always use matter from in situ.
- Install disinfecting facilities – wash-down bays, footbaths and/or scrubbing stations at primary entrance/exit points for both vehicles/machinery and foot traffic
- In priority locations (heath habitat), install signage (e.g. ‘Stay on marked tracks’) to reduce off-track disturbance and elevate or divert walking tracks to minimise contact with soil, particularly in locations that have the potential to become muddy.

Herbivory and environmental degradation caused by feral deer

Deer are known to occur within the study area. The establishment of new tracks throughout the Study Area may facilitate the dispersal of this species and worsen existing impacts.

It is recommended that:

- Project-specific pest management actions be developed as part of the BMP, which is appropriately funded and based on the principles of adaptive management. It will include provisions for monitoring (e.g. camera traps to detect deer densities), evaluation and the user control strategies through other means, where appropriate.
- Any new program needs to be integrated with existing control strategies in the park and broader initiative such as Saving Our Species (SOS) programs.

Predation by the European Red Fox; &Predation by the Feral Cat *Felis catus*

Direct observations, indirect signs (tracks, scats), visible impacts (browsing, burrows) of pest predators including Red Fox and Feral Cats are evident through all areas investigated. The establishment of new tracks throughout the Study Area may facilitate the dispersal of these species and worsen existing impacts, particularly by increasing risk of predation for small native fauna species at a site level.

It is recommended that:

- Project-specific pest management actions be developed as part of the BMP, which is appropriately funded and based on the principles of adaptive management. It will include provisions for monitoring (e.g. camera traps to detect feral predator densities), evaluation and the user control strategies through baiting or other means, where appropriate.
- Any new program needs to be integrated with existing control strategies in the park and broader initiative such as Saving Our Species (SOS) programs.

Invasion of native plant communities by exotic perennial grasses

As a result of the disturbance caused in the study area, spread of exotic perennial grasses could potentially be facilitated.

It is recommended that:

- Project-specific management actions be developed as part of the BMP, which is appropriately funded and based on the principles of adaptive management. It will include provisions for monitoring, evaluation and control strategies for exotic grasses on site.
- Any new program needs to be integrated with existing control strategies in the park and broader initiative such as Saving Our Species (SOS) programs.

High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition

Not relevant to the project. No aspect of the proposal is considered to increase the likelihood of fire frequency in the study area.

Appendix C Assessments of Significance (EPBC Act)

The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) protects the environment, particularly Matters of National Environmental Significance (Protected matters). It streamlines the national environmental assessment and approvals process, protects Australian biodiversity and integrates management of important natural and cultural places. The Matters of National Environmental Significance are:

- World heritage properties;
- National heritage properties;
- Wetlands of international importance;
- Listed threatened species and ecological communities;
- Migratory species;
- Commonwealth marine areas;
- The Great Barrier Marine Park;
- Nuclear actions; and
- Water resources, in relation to coal seam gas development and large coal mining development.

An action will require approval if the action has, will have, or is likely to have a significant impact on a species listed in any of the following categories:

- Extinct in the wild;
- Critically endangered;
- Endangered; or
- Vulnerable.

The factors required to be addressed vary depending on the conservation status of the listed entity in question. The Assessments of Significance (AoS) below reflect this variability. AoS have been undertaken for the following EPBC Act listed entities:

Flora

- Leafless Tongue Orchid (*Cryptostylis hunteriana*) (Vulnerable)

Fauna

- Eastern Bristlebird (Endangered)
- Long-nosed Potoroo (Vulnerable)
- Spotted-tailed Quoll (Endangered)
- Southern Brown Bandicoot (Endangered)
- Long-footed Potoroo (Endangered)
- Smoky Mouse (Endangered)

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:

a) Will the action lead to a long-term decrease in the size of an important population of a species?

The Significant Impact Guidelines 1.1 define an important population of a vulnerable species as 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.

Long-nosed Potoroo

There are 295 long-nosed Potoroo records within 10 km of the study area and field surveys confirmed the species presence. Given the extent of the 2019/2020 bushfires, and the importance of habitat within unburnt patches, development within those unburnt patches has the potential to have an adverse negative effect on the life cycle of the Long-nosed Potoroo. However, considering that construction would not take place until at least 24 months after the fire, it is likely that potoroos would be utilising burnt patches where there is suitable recovery of vegetation. Given the low impacts associated with the proposal, it is unlikely to lead to a long-term decrease in the size of an important population

Leafless Tongue Orchid

At present (December 2020), there are no known viable populations of the Leafless Tongue Orchid (*Cryptostylis hunteriana*) in the vicinity of the proposed new walking track. However, there are a small number of old records of the species in the region, one of them from Mowarry Track between Leatherjacket Bay and Mowarry Point (cited in Keith and Ashby, 1992). Keith and Ashby also cite a collection from Nadgee (D. Jones, pers. comm.) and six records of the species from East Gippsland. The bulk of the distribution of this species is north of Ulladulla. As such, the proposal is unlikely to lead to a long-term decrease in the size of an important population.

b) Will the action reduce the area of occupancy of an important species?

Long-nosed Potoroo

The proposal will remove 2.25 ha of potential foraging and breeding habitat, however considering the very low impacts associated with the proposal, the recovery of the study area post-fire, and the future rehabilitation of the old track, it is unlikely to reduce the area of occupancy of the species.

Leafless Tongue Orchid

0.08 ha of potential habitat PCT 1141 would be removed for the proposal. Of the total 2.21 ha of this habitat within the study area 1.95 ha was burnt in January 2020. No individuals were recorded during surveys. Due to the low impacts associated with the proposal, it is unlikely that the proposal would reduce the area of occupancy of this species.

c) Will the action fragment an existing important population into two or more populations?

Long-nosed Potoroo

Considering the species mobility, the low impacts associated with the proposal and that the proposal is located is on the edge of the coastline, it is unlikely that the proposal would fragment an existing population into two or more populations.

Leafless Tongue Orchid

d) Will the action adversely affect habitat critical to the survival of a species?

Long-nosed Potoroo

Critical habitat has not been defined for this species, however, considering that key habitat features will be avoided during construction, it is unlikely that the proposal would adversely affect habitat critical to the survival of the species.

Leafless Tongue Orchid

Critical habitat has not been defined for this species and it occurs in a variety of habitats.

e) Will the action disrupt the breeding cycle of an important population?

Long-nosed Potoroo

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. However, given the low impacts associated with the proposal, and the avoidance of key habitat features, the proposal is unlikely to disrupt the breeding cycle of an important population

Leafless Tongue Orchid

This species flowers between December and January along the south coast. Considering that no individuals were detected, and the low impacts associated with the proposal (no earthworks), it is unlikely that the proposal would disrupt the breeding cycle of an important population.

f) Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Long-nosed Potoroo

Approximately 2.25 ha of suitable foraging and breeding habitat would be removed and a further 2.45 ha is considered indirectly impacted. However, areas of the redundant track would be rehabilitated to provide ongoing habitat for individuals. As such, the proposal is unlikely to decrease the availability or quality of habitat to the extent that the Long-nosed Potoroo would decline.

Leafless Tongue Orchid

Approximately 0.08 ha of potential habitat would be removed for the proposal, which is a very small area compared to the habitat present in the surrounding areas of the National Park. Provided pre-clearing surveys are undertaken and given the low impacts associated with the proposal, it is unlikely that the proposal would decrease the availability or quality of habitat to the extent that the Leafless Tongue Orchid would decline.

g) Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

Long-nosed Potoroo

Predatory invasive species such as cats and foxes may be more prevalent at the subject site due to the 2019/2020 bushfire, which may increase competition and predation from those introduced predators. However, ongoing fox and cat control, that is safe to use in an area where native mammals are present, is a commitment of the proposal.

Leafless Tongue Orchid

Weeds may compete for space and resources. Management of weeds would be undertaken to ensure that adjacent habitat is maintained.

h) Will the action introduce disease that may cause the species to decline?

The dieback disease caused by the root-rot fungus *Phytophthora cinnamomi* is listed as a Key Threatening Process under the EBPC Act and has the potential to impact on the habitat of the Long-nosed Potoroo. Measures will be incorporated during construction to ensure that it is not introduced or spread.

Leafless Tongue Orchid

The proposal would not introduce disease that may cause the species to decline.

i) Will the action interfere substantially with the recovery of the species?

Long-nosed Potoroo

There is no recovery plan for this species.

Leafless Tongue Orchid

There is no recovery plan for this species.

Endangered Species

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

a) Lead to a long-term decrease in the size of a population?

Eastern Bristlebird

The **Eastern Bristlebird** (*Dasyornis brachypterus*) inhabits a broad range of plant communities, with low, dense, ground or understorey vegetation. The species spends most of its time in dense vegetation, rarely appearing in the open or flying. It feeds mostly on invertebrates, but also on seeds, earthworms, fungi and occasionally nectar. The species' distribution has contracted to three disjunct populations in south-eastern Australia, with only two confirmed populations in the south (Nadgee NR in NSW, Croajingolong NP, in Victoria (<380 birds)). It breeds from August to February. The Eastern Bristlebird has not been recorded within 5 km of the subject site and the avoidance of key habitat features and low impacts within heathland habitat are unlikely lead to a long-term decrease in the size of a population.

Spotted-tailed Quoll

The **Spotted-tail Quoll** (*Dasyurus maculatus*) occupies a range of habitat types, including rainforest, open forest, woodland, coastal heath, farmland, plantations and the edges of rural villages and towns. Within the Study Area, suitable prey species detected on camera traps in a targeted survey that was part of this assessment included the Southern Brown Bandicoot, Long-nosed Bandicoot, Long-nosed Potoroo, Common Brushtail Possum, and Common Ringtail Possum. Recorded den sites include rock crevices, hollow logs, hollow tree buttresses, tree hollows, woody debris, dense clumps of vegetation, caves and boulder tumbles,

under buildings, and underground burrows, including those of rabbits and wombats. The proposal provides suitable foraging and breeding habitat for this highly mobile predator. Based on knowledge of Spotted-tail Quoll home range sizes, the Study Area may form part of the home range of 1-2 males and <5 females. The low impacts associated with the proposal, and the avoidance of key habitat features such as rocky outcrops and hollow logs, means that the proposal is unlikely to lead to a long-term decrease in the size of a population.

Southern Brown Bandicoot

The **Southern Brown Bandicoot** (*Isoodon obesulus*) is generally only found in heathland or open forest with a heathy understorey on sandy or friable soils. It feeds on a variety of ground-dwelling invertebrates and underground-fruiting fungi. The Southern Brown Bandicoot has been confirmed within the study area, however the impacts of the 2019/2020 bushfire are unknown. Given the extent of the 2019/2020 bushfires, and the importance of habitat within unburnt patches, development within those unburnt patches has the potential to have an adverse negative effect on the life cycle of the Southern Brown Bandicoot. However, once there is suitable recovery of vegetation within burnt patches and in the broader locality, the proposal is unlikely to lead to a long-term decrease in the size of a population.

Long-footed Potoroo

The **Long-footed Potoroo** (*Potorous longipes*) inhabits a variety of vegetation classes from shrubby dry forest to warm temperate rainforest and wet forest. Sites on sheltered aspects with moist soils, supporting a mixed species overstorey and a dense understorey, are characteristic of preferred habitat. The Long-footed Potoroo depends on fungi as a food source (>90% of their diet), with invertebrates and plant material making up the remainder. This species has a very restricted distribution and is no-where abundant. Given the extent of the 2019/2020 bushfires, and the importance of habitat within unburnt patches, development within those unburnt patches has the potential to have an adverse negative effect on the life cycle of the Long-footed Potoroo. However, considering that construction would not take place until at least 18 months after the fire, it is likely that potoroos would be utilising burnt patches where there is suitable recovery of vegetation. Given the low impacts associated with the proposal, it is unlikely to lead to a long-term decrease in the size of a population.

Smoky Mouse

The Smoky Mouse occurs in a variety of vegetation communities, ranging from coastal heath to dry ridgeline forest, sub-alpine heath and, occasionally, wetter gullies. Except for the wetter sites, a consistent feature of habitats is the diversity of heath and bush-pea species present, combined with potential shelter sites in the form of woody debris or rocks. A known population occurs in the Nullica area, north-east of Ben Boyd National Park. This species was not detected during the field surveys, and there are no records within 10km of the study area. Given the low impacts associated with the proposal, it is unlikely to lead to a long-term decrease in the size of a population.

b) Reduce the area of occupancy of the species?

Eastern Bristlebird

The proposal will remove 2.81 ha of potential foraging and breeding habitat, however considering the very low impacts associated with the proposal and the future rehabilitation of the old track, it is unlikely to reduce the area of occupancy of the species.

Spotted-tailed Quoll

The proposal will remove 0.68 ha of potential foraging and breeding habitat, however considering the very low impacts associated with the proposal and the future rehabilitation of the old track, it is unlikely to reduce the area of occupancy of the species.

Southern Brown Bandicoot

The proposal will remove 2.82 ha of potential foraging and breeding habitat, however considering the very low impacts associated with the proposal, the recovery of the study area post-fire, and the future rehabilitation of the old track, it is unlikely to reduce the area of occupancy of the species.

Long-footed Potoroo

The proposal will remove 2.82 ha of potential foraging and breeding habitat, however considering the very low impacts associated with the proposal, the recovery of the study area post-fire, and the future rehabilitation of the old track, it is unlikely to reduce the area of occupancy of the species.

Smoky Mouse

The proposal will remove 0.06 ha of potential foraging and breeding habitat, however considering the very low impacts associated with the proposal, the recovery of the study area post-fire, and the future rehabilitation of the old track, it is unlikely to reduce the area of occupancy of the species, if present.

c) Fragment an existing population into two or more populations?

Eastern Bristlebird

Considering the species mobility, and that the proposal is located is on the edge of the coastline, and no known populations are present within the study area, it is unlikely that the proposal would fragment an existing population into two or more populations.

Spotted-tailed Quoll

Considering the species mobility, the low impacts associated with the proposal and that the proposal is located is on the edge of the coastline, it is unlikely that the proposal would fragment an existing population into two or more populations.

Southern Brown Bandicoot

Considering the species mobility, the low impacts associated with the proposal and that the proposal is located is on the edge of the coastline, it is unlikely that the proposal would fragment an existing population into two or more populations.

Long-footed Potoroo

Considering the species mobility, the low impacts associated with the proposal and that the proposal is located is on the edge of the coastline, it is unlikely that the proposal would fragment an existing population into two or more populations.

Smoky Mouse

Considering the species mobility, the low impacts associated with the proposal and that the proposal is located is on the edge of the coastline, it is unlikely that the proposal would fragment an existing population into two or more populations.

d) Adversely affect habitat critical to the survival of a species?

Eastern Bristlebird

The National Recovery Plan states that ‘All habitat currently occupied by the Eastern Bristlebird is critical to its survival’. Considering that there have been no records within 5 km of the site and that the study area has

not been identified as part of the southern population, it is unlikely that the proposal would affect habitat critical to the survival of the species.

Spotted-tailed Quoll

The National Recovery Plan states that it is currently not possible to define (or map) habitat critical to the survival of the Spotted-tailed Quoll. However, critical habitat elements include trees with hollows, hollow logs, a complex vegetation structure, >50% canopy cover and rock or burrow den sites. Considering that hollows, hollow logs and rock or burrow den sites would be actively avoided, it is unlikely that the proposal would adversely affect habitat critical to the survival of the Spotted-tailed Quoll.

Southern Brown Bandicoot

The NSW Recovery Plan states that critical habitat has not been declared for this species. There is no national recovery plan. However, considering that key habitat features will be avoided during construction, it is unlikely that the proposal would adversely affect habitat critical to the survival of the species.

Long-footed Potoroo

Habitat critical to the survival of the species has not been defined in the recovery plan. However, considering that key habitat features will be avoided during construction, it is unlikely that the proposal would adversely affect habitat critical to the survival of the species.

Smoky Mouse

The National Recovery Plan states that 'knowledge of the habitat requirements of the Smoky Mouse is inadequate to allow a meaningful description of habitat critical to survival'. However, considering that key habitat features will be avoided during construction as well as the low impacts associated with the proposal, it is unlikely that the proposal would adversely affect habitat critical to the survival of the species.

e) Disrupt the breeding cycle of a population

Eastern Bristlebird

The Eastern Bristlebird breeds from August to February. Females build a small, globular nest that has a side entrance and is made from grass, bark, sedges or reeds, and leaves. The nest is generally constructed at 10 to 45cm above the ground in low dense vegetation, in grass tussocks, sedges, ferns and shrubs. Measures have been put in place to avoid active nests of threatened bird species, and construction of the track itself will be undertaken without the use of heavy machinery. As such, the proposal is unlikely to disrupt the breeding cycle of a population, if present.

Spotted-tailed Quoll

Pre-construction surveys will inspect for breeding suitability/ denning structures and communal latrine sites and the track will avoid these areas. As such, the proposal is unlikely to disrupt the breeding cycle of a population.

Southern Brown Bandicoot

Nests may be located under Grass trees (*Xanthorrhoea* spp.), dense shrubs, or in rabbit burrows. The breeding season extends for 5-8 months of the year, corresponding well to the time of maximum food abundance, usually following heavy rainfall. Given the low impacts associated with the proposal, and the avoidance of key habitat features such as grass trees, the proposal is unlikely to disrupt the breeding cycle of a population.

Long-footed Potoroo

Breeding occurs throughout the year, however, given the low impacts associated with the proposal, and the avoidance of key habitat features, the proposal is unlikely to disrupt the breeding cycle of a population.

Smoky Mouse

Breeding is in spring with one or two litters produced of up to four young. Nesting burrows have been found in rocky localities among tree roots and under the skirts of Grass Trees *Xanthorrhoea* spp. Given the low impacts associated with the proposal, and the avoidance of key habitat features, the proposal is unlikely to disrupt the breeding cycle of a population.

f) Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Eastern Bristlebird

Approximately 2.21 ha of suitable habitat would be cleared, a further 2.34 ha is considered indirectly impacted. This would include potential foraging and breeding habitat. However, areas of the redundant track would be rehabilitated to provide ongoing habitat for potential individuals. As such, the proposal is unlikely to decrease the availability or quality of habitat to the extent that the Eastern Bristlebird would decline.

Spotted-tailed Quoll

Approximately 0.68 ha of suitable habitat would be cleared, a further 0.65 ha is considered indirectly impacted. This would include potential foraging habitat. However, areas of the redundant track would be rehabilitated to provide ongoing habitat for individuals. As such, the proposal is unlikely to decrease the availability or quality of habitat to the extent that the Spotted-tailed Quoll would decline.

Southern Brown Bandicoot

Approximately 2.82 ha of suitable habitat would be cleared, a further 2.90 ha is considered indirectly impacted. However, areas of the redundant track would be rehabilitated to provide ongoing habitat for individuals. As such, the proposal is unlikely to decrease the availability or quality of habitat to the extent that the Southern Brown Bandicoot would decline.

Long-footed Potoroo

Approximately 2.82 ha of suitable habitat would be cleared, a further 2.90 ha is considered indirectly impacted. However, areas of the redundant track would be rehabilitated to provide ongoing habitat for individuals. As such, the proposal is unlikely to decrease the availability or quality of habitat to the extent that the Long-footed Potoroo would decline.

Smoky Mouse

Approximately 0.06 ha of suitable habitat would be cleared, a further 0.25 ha is considered indirectly impacted. However, areas of the redundant track would be rehabilitated to provide ongoing habitat for individuals. As such, the proposal is unlikely to decrease the availability or quality of habitat to the extent that the Smoky Mouse would decline.

g) Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat?

Eastern Bristlebird

Management of weeds would be undertaken to ensure that adjacent habitat is maintained. Measures for pathogen prevention and control would also be undertaken during construction. Predatory invasive species such as cats and foxes may be more prevalent at the subject site due to the 2019/2020 bushfire, however ongoing fox and cat control is a commitment of the proposal.

Spotted-tailed Quoll

Predatory invasive species such as cats and foxes may be more prevalent at the subject site due to the 2019/2020 bushfire, which may increase competition and predation from those introduced predators. However, ongoing fox and cat control, that is safe to use in an area where native mammals are present, is a commitment of the proposal.

Southern Brown Bandicoot

Predatory invasive species such as cats and foxes may be more prevalent at the subject site due to the 2019/2020 bushfire, which may increase competition and predation from those introduced predators. However, ongoing fox and cat control, that is safe to use in an area where native mammals are present, is a commitment of the proposal.

Long-footed Potoroo

Predatory invasive species such as cats and foxes may be more prevalent at the subject site due to the 2019/2020 bushfire, which may increase competition and predation from those introduced predators. However, ongoing fox and cat control, that is safe to use in an area where native mammals are present, is a commitment of the proposal.

Smoky Mouse

Predatory invasive species such as cats and foxes may be more prevalent at the subject site due to the 2019/2020 bushfire, which may increase competition and predation from those introduced predators. However, ongoing fox and cat control, that is safe to use in an area where native mammals are present, is a commitment of the proposal.

h) Introduce disease that may cause the species to decline?

Eastern Bristlebird

The dieback disease caused by the root-rot fungus *Phytophthora cinnamomi* is listed as a Key Threatening Process under the EBPC Act and has the potential to impact on the habitat of the Eastern Bristlebird. While not recorded at the site, precautionary measures will be incorporated during construction to ensure that it is not introduced or spread.

Spotted-tailed Quoll

The proposal would not introduce disease that may cause the species to decline.

Southern Brown Bandicoot

The dieback disease caused by the root-rot fungus *Phytophthora cinnamomi* is listed as a Key Threatening Process under the EBPC Act and has the potential to impact on the habitat of the Southern Brown Bandicoot. While not recorded at the site, precautionary measures will be incorporated during construction to ensure that it is not introduced or spread.

Long-footed Potoroo

The dieback disease caused by the root-rot fungus *Phytophthora cinnamomi* is listed as a Key Threatening Process under the EBPC Act and has the potential to impact on the habitat of the Long-footed Potoroo. While not recorded at the site, precautionary measures will be incorporated during construction to ensure that it is not introduced or spread.

Smoky Mouse

The dieback disease caused by the root-rot fungus *Phytophthora cinnamomi* is listed as a Key Threatening Process under the EBPC Act and has the potential to impact on the habitat of the Smoky Mouse. While not recorded at the site, precautionary measures will be incorporated during construction to ensure that it is not introduced or spread

i) Interfere with the recovery of the species?

Eastern Bristlebird

There is a recovery plan for the Eastern Bristlebird, and the proposal will not interfere with the recovery objectives detailed within the plan.

Spotted-tailed Quoll

There is a recovery plan for the Spotted-tailed Quoll, and the proposal will not interfere with the recovery objectives detailed within the plan.

Southern Brown Bandicoot

There is a recovery plan for the Southern Brown Bandicoot, and the proposal will not interfere with the recovery objectives detailed within the plan.

Long-footed Potoroo

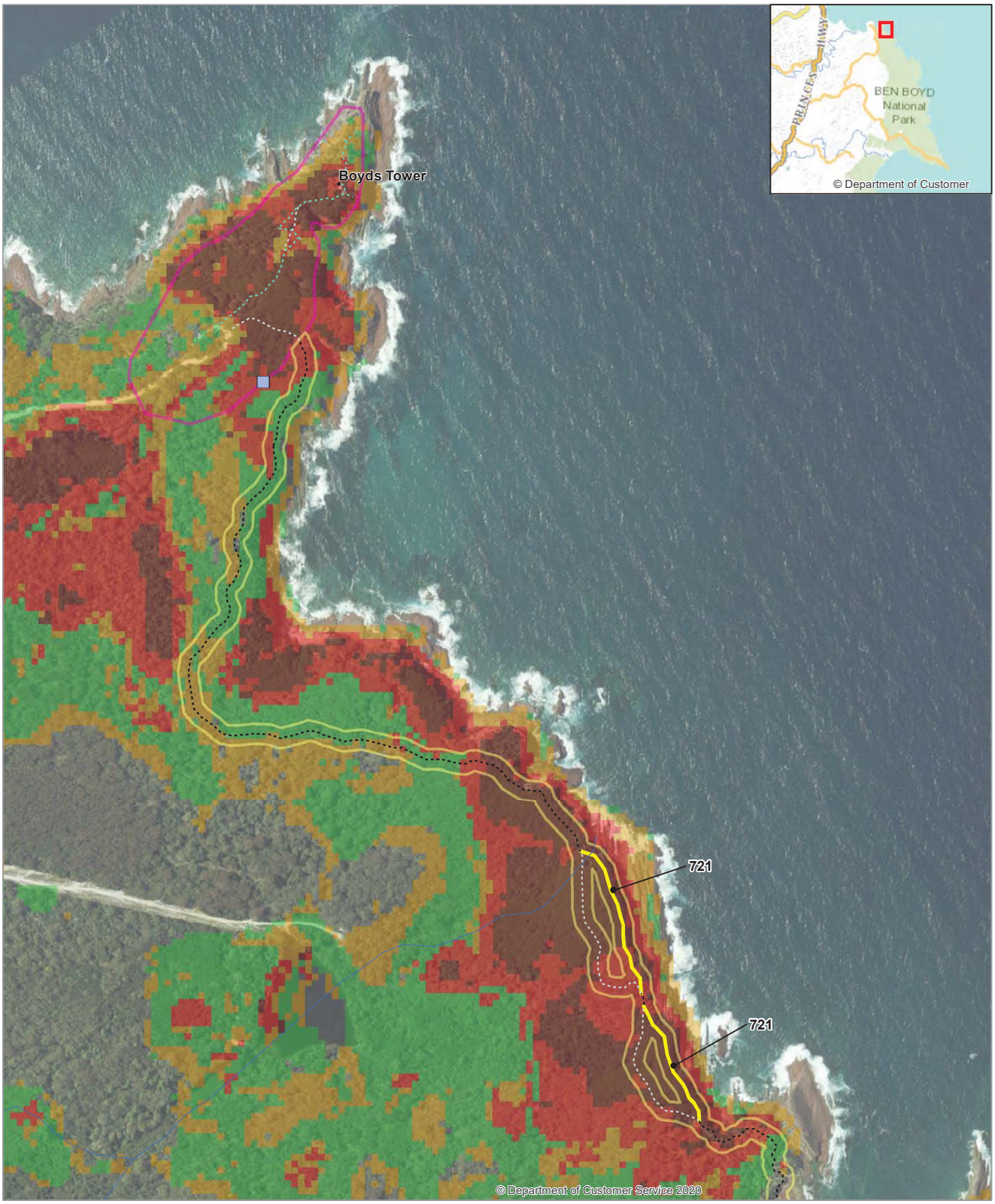
There is a recovery plan for the Long-footed Potoroo, and the proposal will not interfere with the recovery objectives detailed within the plan.

Smoky Mouse

There is a recovery plan for the Smoky Mouse, and the proposal will not interfere with the recovery objectives detailed within the plan.

Appendix D Map sets

D.1 Detail of PCTs identified in the study area and survey effort, and FESM extent



Light to Light Walk Upgrade REF - PCTs within Activity 1 - Map 1 of 12

0 50 100 200 300 Metres

A3 @ 1:6,000
Ref: 18569 Light to Light REF
Author: TH
Date Created: 05/09/2021
Datum: GDA94 \ MGA94 Zone 55

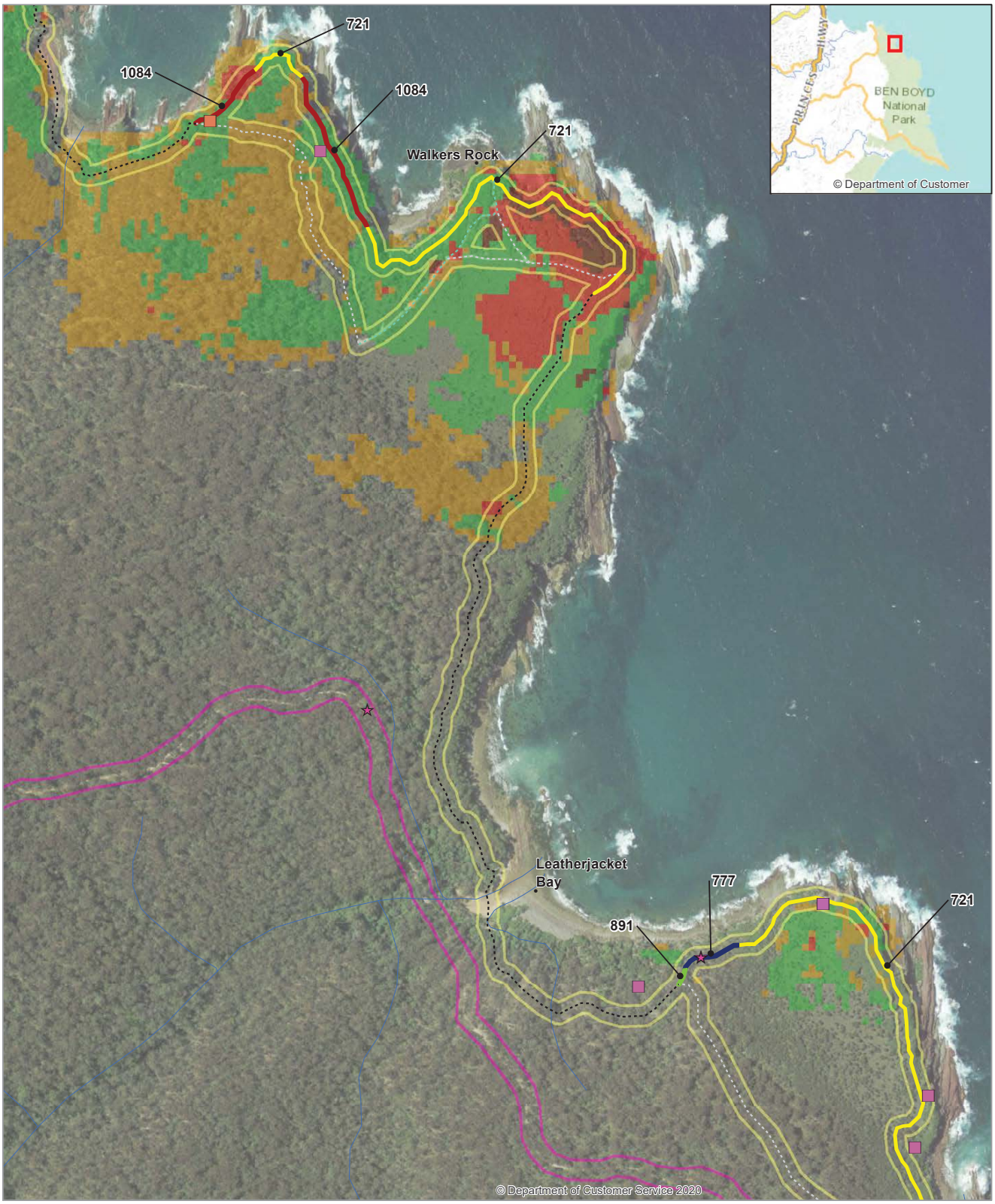
Native Fauna Identified
- wallaby
- red-necked wallaby

- Points of Interest
- Hollow Bearing Trees
- Existing Walking Tracks
- Existing Subsidiary Tracks
- Redundant Tracks
- Watercourses
- Light to Light Walk Upgrade Study Area (30m corridor and precincts)
- Other REF Precincts

Plant Community Types within Activity 1
- PCT 721
- PCT 772
- PCT 777
- PCT 891
- PCT 1084
- PCT 1141
- PCT 1157

DPIE Fire Extent and Severity Mapping (FESM) v2
- Unburnt
- Non-FESM burnt area
- Low - burnt understory with unburnt canopy
- Medium - partial canopy scorch
- High - full canopy scorch / partial consumption
- Extreme - full canopy consumption

NGH



Light to Light Walk Upgrade REF - PCTs within Activity 1 - Map 2 of 12

0 50 100 200 300 Metres

A3 @ 1:6,000
Ref: 18569 Light to Light REF
Author: TH
Date Created: 05/09/2021
Datum: GDA94 \ MGA94 Zone 55

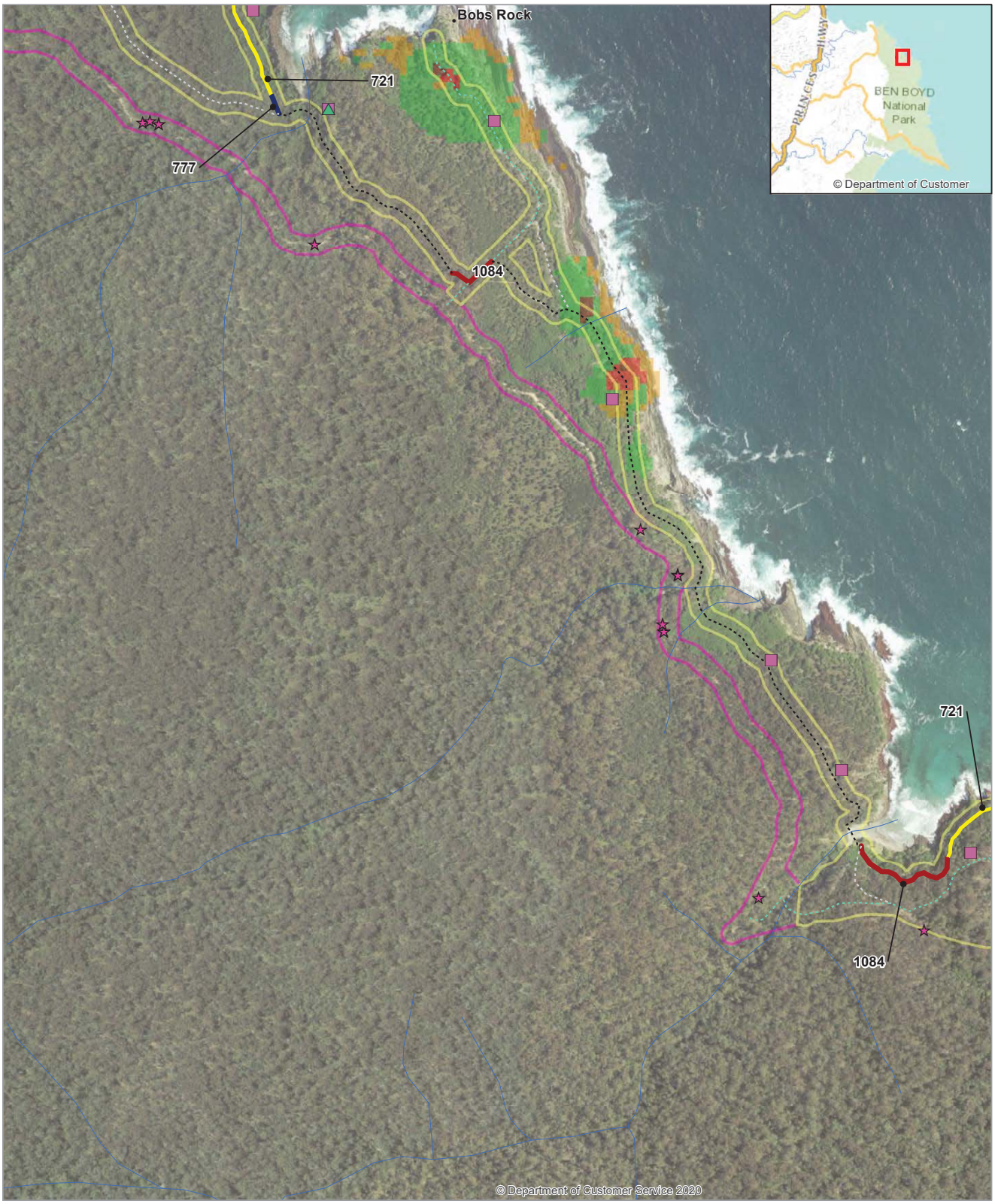
Native Fauna Identified
- lace monitor
- bush rat
- common brush-tail possum
- eastern grey kangaroo
- red-necked wallaby
- wallaby
- Superb Lyrebird

- Points of Interest
- Hollow Bearing Trees
- Existing Walking Tracks
- Existing Subsidiary Tracks
- Redundant Tracks
- Watercourses
- Light to Light Walk Upgrade Study Area (30m corridor and precincts)
- Other REF Precincts

Plant Community Types within Activity 1
- PCT 721
- PCT 772
- PCT 777
- PCT 891
- PCT 1084
- PCT 1141
- PCT 1157

DPIE Fire Extent and Severity Mapping (FESM) v2
- Unburnt
- Non-FESM burnt area
- Low - burnt understory with unburnt canopy
- Medium - partial canopy scorch
- High - full canopy scorch / partial consumption
- Extreme - full canopy consumption

NGH



Light to Light Walk Upgrade REF - PCTs within Activity 1 - Map 3 of 12

0 50 100 200 300 Metres

A3 @ 1:6,000
Ref: 18569 Light to Light REF
Author: TH
Date Created: 05/09/2021
Datum: GDA94 \ MGA94 Zone 55

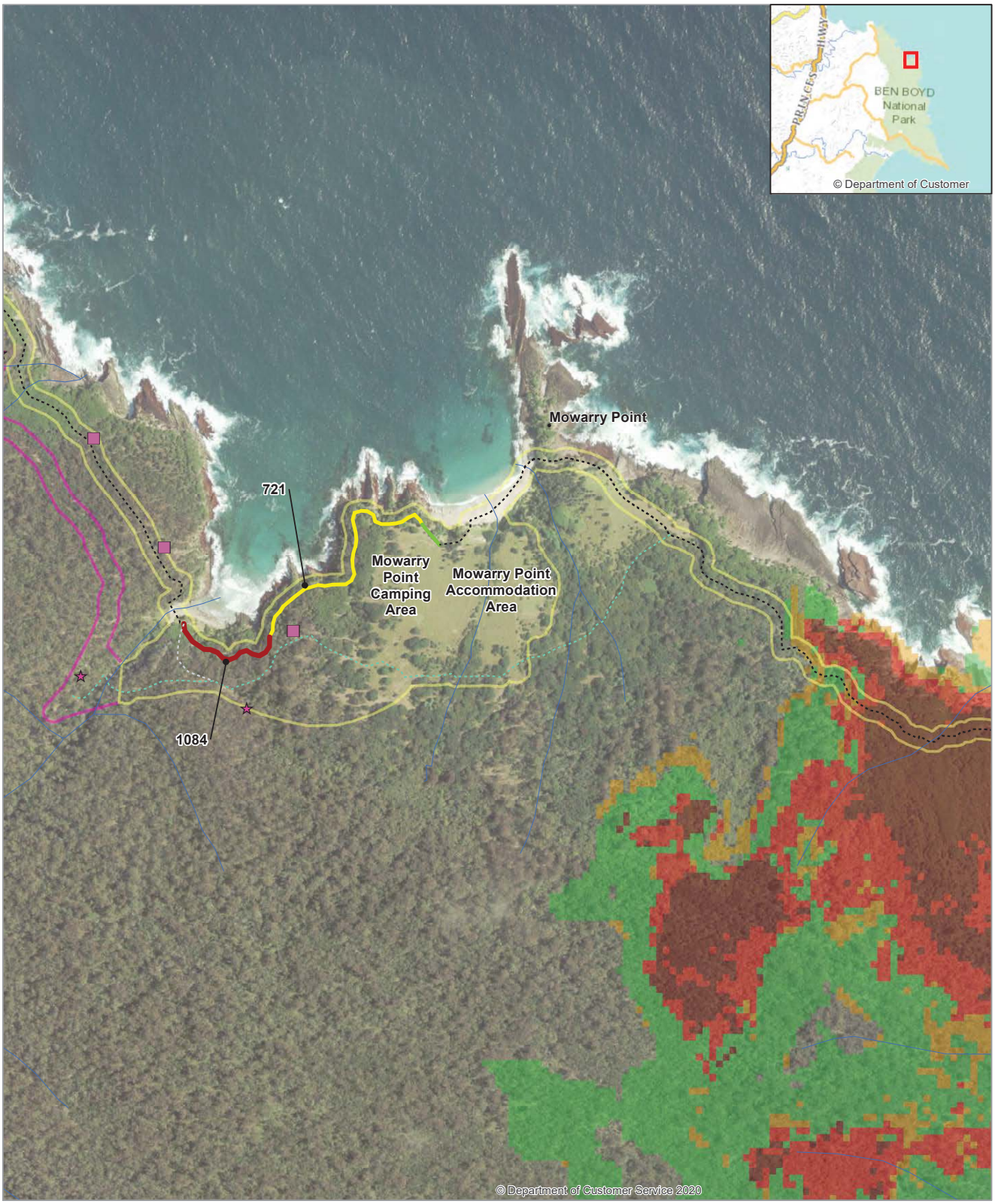
Native Fauna Identified
- lace monitor
- bush rat
- common brush-tail possum
- red-necked wallaby
- wombat
- wallaby
- Superb Lyrebird

- Points of Interest
- Hollow Bearing Trees
- Existing Walking Tracks
- Existing Subsidiary Tracks
- Redundant Tracks
- Watercourses
- Light to Light Walk Upgrade Study Area (30m corridor and precincts)
- Other REF Precincts

Plant Community Types within Activity 1
- PCT 721
- PCT 772
- PCT 777
- PCT 891
- PCT 1084
- PCT 1141
- PCT 1157

DPIE Fire Extent and Severity Mapping (FESM) v2
- Unburnt
- Non-FESM burnt area
- Low - burnt understory with unburnt canopy
- Medium - partial canopy scorch
- High - full canopy scorch / partial consumption
- Extreme - full canopy consumption

NGH



Light to Light Walk Upgrade REF - PCTs within Activity 1 - Map 4 of 12

0 50 100 200 300 Metres

A3 @ 1:6,000
Ref: 18569 Light to Light REF
Author: TH
Date Created: 05/09/2021
Datum: GDA94 \ MGA94 Zone 55

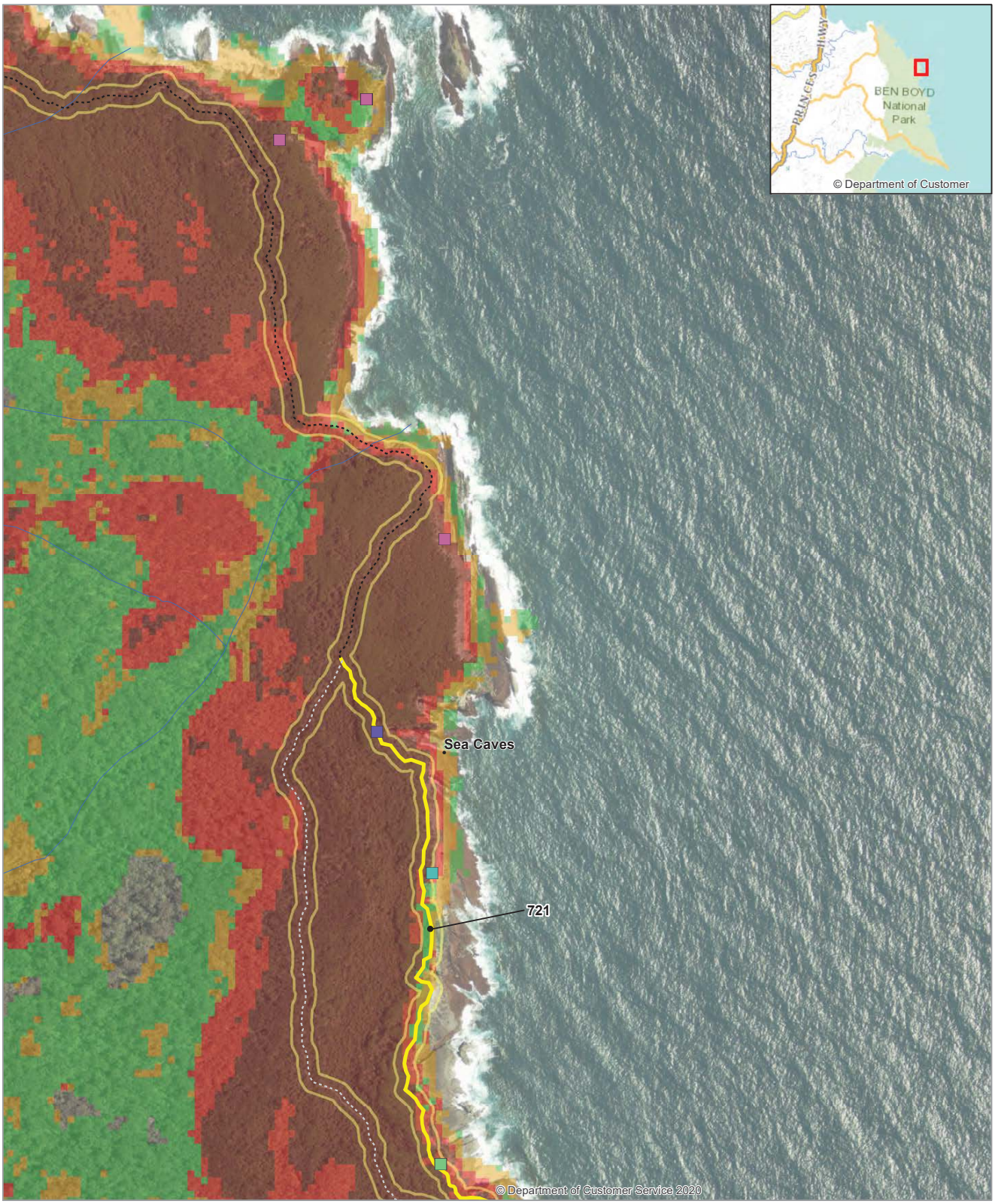
Native Fauna Identified
- bush rat
- common brush-tail possum
- red-necked wallaby
- wombat
- wallaby
- Superb Lyrebird

- Points of Interest
- Hollow Bearing Trees
- Existing Walking Tracks
- Existing Subsidiary Tracks
- Redundant Tracks
- Watercourses
- Light to Light Walk Upgrade Study Area (30m corridor and precincts)
- Other REF Precincts

Plant Community Types within Activity 1
- PCT 721
- PCT 772
- PCT 777
- PCT 891
- PCT 1084
- PCT 1141
- PCT 1157

DPIE Fire Extent and Severity Mapping (FESM) v2
- Unburnt
- Non-FESM burnt area
- Low - burnt understory with unburnt canopy
- Medium - partial canopy scorch
- High - full canopy scorch / partial consumption
- Extreme - full canopy consumption

NGH



Light to Light Walk Upgrade REF - PCTs within Activity 1 - Map 5 of 12

0 50 100 200 300 Metres

A3 @ 1:6,000
Ref: 18569 Light to Light REF
Author: TH
Date Created: 05/09/2021
Datum: GDA94 \ MGA94 Zone 55

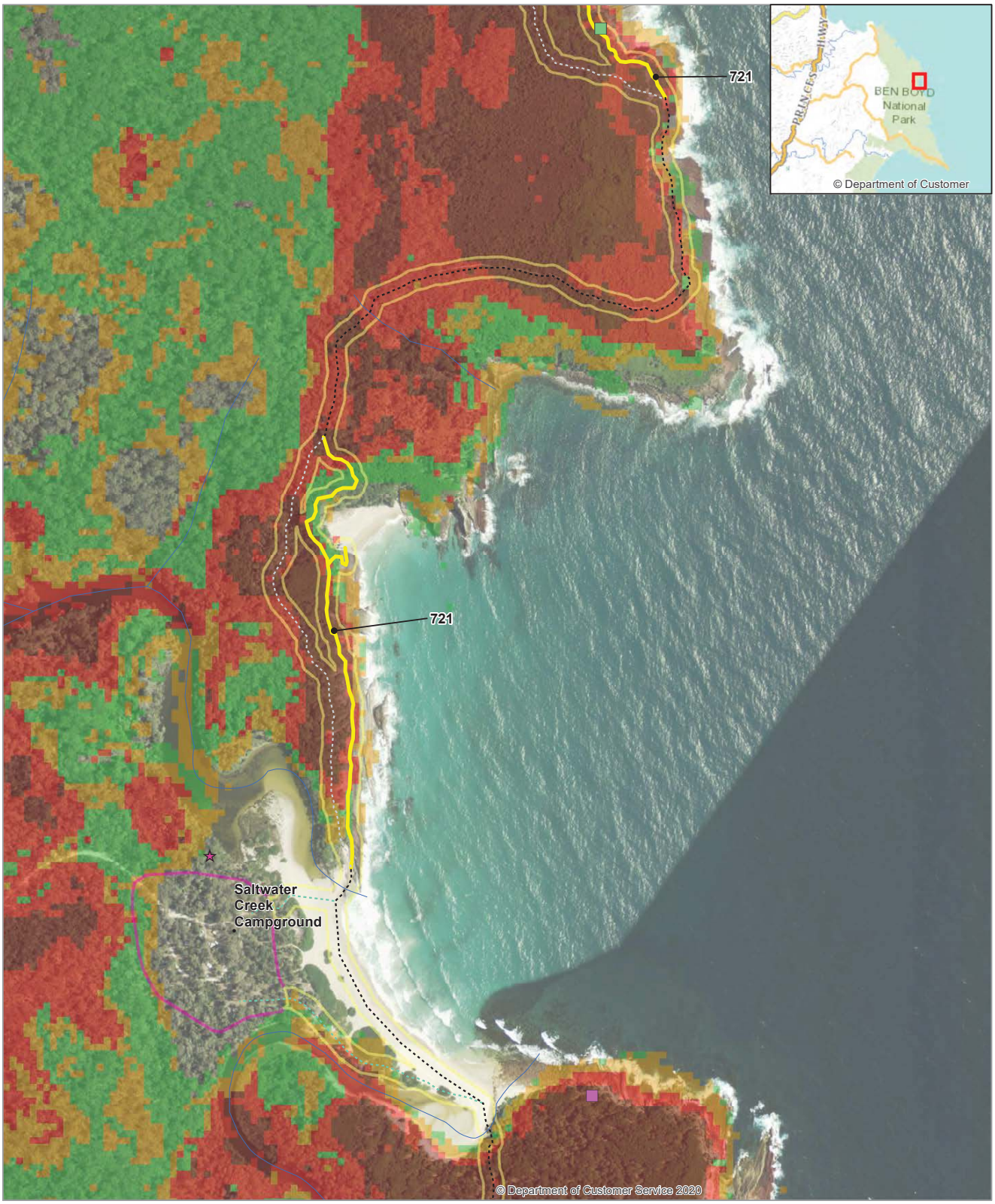
Native Fauna Identified
- long-nosed bandicoot
- red-necked wallaby
- wombat
- unknown macropod

- Points of Interest
- Hollow Bearing Trees
- Existing Walking Tracks
- Existing Subsidiary Tracks
- Redundant Tracks
- Watercourses
- Light to Light Walk Upgrade Study Area (30m corridor and precincts)
- Other REF Precincts

Plant Community Types within Activity 1
- PCT 721
- PCT 772
- PCT 777
- PCT 891
- PCT 1084
- PCT 1141
- PCT 1157

DPIE Fire Extent and Severity Mapping (FESM) v2
- Unburnt
- Non-FESM burnt area
- Low - burnt understory with unburnt canopy
- Medium - partial canopy scorch
- High - full canopy scorch / partial consumption
- Extreme - full canopy consumption

NGH



Light to Light Walk Upgrade REF - PCTs within Activity 1 - Map 6 of 12

0 50 100 200 300 Metres

Native Fauna Identified
- bush rat
- red-necked wallaby
- unknown macropod
- raven

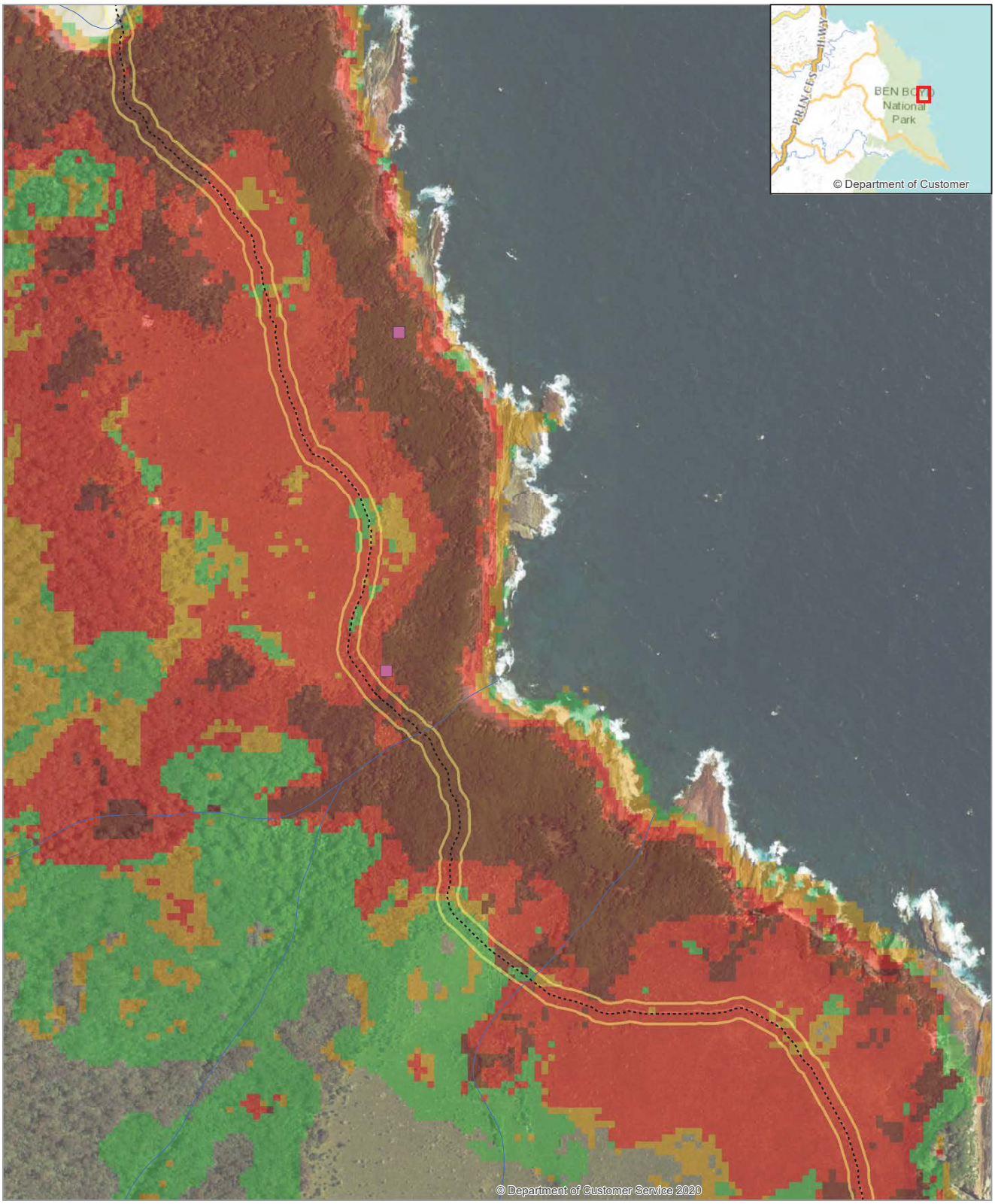
- Points of Interest
- Hollow Bearing Trees
- Existing Walking Tracks
- Existing Subsidiary Tracks
- Redundant Tracks
- Watercourses
- Light to Light Walk Upgrade Study Area (30m corridor and precincts)
- Other REF Precincts

Plant Community Types within Activity 1
- PCT 721
- PCT 772
- PCT 777
- PCT 891
- PCT 1084
- PCT 1141
- PCT 1157

DPIE Fire Extent and Severity Mapping (FESM) v2
- Unburnt
- Non-FESM burnt area
- Low - burnt understory with unburnt canopy
- Medium - partial canopy scorch
- High - full canopy scorch / partial consumption
- Extreme - full canopy consumption

A3 @ 1:6,000
Ref: 18569 Light to Light REF
Author: TH
Date Created: 05/09/2021
Datum: GDA94 \ MGA94 Zone 55

NGH



Light to Light Walk Upgrade REF - PCTs within Activity 1 - Map 7 of 12

0 50 100 200 300 Metres

A3 @ 1:6,000
Ref: 18569 Light to Light REF
Author: TH
Date Created: 05/09/2021
Datum: GDA94 \ MGA94 Zone 55

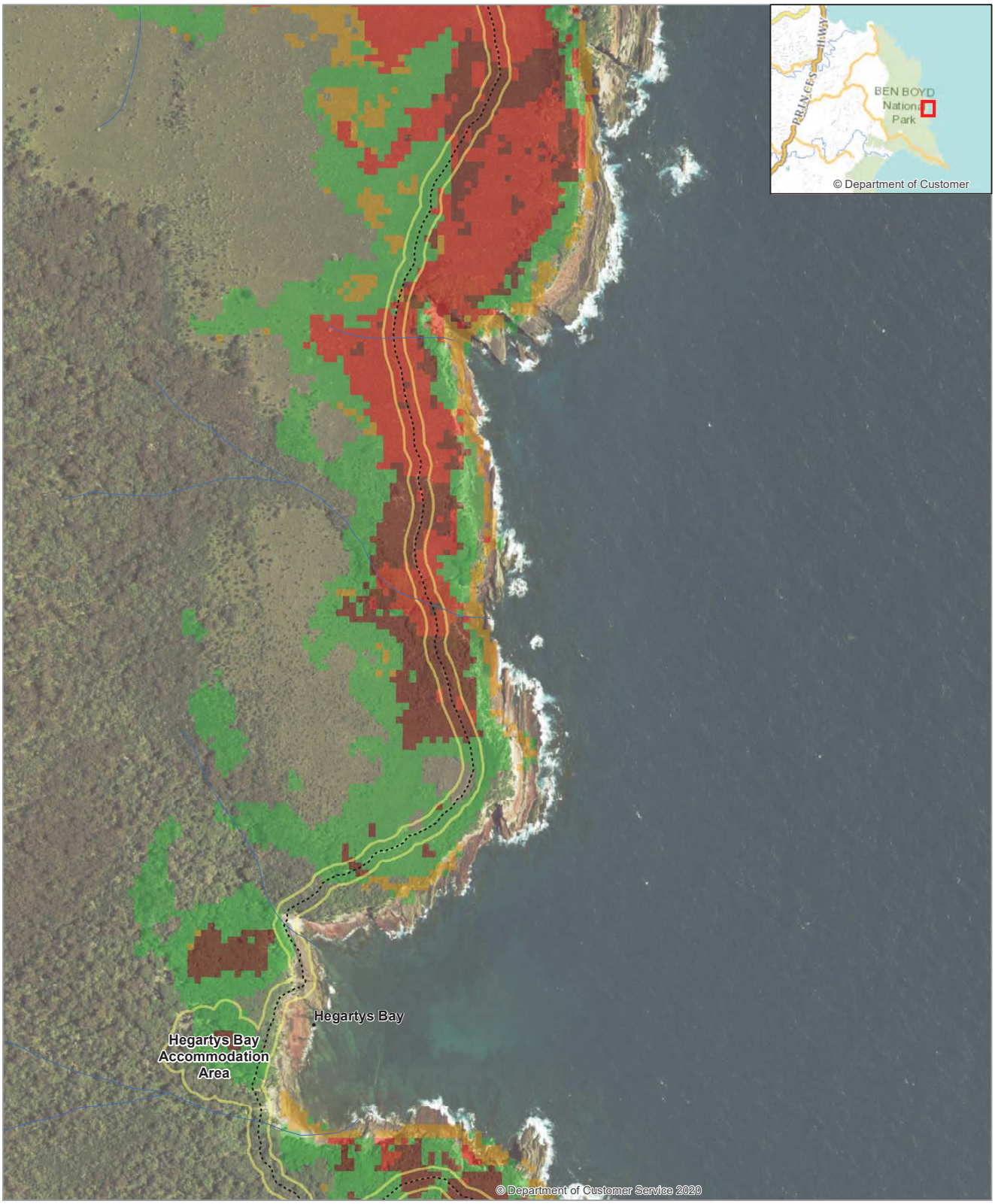
Native Fauna Identified
- red-necked wallaby

- Points of Interest
- Hollow Bearing Trees
- Existing Walking Tracks
- Existing Subsidiary Tracks
- Redundant Tracks
- Watercourses
- Light to Light Walk Upgrade Study Area (30m corridor and precincts)
- Other REF Precincts

Plant Community Types within Activity 1
- PCT 721
- PCT 772
- PCT 777
- PCT 891
- PCT 1084
- PCT 1141
- PCT 1157

DPIE Fire Extent and Severity Mapping (FESM) v2
- Unburnt
- Non-FESM burnt area
- Low - burnt understory with unburnt canopy
- Medium - partial canopy scorch
- High - full canopy scorch / partial consumption
- Extreme - full canopy consumption

NGH



Light to Light Walk Upgrade REF - PCTs within Activity 1 - Map 8 of 12

- Points of Interest
- Hollow Bearing Trees
- Existing Walking Tracks
- Existing Subsidiary Tracks
- Redundant Tracks
- Watercourses
- Light to Light Walk Upgrade Study Area (30m corridor and precincts)
- Other REF Precincts

Plant Community Types within Activity 1

- PCT 721
- PCT 772
- PCT 777
- PCT 891
- PCT 1084
- PCT 1141
- PCT 1157

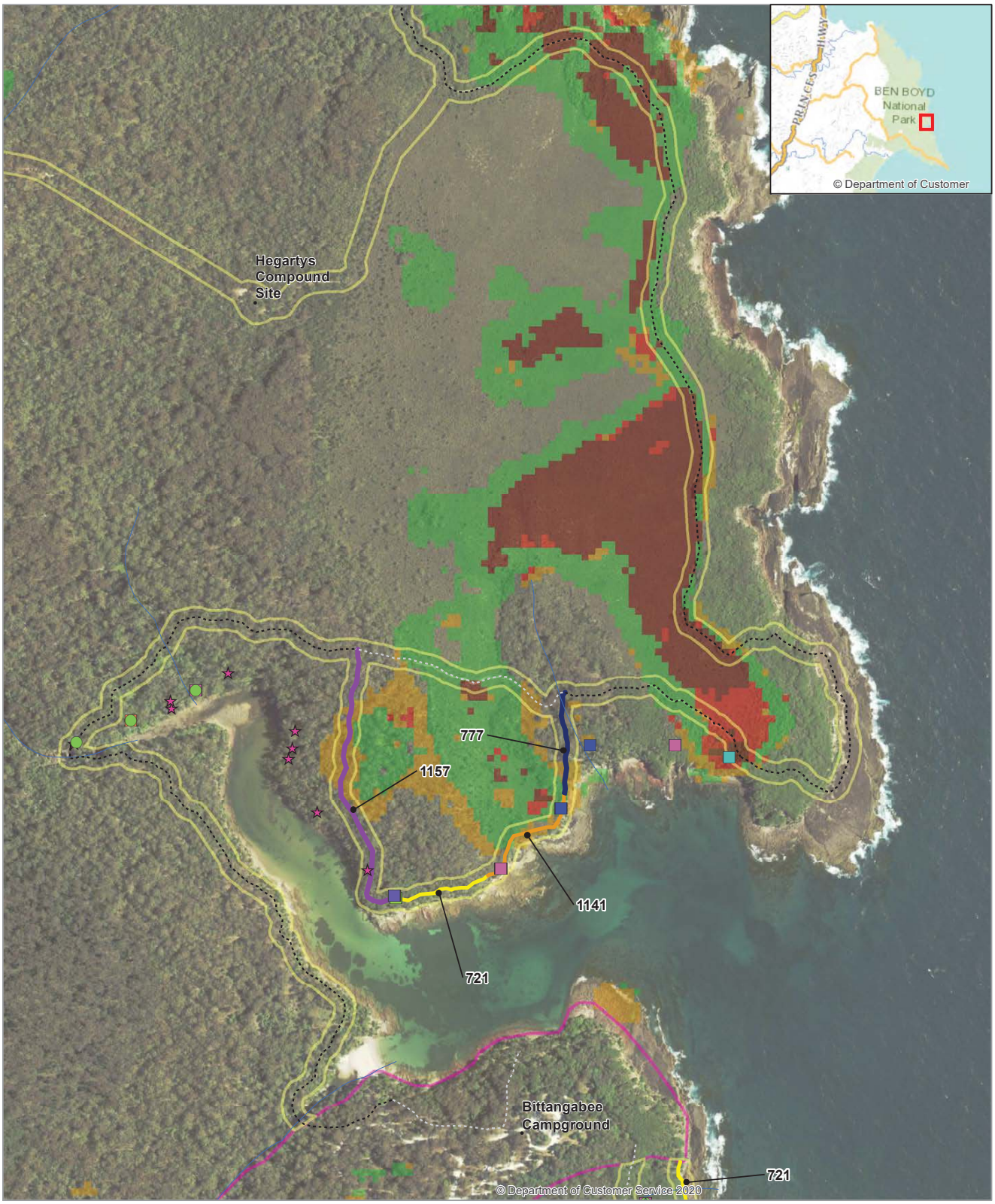
DPIE Fire Extent and Severity Mapping (FESM) v2

- Unburnt
- Non-FESM burnt area
- Low - burnt understory with unburnt canopy
- Medium - partial canopy scorch
- High - full canopy scorch / partial consumption
- Extreme - full canopy consumption

0 50 100 200 300 Metres

A3 @ 1:6,000
Ref: 18569 Light to Light REF
Author: TH
Date Created: 05/09/2021
Datum: GDA94 \ MGA94 Zone 55

NGH



Light to Light Walk Upgrade REF - PCTs within Activity 1 - Map 9 of 12

0 50 100 200 300 Metres

A3 @ 1:6,000
Ref: 18569 Light to Light REF
Author: TH
Date Created: 05/09/2021
Datum: GDA94 \ MGA94 Zone 55

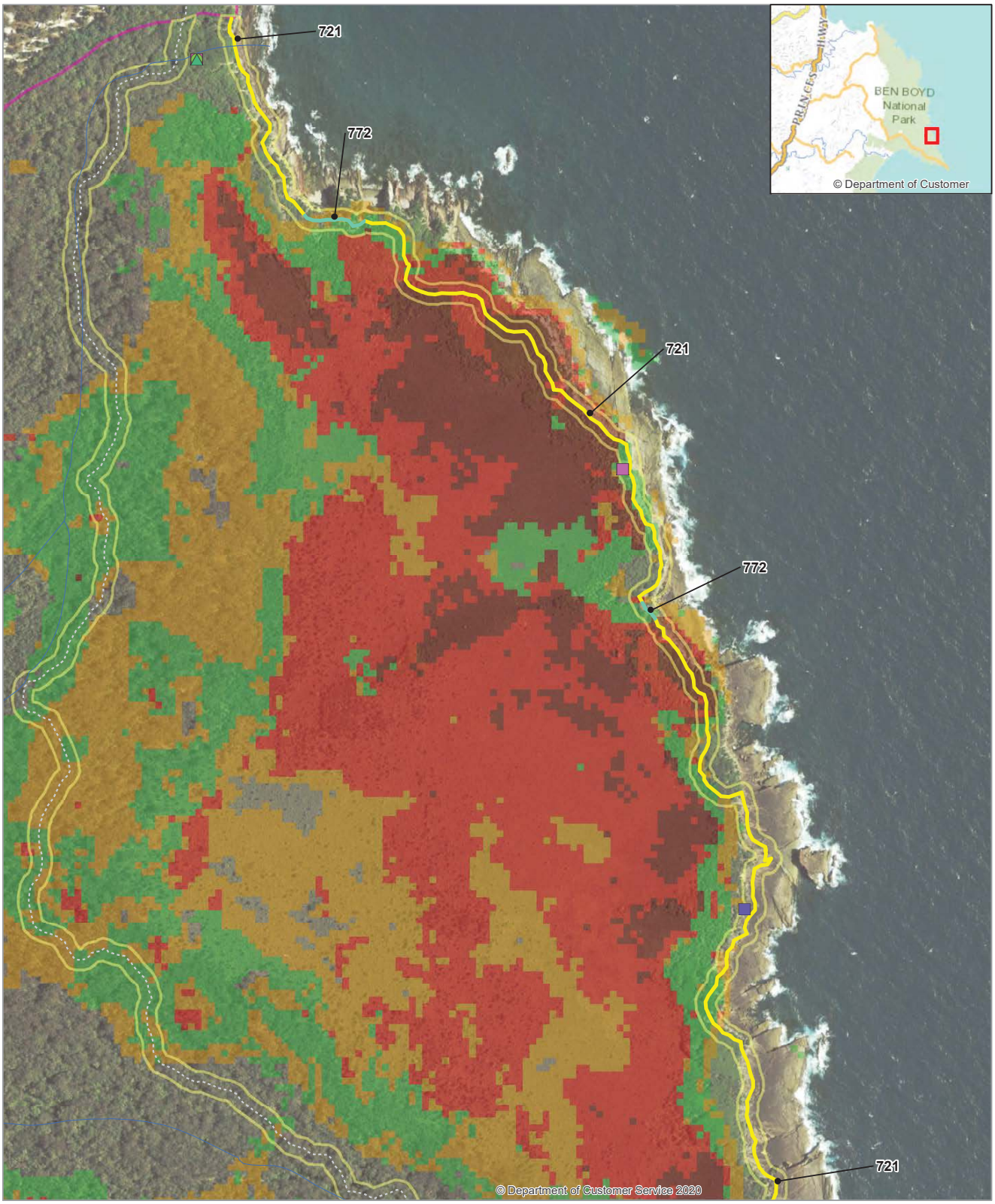
Native Fauna Identified
- lace monitor
- long-nosed bandicoot
- bush rat
- common brush-tail possum
- eastern grey kangaroo
- long-nosed potoroo (threatened species)
- red-necked wallaby
- wombat
- unknown macropod
- Superb Lyrebird

- Points of Interest
- Hollow Bearing Trees
- Existing Walking Tracks
- Existing Subsidiary Tracks
- Redundant Tracks
- Watercourses
- Light to Light Walk Upgrade Study Area (30m corridor and precincts)
- Other REF Precincts

Plant Community Types within Activity 1
- PCT 721
- PCT 772
- PCT 777
- PCT 891
- PCT 1084
- PCT 1141
- PCT 1157

DPIE Fire Extent and Severity Mapping (FESM) v2
- Unburnt
- Non-FESM burnt area
- Low - burnt understory with unburnt canopy
- Medium - partial canopy scorch
- High - full canopy scorch / partial consumption
- Extreme - full canopy consumption

NGH



Light to Light Walk Upgrade REF - PCTs within Activity 1 - Map 10 of 12

0 50 100 200 300 Metres

A3 @ 1:6,000
Ref: 18569 Light to Light REF
Author: TH
Date Created: 05/09/2021
Datum: GDA94 \ MGA94 Zone 55

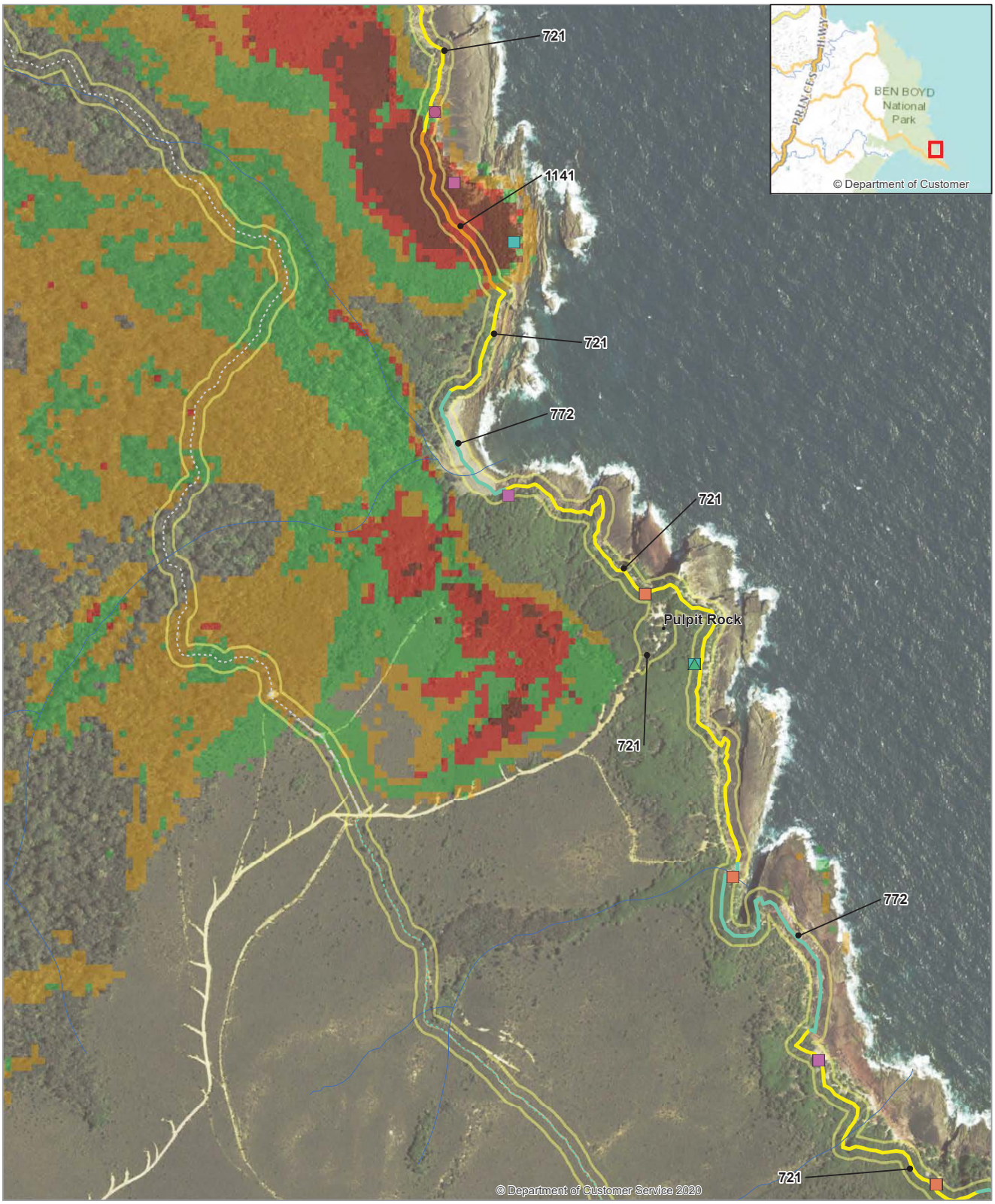
Native Fauna Identified
- lace monitor
- jacky lizard
- bush rat
- common brush-tail possum
- long-nosed potoroo (threatened species)
- red-necked wallaby
- wombat
- Superb Lyrebird

- Points of Interest
- Hollow Bearing Trees
- Existing Walking Tracks
- Existing Subsidiary Tracks
- Redundant Tracks
- Watercourses
- Light to Light Walk Upgrade Study Area (30m corridor and precincts)
- Other REF Precincts

Plant Community Types within Activity 1
- PCT 721
- PCT 772
- PCT 777
- PCT 891
- PCT 1084
- PCT 1141
- PCT 1157

DPIE Fire Extent and Severity Mapping (FESM) v2
- Unburnt
- Non-FESM burnt area
- Low - burnt understory with unburnt canopy
- Medium - partial canopy scorch
- High - full canopy scorch / partial consumption
- Extreme - full canopy consumption

NGH



Light to Light Walk Upgrade REF - PCTs within Activity 1 - Map 11 of 12

0 50 100 200 300 Metres

A3 @ 1:6,000
Ref: 18569 Light to Light REF
Author: TH
Date Created: 05/09/2021
Datum: GDA94 \ MGA94 Zone 55

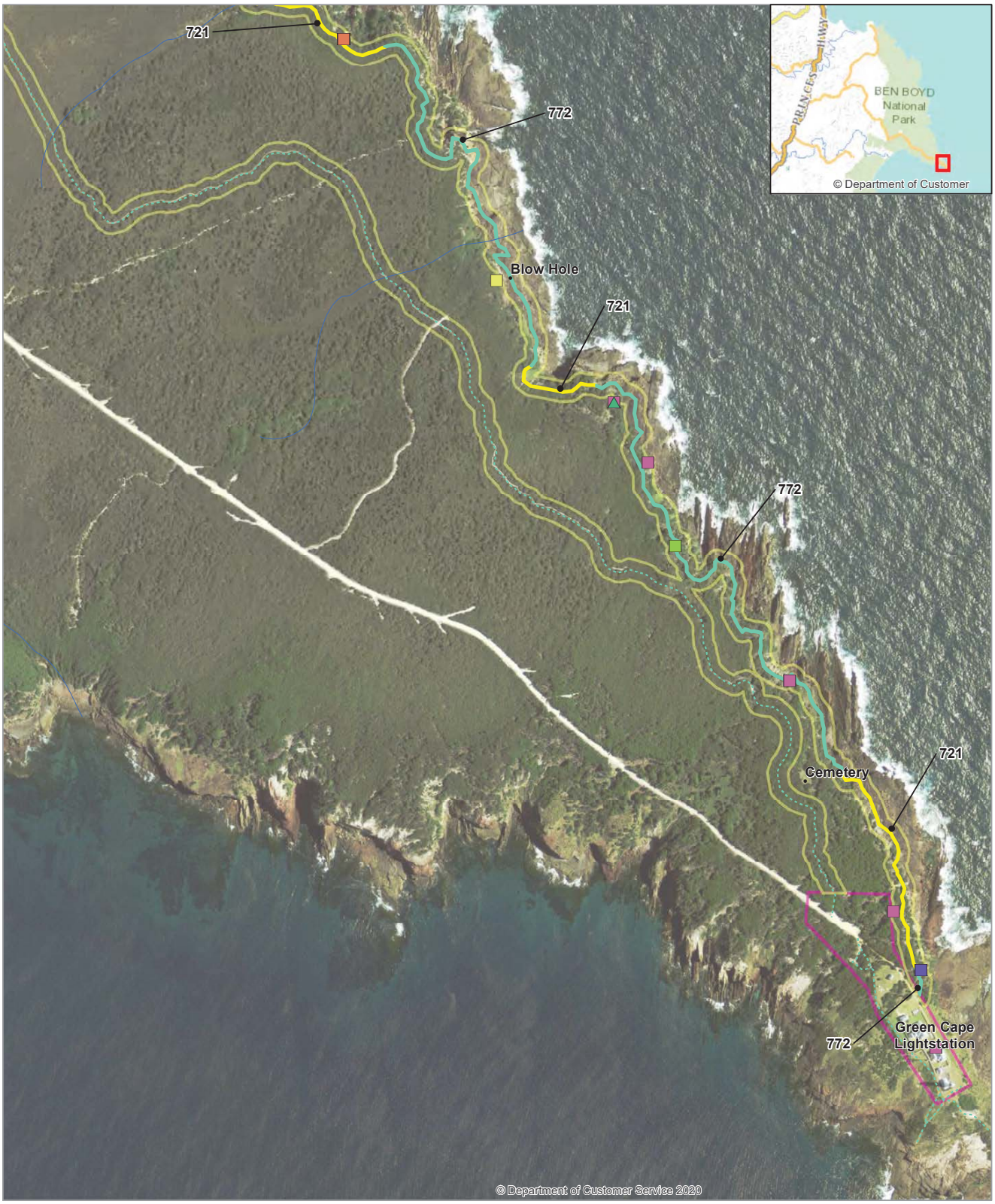
Native Fauna Identified
- lace monitor
- long-nosed bandicoot
- bush rat
- common brush-tail possum
- long-nosed potoroo (threatened species)
- southern brown bandicoot (threatened species)
- red-necked wallaby
- wombat
- raven
- Superb Lyrebird

- Points of Interest
- Hollow Bearing Trees
- Existing Walking Tracks
- Existing Subsidiary Tracks
- Redundant Tracks
- Watercourses
- Light to Light Walk Upgrade Study Area (30m corridor and precincts)
- Other REF Precincts

Plant Community Types within Activity 1
- PCT 721
- PCT 772
- PCT 777
- PCT 891
- PCT 1084
- PCT 1141
- PCT 1157

DPIE Fire Extent and Severity Mapping (FESM) v2
- Unburnt
- Non-FESM burnt area
- Low - burnt understory with unburnt canopy
- Medium - partial canopy scorch
- High - full canopy scorch / partial consumption
- Extreme - full canopy consumption

NGH



Light to Light Walk Upgrade REF - PCTs within Activity 1 - Map 12 of 12

0 50 100 200 300 Metres

A3 @ 1:6,000
Ref: 18569 Light to Light REF
Author: TH
Date Created: 05/09/2021
Datum: GDA94 \ MGA94 Zone 55

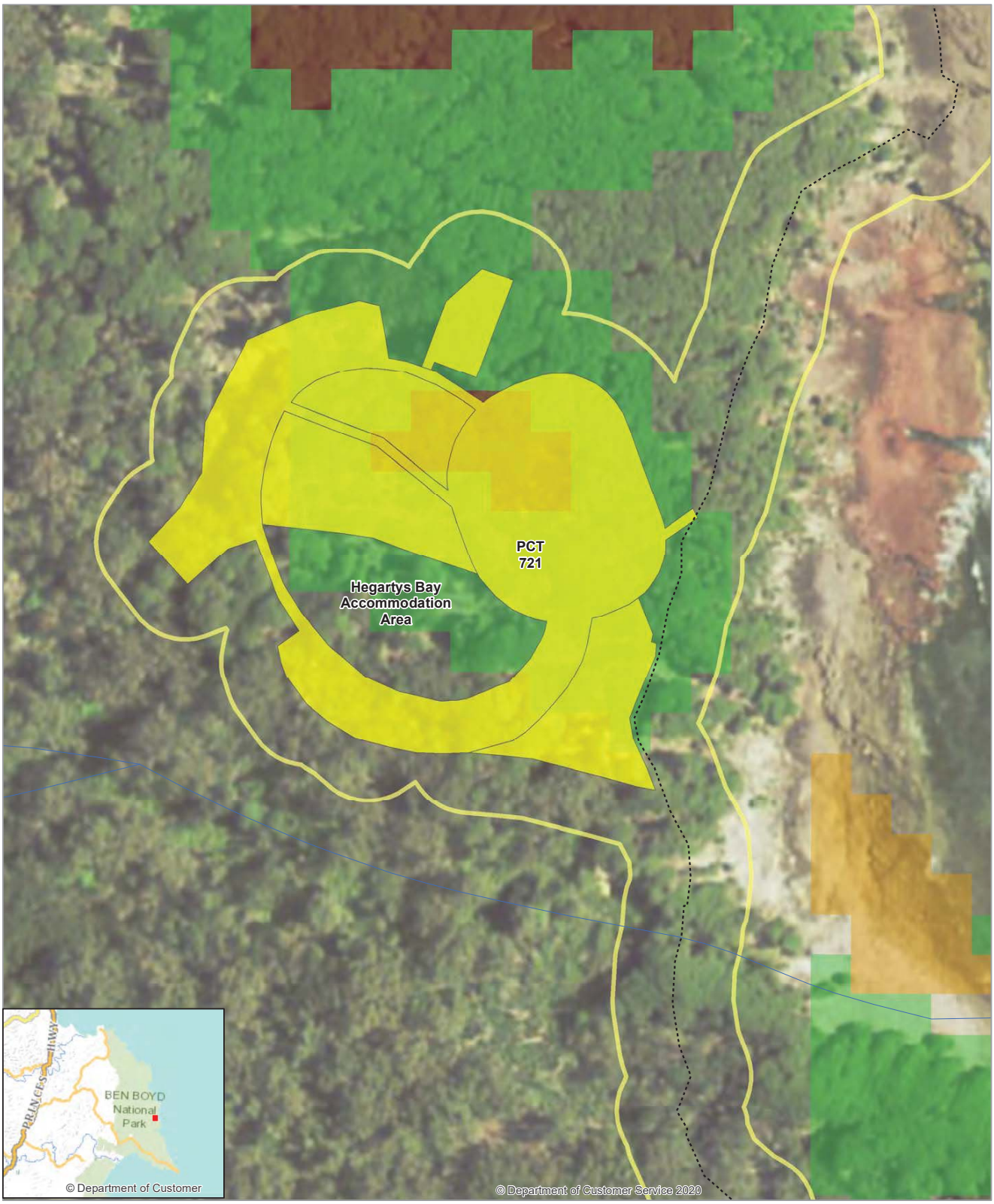
Native Fauna Identified
- lace monitor
- long-nosed bandicoot
- common brush-tail possum
- eastern grey kangaroo
- long-nosed potoroo (threatened species)
- southern brown bandicoot (threatened species)
- red-necked wallaby
- swamp wallaby
- wombat
- wallaby
- Superb Lyrebird

- Points of Interest
- Hollow Bearing Trees
- Existing Walking Tracks
- Existing Subsidiary Tracks
- Redundant Tracks
- Watercourses
- Light to Light Walk Upgrade Study Area (30m corridor and precincts)
- Other REF Precincts

Plant Community Types within Activity 1
- PCT 721
- PCT 772
- PCT 777
- PCT 891
- PCT 1084
- PCT 1141
- PCT 1157

DPIE Fire Extent and Severity Mapping (FESM) v2
- Unburnt

NGH



Light to Light Walk Upgrade REF
PCTs within Activity 2 - Hegartys Accommodation

0 10 20 40 Metres

A3 @ 1:1,000
Ref: 18569 Light to Light REF
Author: TH
Date Created: 05/09/2021
Datum: GDA94 \ MGA94 Zone 55

- Points of Interest
- Hollow Bearing Trees
- Existing Walking Tracks
- Existing Subsidiary Tracks
- Redundant Tracks
- Watercourses
- Light to Light Walk Upgrade Study Area (30m corridor and precincts)

Plant Community Types within Activity 2

- PCT 721
- PCT 772
- PCT 777
- PCT 891
- PCT 1084
- PCT 1141
- PCT 1157

DPIE Fire Extent and Severity Mapping (FESM) v2

- Unburnt
- Non-FESM burnt area
- Low - burnt understory with unburnt canopy
- Medium - partial canopy scorch
- Extreme - full canopy consumption

NGH

Light to Light Walk Upgrade REF -
PCTs within Activity 2 - Mowarry Accommodation

- Points of Interest
- Hollow Bearing Trees
- Existing Walking Tracks
- Existing Subsidiary Tracks
- Redundant Tracks
- Watercourses
- Light to Light Walk Upgrade Study Area (30m corridor and precincts)

Plant Community Types within Activity 2

- PCT 721
- PCT 772
- PCT 777
- PCT 891
- PCT 1084
- PCT 1141
- PCT 1157

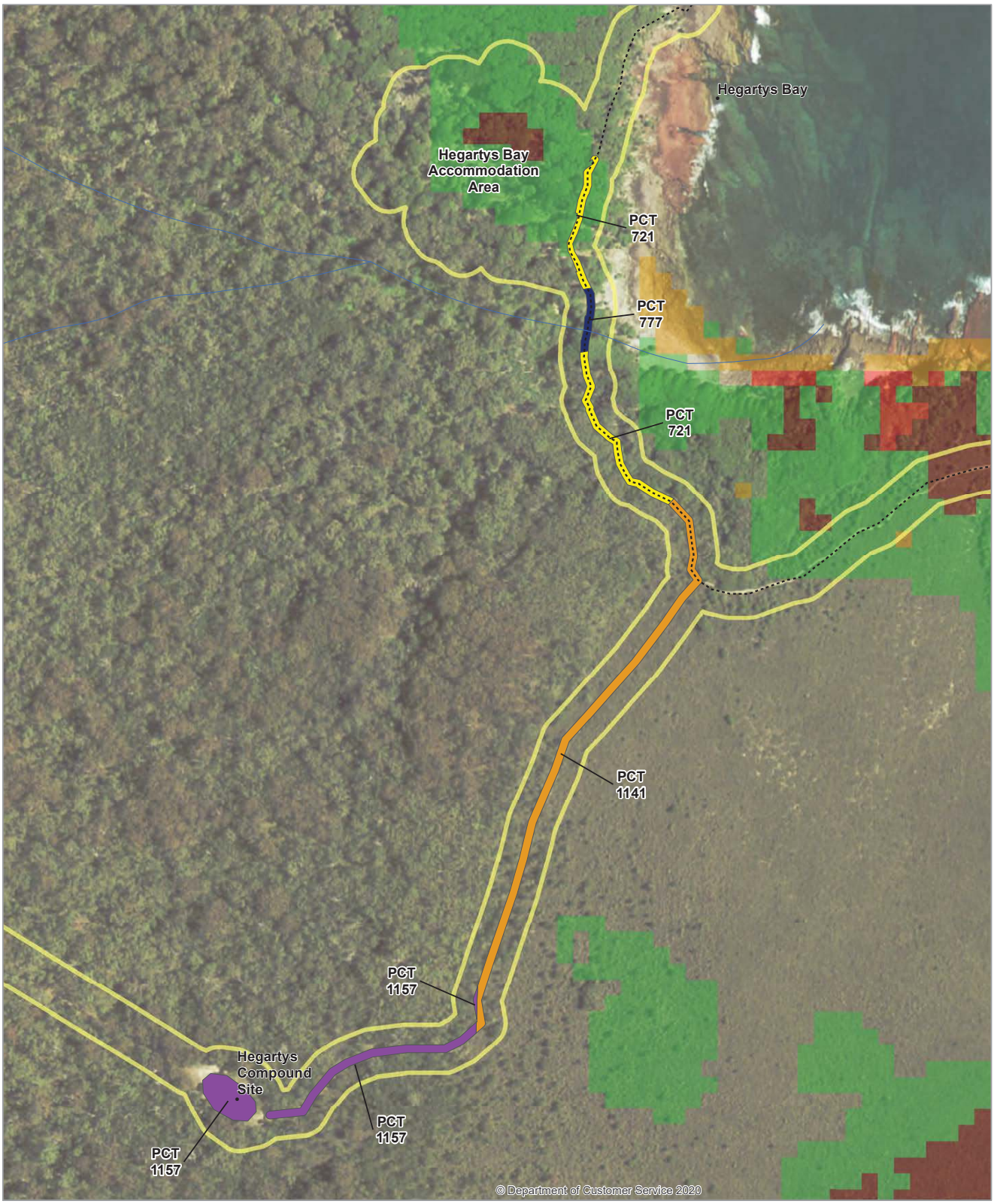
DPIE Fire Extent and Severity Mapping (FESM) v2

- Unburnt
- Non-FESM burnt area

0 10 20 40 60 Metres

A3 @ 1:1,500
Ref: 18569 Light to Light REF
Author: TH
Date Created: 05/09/2021
Datum: GDA94 \ MGA94 Zone 55

NGH



Light to Light Walk Upgrade REF - PCTs within Activity 3 - Hegartys Bay Boardwalk Works

- Points of Interest
- Hollow Bearing Trees
- Existing Walking Tracks
- Existing Subsidiary Tracks
- Redundant Tracks
- Watercourses
- Light to Light Walk Upgrade Study Area (30m corridor and precincts)

Plant Community Types within Activity 3

- PCT 721
- PCT 772
- PCT 777
- PCT 891
- PCT 1084
- PCT 1141
- PCT 1157

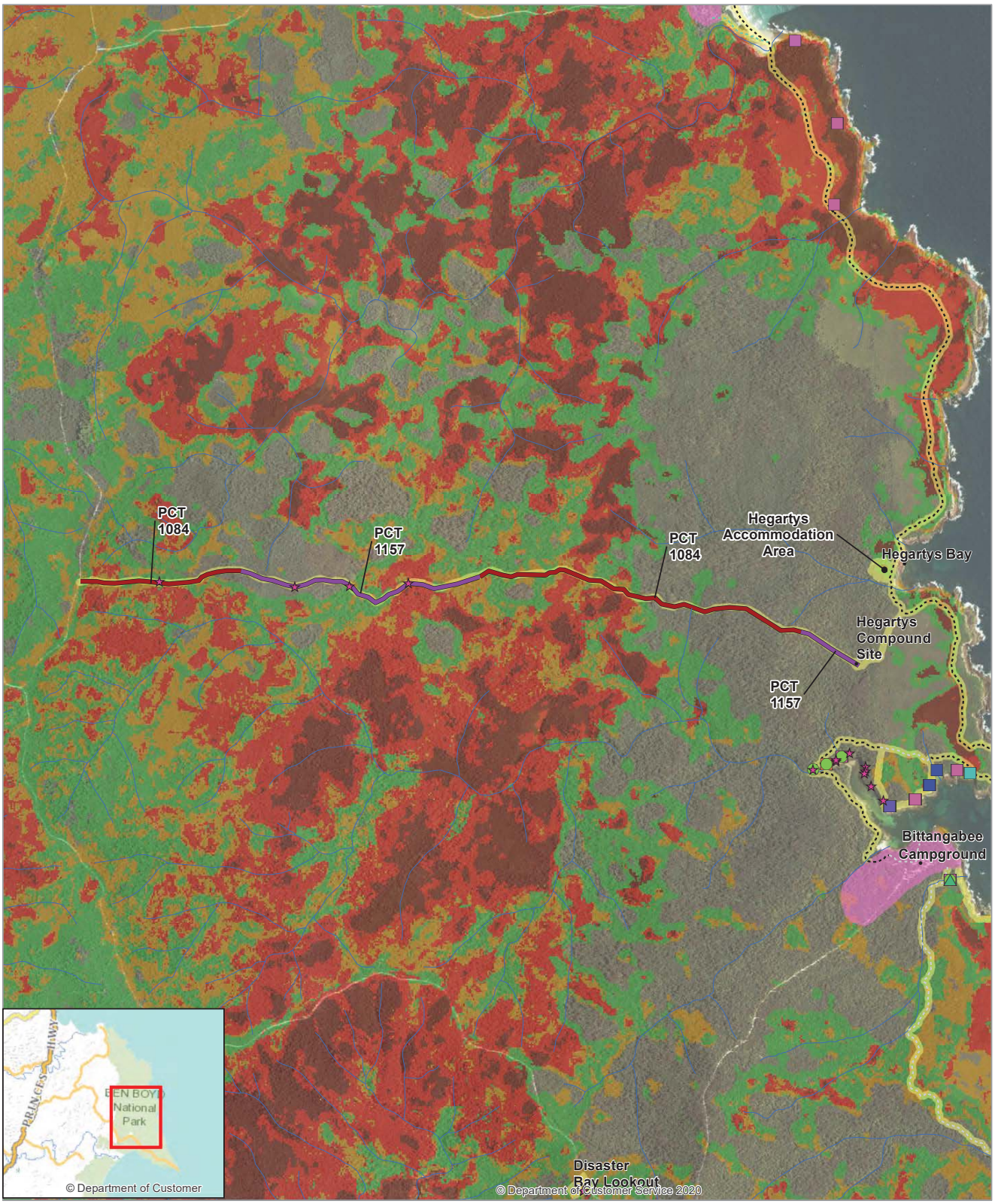
DPIE Fire Extent and Severity Mapping (FESM) v2

- Unburnt
- Non-FESM burnt area
- Low - burnt understory with unburnt canopy
- Medium - partial canopy scorch
- High - full canopy scorch / partial consumption
- Extreme - full canopy consumption

0 25 50 100 Metres

A3 @ 1:2,500
Ref: 18569 Light to Light REF
Author: TH
Date Created: 05/09/2021
Datum: GDA94 \ MGA94 Zone 55

NGH



Light to Light Walk Upgrade REF - PCTs within Activity 3 - Hegartys Trail Vehicle Access Works

0 0.25 0.5 1 Km

A3 @ 1:25,000
Ref: 18569 Light to Light REF
Author: TH
Date Created: 05/09/2021
Datum: GDA94 \ MGA94 Zone 55

Native Fauna Identified
- lace monitor
- long-nosed bandicoot
- bush rat
- common brush-tail possum
- eastern grey kangaroo
- long-nosed potoroo (threatened species)
- red-necked wallaby
- wombat
- unknown macropod
- raven
- Superb Lyrebird

- Points of Interest
- Hollow Bearing Trees
- Existing Walking Tracks
- Existing Subsidiary Tracks
- Redundant Tracks
- Watercourses

Plant Community Types within Activity 3
- PCT 1084
- PCT 1157
- Light to Light Walk Upgrade Study Area (30m corridor and precincts)
- Other REF Precincts

DPIE Fire Extent and Severity Mapping (FESM) v2
- Unburnt
- Non-FESM burnt area
- Low - burnt understory with unburnt canopy
- Medium - partial canopy scorch
- High - full canopy scorch / partial consumption
- Extreme - full canopy consumption

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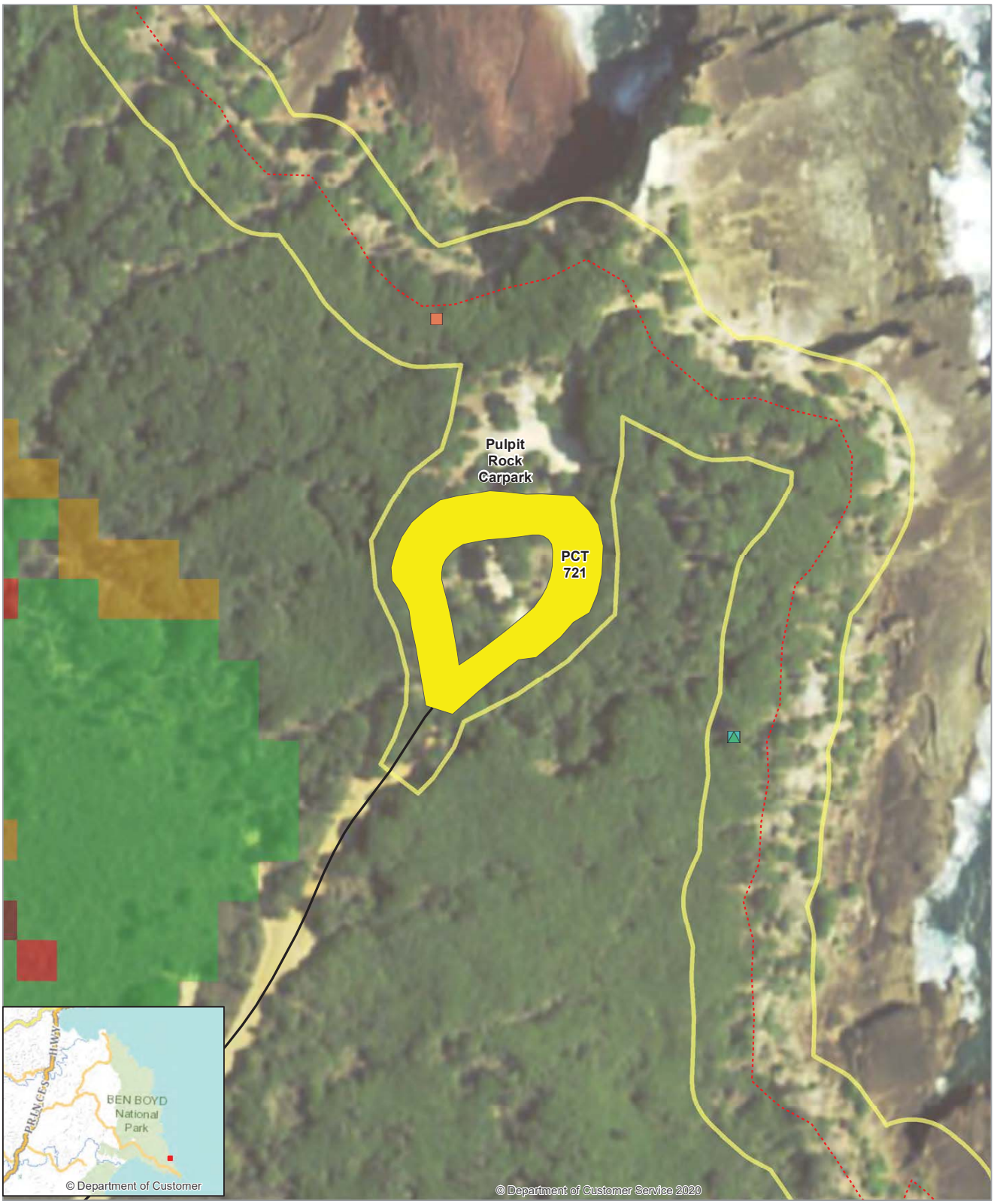

Light to Light Walk Upgrade REF - PCTs within Activity 3 - Pulpit Rock Precinct

0 10 20 40 Metres

A3 @ 1:1,000
Ref: 18569 Light to Light REF
Author: TH
Date Created: 08/09/2021
Datum: GDA94 \ MGA94 Zone 55

Hollow Bearing Trees

Native Fauna Identified

- lace monitor
- long-nosed bandicoot
- bush rat
- common brush-tail possum

- Proposed New Tracks
- Existing Walking Tracks
- Existing Subsidiary Tracks
- Redundant Tracks
- Existing Road
- Light to Light Walk Upgrade Study Area (30m corridor and precincts)

Plant Community Types within Activity 3

- PCT 721
- PCT 772
- PCT 777
- PCT 891
- PCT 1084
- PCT 1141
- PCT 1157

DPIE Fire Extent and Severity Mapping (FESM) v2

- Unburnt
- Non-FESM burnt area
- Low - burnt understory with unburnt canopy
- Medium - partial canopy scorch
- High - full canopy scorch / partial consumption
- Extreme - full canopy consumption

NGH

D.2 Preliminary constraints mapping, February 2019

15 February 2019

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RE – Light to Light Great Walk REF – 18-569

Preliminary constraints identification

NGH Environmental has undertaken an identification of areas of high environmental constraints for the Light to Light Great Walk proposal site (30m wide proposed path, track upgrades and accommodation and facilities) of the project. The findings are considered preliminary. They are based on a desktop review and site inspection by a senior ecologist and environmental consultant (115 person hours). This advice includes general environmental and specific biodiversity constraints.

Development within high constraint areas would need to be very well justified to be considered approvable. Further, it will likely add to assessment costs and may affect assessment approach.

While we can continue with aspects of the assessment, we would like to consider this a 'hold point' for the impact assessment components, until National Parks can confirm whether these areas can be avoided by the project. Upon confirmation of the final route to be assessed, we will update the survey program and expected delivery date.

Please do not hesitate to contact me should you have any questions on the attached information.

Yours sincerely,

Brooke Marshall | Manager, NSW SE & ACT
Certified Environmental Practitioner (CEnvP)
PO Box 470 Bega NSW 2550

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METHODS

Background research

A search of the OEH Wildlife Atlas database for the Southern Rivers CMA identified 11 Endangered Ecological Communities (EEC), 10 threatened flora species and 52 threatened fauna species, comprising of, 2 amphibians, 31 bird species and 18 mammal species. 32 threatened fauna species and 3 threatened flora species have been recorded within 300m of the proposal site:

- Australian Fur-seal
- Black-browed Albatross
- Brown Treecreeper (eastern subspecies)
- Dusky Woodswallow
- Eastern Bentwing-bat
- Eastern False Pipistrelle
- Eastern Ground Parrot
- Eastern Osprey
- Eastern Pygmy-possum
- Gang-gang Cockatoo
- Glossy Black-Cockatoo
- Green and Golden Bell Frog
- Hooded Plover
- Little Shearwater
- Long-nosed Potoroo
- Northern Giant-Petrel
- Pied Oystercatcher
- Pink Robin
- Powerful Owl
- Shy Albatross
- Sooty Owl
- Sooty Oystercatcher
- Southern Brown Bandicoot (eastern)
- Southern Giant Petrel
- Southern Myotis
- Spotted-tailed Quoll
- Striated Fieldwren
- Varied Sittella
- Wandering Albatross
- White-bellied Sea-Eagle
- Yellow-bellied Glider
- Hidden Violet
- Leafless Tongue Orchid
- Narrabarba Wattle

An *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool, 10km buffer of the proposal, identified 3 Endangered Ecological Communities, 50 migratory species and 69 threatened species that have the potential to occur at the site. A search of the Department of Primary Industries WeedWise identified 121 priority weeds for then South Ease Region.

Field survey

A field survey was undertaken on the 17th, 18th, 20th, and 21st December 2018; and 23rd, 24th and 26th January 2019, by a senior ecologist and an environmental consultant to characterise the receiving environment.

The site inspection included an assessment of the following areas (the proposal site):

- The entire length of the proposed Light to Light Great Walk track, including the area within 30 metres either side of the flagged track;
- The footprint of the proposed accommodation at both Mowarry Point and Hegartys Bay;
- Vehicle access tracks to Mowarry Point and Hegartys Bay (vehicle based survey);
- Disaster Bay Carpark proposed upgrade area;
- Area of Pulpit Rock toilet relocation; and the
- Area proposed for establishment of bush camp sites at Saltwater Creek camping area.

The proposed works areas had previously been marked with flagging tape by NPWS in most areas. The NGH team followed the flagged track for most of the route. Where the flagging tape was missing, the centreline of the 30m study area corridor was followed, using GIS layers loaded onto an iPad. In some places, the survey involved navigation through thick vegetation, rugged terrain and on steep coastal cliffs.

The following information was collected:

- Plant species identification (top canopy, middle stratum, ground cover species) to enable the determination of plant community types.
- An assessment of the condition/habitat quality of the native vegetation (ground cover density, human disturbance and evidence of recent fire).
- Records of significant habitat features, including:
    - Hollow-bearing trees.
    - Dead, fallen timber with hollows.
    - Waterways, soaks and pools.
    - Scats, tracks and runways for wildlife.
    - Feed trees of the Glossy Black Cockatoo (*Calyptorhynchus lathami*).
    - Feed trees and gliding trees for the Yellow-bellied Glider (*Petaurus australis*).
    - Potoroo/bandicoot diggings.
    - Spotted-tail Quoll scats/latrines (*Dasyurus maculatus*).
    - Owl roosts and nests (pellet/whitewash search).
    - Presence of invasive weeds and feral animals (foxes, rabbits).

The following threatened plant species were searched for where suitable habitat was encountered:

- Hidden Violet (*Viola cleistogamoides*).
- Leafless Toung Orchid (*Cryptostylis hunteriana*).
- Tangled Bed Straw (*Galium australe*).
- Matted Bush Pea (*Pultenea pendunculata*).

RESULTS

Plant Community Types and Endangered Ecological Communities

Based on existing vegetation mapping and the initial site inspection, vegetation within the proposal site was assigned to Plant Community Types (PCTs) in accordance with the Vegetation Information System Classification Database. PCTs were determined based on the presence of diagnostic species identified in the site survey.

PCTs identified within the proposal site are:

PCT 721 - Bracelet Honey-myrtle – Coast Tea-tree tall shrubland on headlands, South East Corner Bioregion.

PCT 772 - Coast Banksia – Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion.

PCT 1084 - Red Bloodwood – Silvertop Ash – White Stringybark heathy open forest on costal foothills, southern South East Corner Bioregion.

PCT 777 - Coast Grey Box – Mountain Grey Gum – Stringybark moist shrubby forest in coastal gullies, southern South East Corner Bioregion.

PCT 1141 - Scrub She-oak – Swamp Banksia coastal lowland heath, southern South East Corner Bioregion.

PCT 1157 - Silvertop Ash – Rough-barked Apple shrubby open forest on the hinterland hills, far southern South East Corner Bioregion.

PCT 891 - Ironbark - Woollybutt - White Stringybark open forest on coastal hills, South East Corner Bioregion

No Threatened Ecological Communities were identified on the proposal site.

In most areas, the mapped PCTs were found to be in very good condition (undisturbed, weed free), including excellent examples of intact, species rich South Coast Heath with varied fire histories (PCT1141 'Scrub She-oak – Swamp Banksia coastal lowland heath, southern South East Corner'); this PCT has restricted distribution in NSW along a narrow coastal strip south from Bournda to the Victorian border.

The lack of disturbance to the native vegetation was notable along the walking route, with some exceptions:

- Evidence of human disturbance (removal of undergrowth and some canopy trees) around the campsites at Hegarty Bay, Mowarry Point, Saltwater Creek, Bittangabee Bay; and at the Disaster Bay, City Rock, Green Cape, Boydtown and Pulpit Rock car parks.
- Evidence of historical logging along the Hegarty Bay and Mowarry Point Access trails.
- Severe post-fire weed infestation in the northernmost survey area (south of Boydtown) (Map reference 1 – Attachment A)
- Scat records of the European Rabbit (*Oryctolagus cuniculus*) listed as a Key Threatening Process (TSCA NSW and EPBC Australia) were common on the walking track corridor.
- One scat record of the European Fox (*Vulpes vulpes*) (also listed as Key Threatening Processes (TSCA NSW and EPBC Australia) was recorded (Map reference 17 – Attachment A).

PRELIMINARY CONSTRAINTS

Only high constraints have been mapped. High constraints are defined as follows:

> **Avoid if possible. These areas will be difficult, expensive or may not be possible to obtain approval to develop. They may require costly additional surveys to understand and manage impacts. They may impact the ability to obtain a timely approval and may affect the assessment pathway.**

High constraints are referenced in Attachment A and B and mapped for the site within the attached email link.

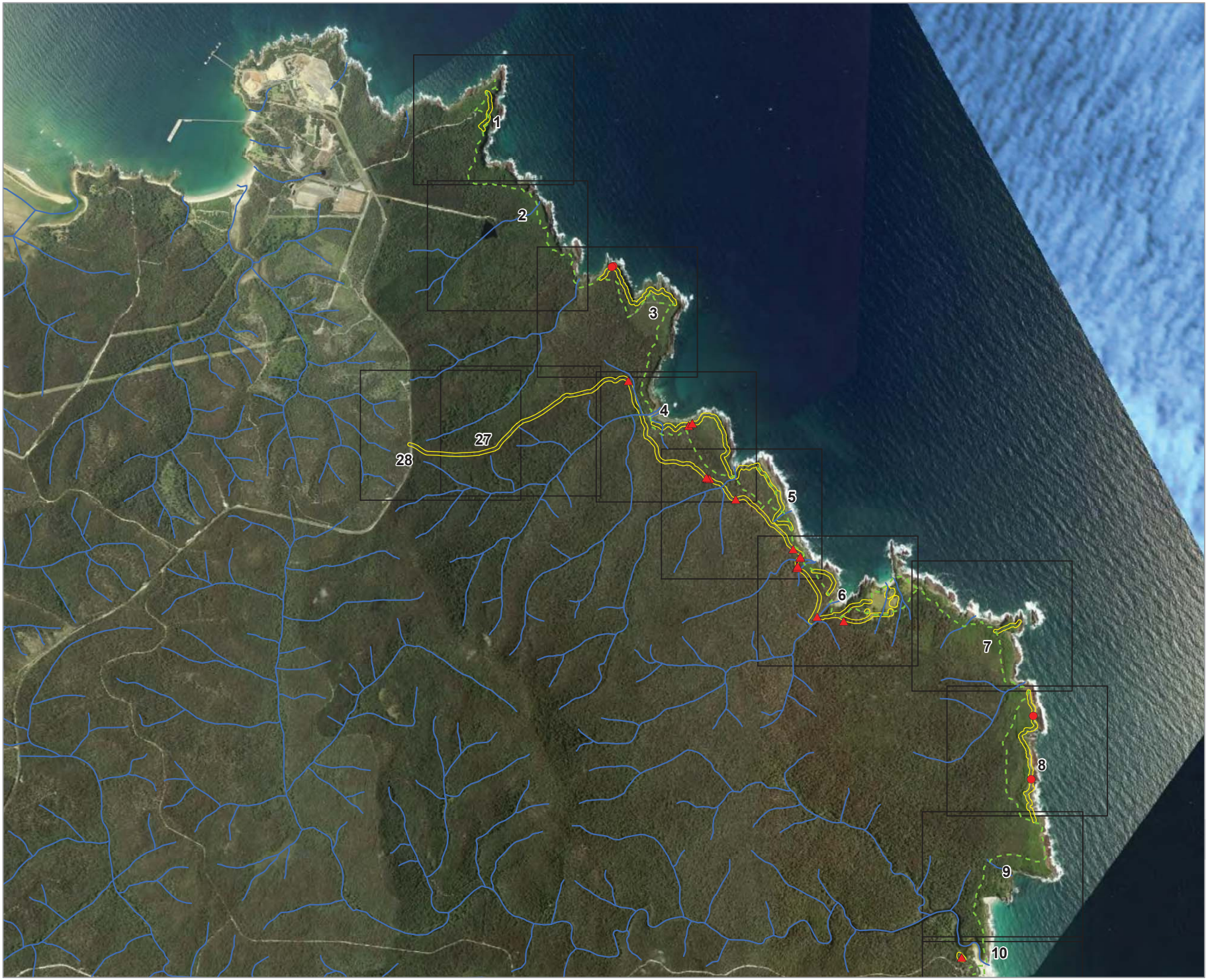
Descriptions of the constraints present within the proposal area are discussed below and mapped in Appendix B, with reference to the constraint definitions above.

High constraints include:

- PCT1141 - 'Scrub She-oak – Swamp Banksia coastal lowland heath, southern South East Corner'. May provide threatened species habitat and require targeted surveys and impact assessment.
- Hollow bearing trees. May provide threatened species habitat and require targeted surveys and impact assessment.
- Watercourses – these provide higher value habitat (riparian and aquatic) and are more sensitive to impacts (including nutrient input / pollution that may disperse into larger areas of habitat).
- Unstable land close to cliff edge. These areas may pose a safety risk to National Park users.
- Areas not accessible during high tide. These areas may require installation of structures that may not be in keeping with the landscape character of the Park.

These areas will require strong justification for impacts and offsets. These areas have been identified as high constraints in Attachment B with reference to the constraints map set within the attached email link.

ATTACHMENT A – OVERVIEW REFERENCE MAPS



DRAFT Constraints - Overview Map 1

Light to Light REF

- Existing Walking Track
- Watercourses
- Study area (30m buffer for walking track and trails, and accommodation locations)
- Detailed Maps Index

Constraints

- Land stability/access (high constraint)
- Watercourse (high constraint)
- HBT's (high constraint)
- Vegetation (high constraint)

Notes:
- Data collected by nghenvironmental (Jan 2019)
- Client data courtesy of OEH, received 2018
- Base map and layers

0 0.25 0.5 1 Kms

A3 @ 1:30000
Ref: 18569 Light to Light REF
Author: TH

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DRAFT Constraints - Overview Map 2

Light to Light REF

- Existing Walking Track
- Watercourses
- Study area (30m buffer for walking track and trails, and accommodation locations)
- Detailed Maps Index

Constraints

- Land stability/access (high constraint)
- Watercourse (high constraint)
- HBT's (high constraint)
- Vegetation (high constraint)

Notes:
- Data collected by nghenvironmental (Jan 2019)
- Client data courtesy of OEH, received 2018
- Base map and layers

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DRAFT Constraints - Overview Map 3

Light to Light REF

- Existing Walking Track
- Watercourses
- Study area (30m buffer for walking track and trails, and accommodation locations)
- Detailed Maps Index

Constraints

- Land stability/access (high constraint)
- Watercourse (high constraint)
- HBT's (high constraint)
- Vegetation (high constraint)

Notes:
- Data collected by nghenvironmental (Jan 2019)
- Client data courtesy of OEH, received 2018
- Base map and layers

0 0.25 0.5 1 Kms

A3 @ 1:30000
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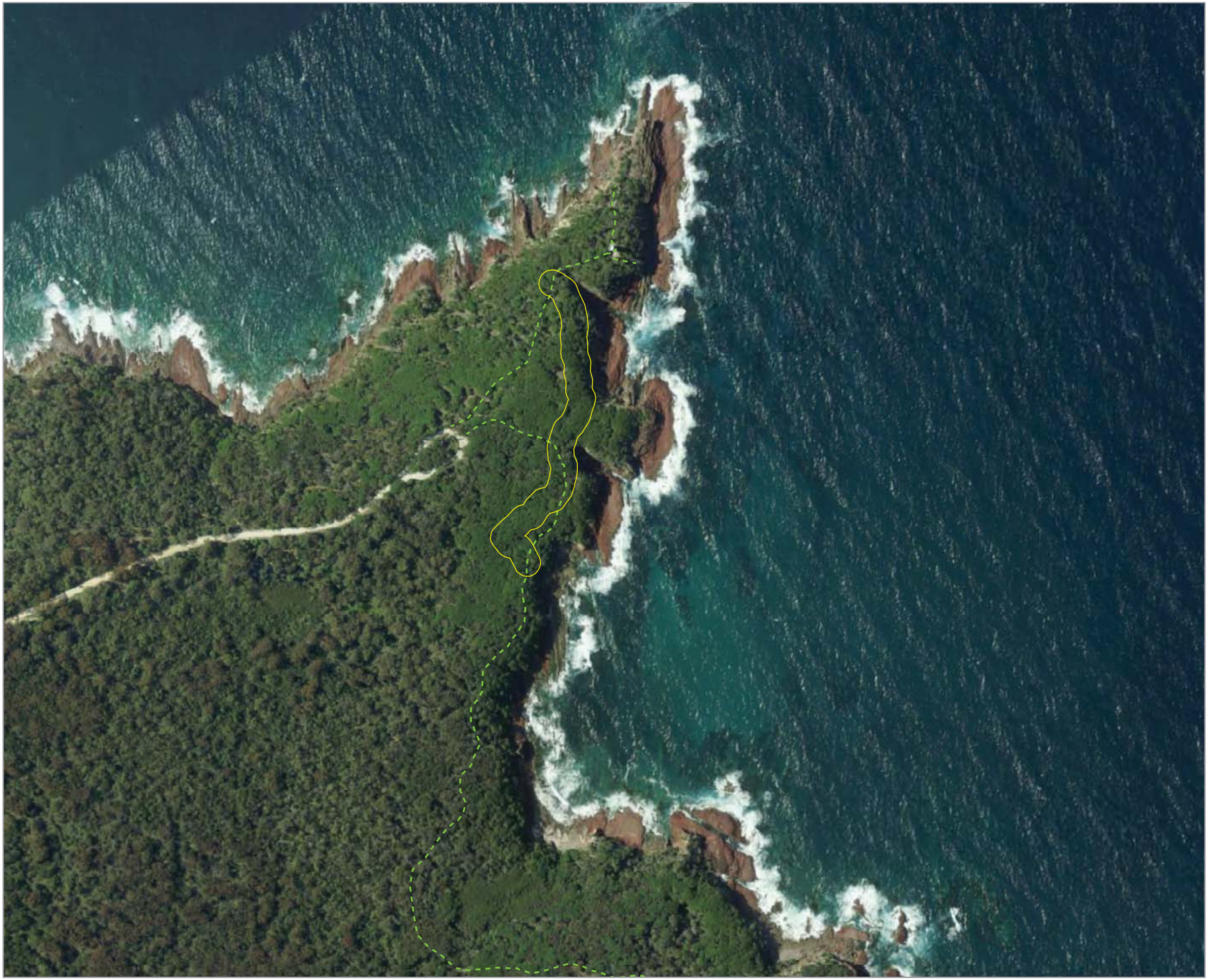
ATTACHMENT B – CONSTRAINTS MAP LOCATION REFERENCES

Location	Map reference[1]
PCT1141	
South of Saltwater Creek (Day 2)	11
Hegartys Access Trail	13
Bittangabee Bay to Pulpit Rock (Day 3)	15, 17, 18
Green Cape to Disaster Bay (Day 4)	22, 23, 24
HBT's	
Mowarry Point Trail	4, 5, 6, 30, 31, 32
Saltwater Creek campground	10
Bittangabee Bay to Pulpit Rock (Day 3)	15
Green Cape to Disaster Bay (Day 4)	23, 24, 25, 26
Watercourses	
Bittangabee Bay to Pulpit Rock (Day 3)	17, 19
Green Cape to City Rock (Day 4)	22
Unstable land	
South of Red Sands Bay (Day 1)	3
Sea Caves	8
South of Saltwater Creek (Day 2)	11
Bittangabee Bay to Pulpit Rock (Day 3)	17, 18, 19
Pulpit Rock to Green Cape (Day 3)	21

[1] Map reference refers to overview maps provided as Appendix A.

Location	Map reference[1]
Green Cape to Disaster Bay (Day 4)	21, 22
Inaccessible land	
Sea Caves	8



Constraints Maps - Detailed Map 1

Light to Light REF

Study area (30m buffer for walking track and trails, and accommodation locations)

Existing Walking Track

Watercourses

Constraints

Land stability/access (high constraint)

Watercourse (high constraint)

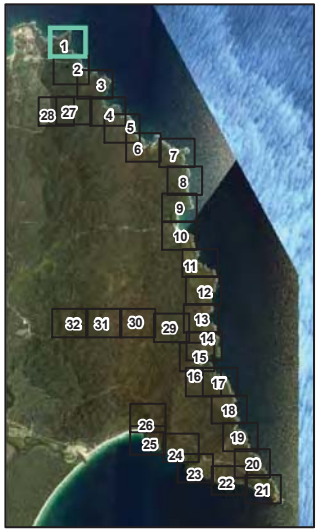
HBT's (high constraint)

Vegetation (high constraint)

NSW Wetlands

Biodiversity Values older than 90 days

Biodiversity Values added in the last 90 days



Notes:
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- Client data courtesy of OEH, received 2018
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0 25 50 100 150 Metres

A3 @ 1:4000
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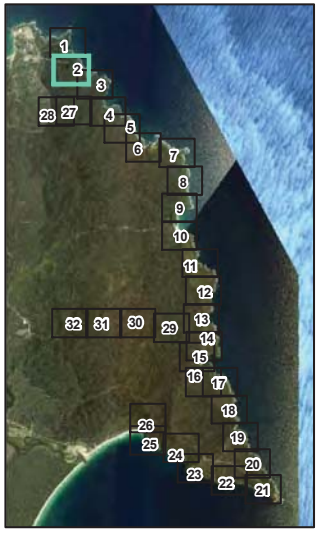
Constraints Maps - Detailed Map 2

Light to Light REF

- Study area (30m buffer for walking track and trails, and accommodation locations)
- Existing Walking Track
- Watercourses

Constraints

- Land stability/access (high constraint)
- Watercourse (high constraint)
- HBT's (high constraint)
- Vegetation (high constraint)
- NSW Wetlands
- Biodiversity Values older than 90 days
- Biodiversity Values added in the last 90 days



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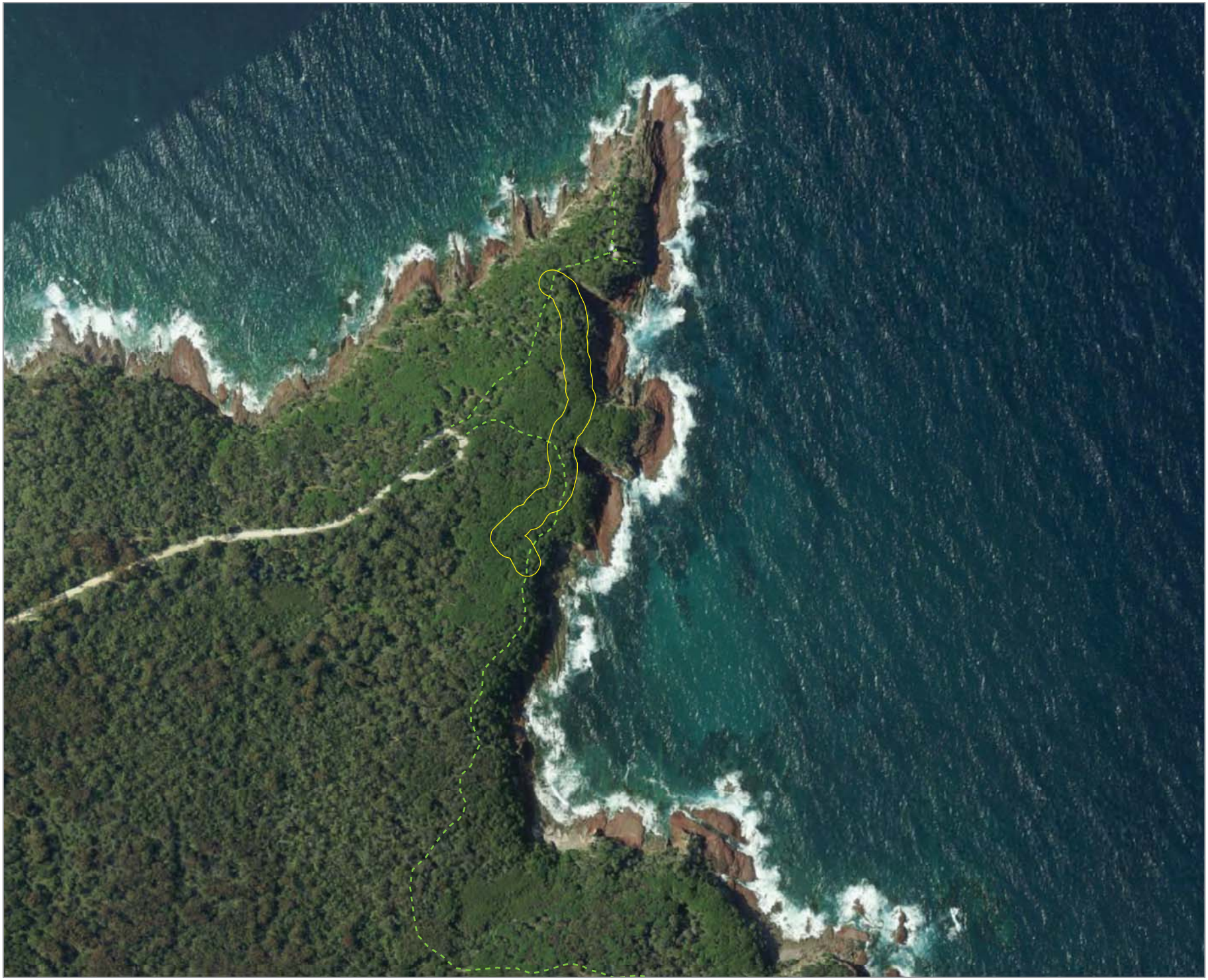


Constraints Maps - Detailed Map 1

Light to Light REF

Study area (30m buffer for walking track and trails, and accommodation locations)

Existing Walking Track

Watercourses

Constraints

Land stability/access (high constraint)

Watercourse (high constraint)

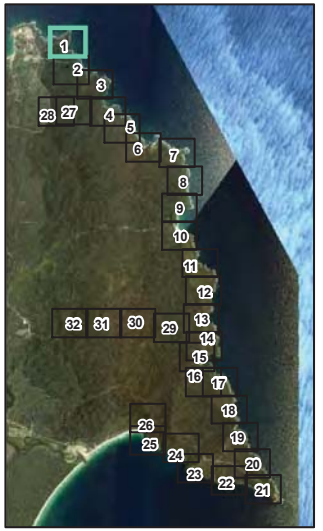
HBT's (high constraint)

Vegetation (high constraint)

NSW Wetlands

Biodiversity Values older than 90 days

Biodiversity Values added in the last 90 days



Notes:
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- Client data courtesy of OEH, received 2018
- Base map and layers
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0 25 50 100 150 Metres

A3 @ 1:4000
Ref: 18569 Light to Light REF
Author: TH

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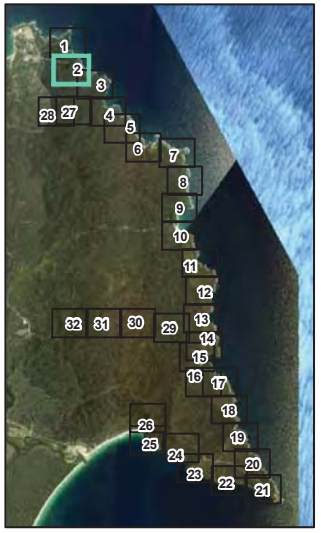
Constraints Maps - Detailed Map 2

Light to Light REF

- Study area (30m buffer for walking track and trails, and accommodation locations)
- Existing Walking Track
- Watercourses

Constraints

- Land stability/access (high constraint)
- Watercourse (high constraint)
- HBT's (high constraint)
- Vegetation (high constraint)
- NSW Wetlands
- Biodiversity Values older than 90 days
- Biodiversity Values added in the last 90 days



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- Base map and layers
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0 25 50 100 150 Metres

A3 @ 1:4000
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Author: TH

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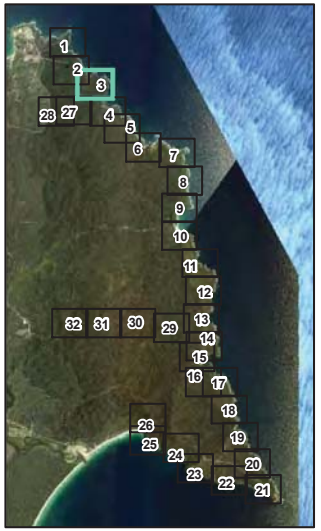
Constraints Maps - Detailed Map 3

Light to Light REF

- Study area (30m buffer for walking track and trails, and accommodation locations)
- Existing Walking Track
- Watercourses

Constraints

- Land stability/access (high constraint)
- Watercourse (high constraint)
- HBT's (high constraint)
- Vegetation (high constraint)
- NSW Wetlands
- Biodiversity Values older than 90 days
- Biodiversity Values added in the last 90 days



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- Data collected by nghenvironmental (Jan 2019)
- Client data courtesy of OEH, received 2018
- Base map and layers

0 25 50 100 150 Metres

A3 @ 1:4000
Ref: 18569 Light to Light REF
Author: TH

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Constraints Maps - Detailed Map 4

Light to Light REF

Study area (30m buffer for walking track and trails, and accommodation locations)

Existing Walking Track

Watercourses

Constraints

Land stability/access (high constraint)

Watercourse (high constraint)

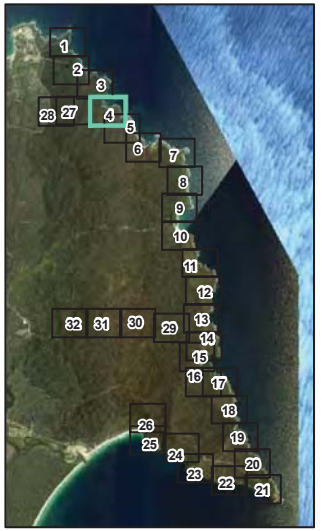
HBT's (high constraint)

Vegetation (high constraint)

NSW Wetlands

Biodiversity Values older than 90 days

Biodiversity Values added in the last 90 days



Notes:
- Data collected by nghenvironmental (Jan 2019)
- Client data courtesy of OEH, received 2018
- Base map and layers

0 25 50 100 150 Metres

A3 @ 1:4000
Ref: 18569 Light to Light REF
Author: TH

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Constraints Maps - Detailed Map 5

Light to Light REF

Study area (30m buffer for walking track and trails, and accommodation locations)

Existing Walking Track

Watercourses

Constraints

Land stability/access (high constraint)

Watercourse (high constraint)

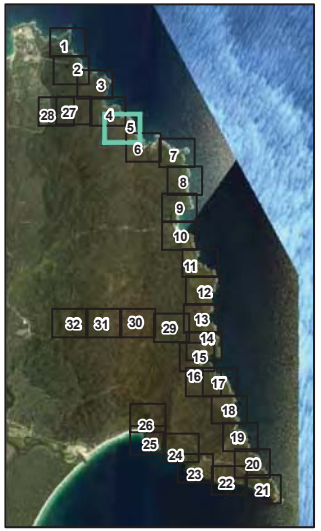
HBT's (high constraint)

Vegetation (high constraint)

NSW Wetlands

Biodiversity Values older than 90 days

Biodiversity Values added in the last 90 days



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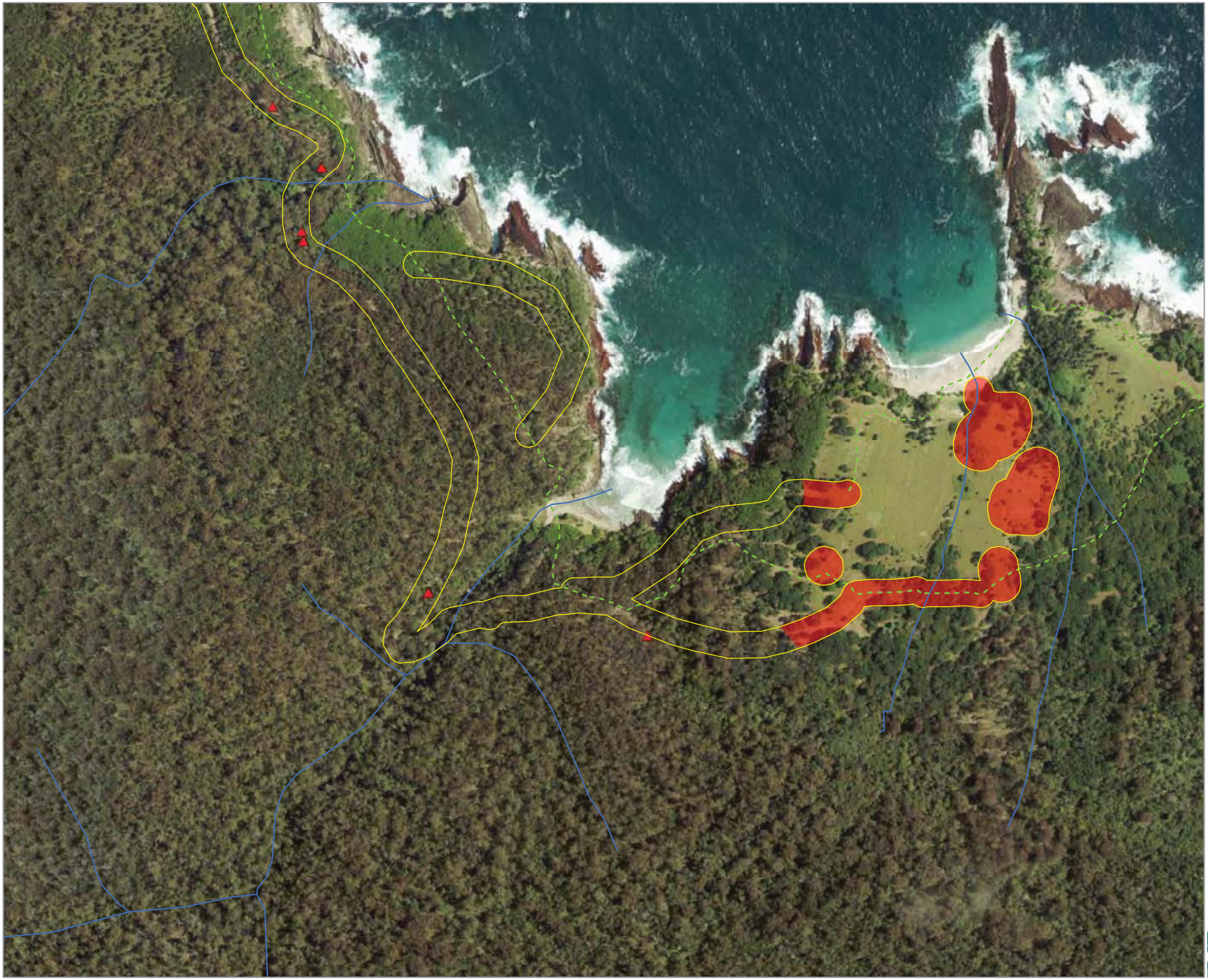


Constraints Maps - Detailed Map 6

Light to Light REF

Study area (30m buffer for walking track and trails, and accommodation locations)

Existing Walking Track

Watercourses

Constraints

Land stability/access (high constraint)

Watercourse (high constraint)

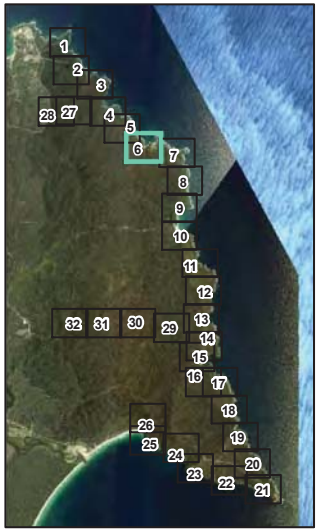
HBT's (high constraint)

Vegetation (high constraint)

NSW Wetlands

Biodiversity Values older than 90 days

Biodiversity Values added in the last 90 days



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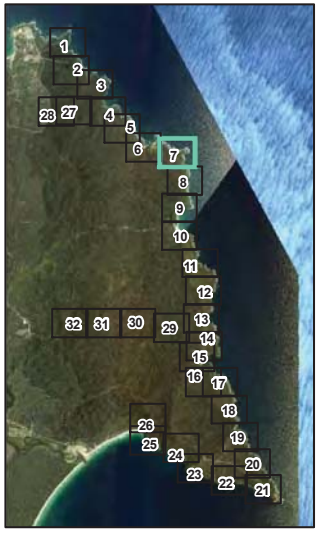
Constraints Maps - Detailed Map 7

Light to Light REF

- Study area (30m buffer for walking track and trails, and accommodation locations)
- Existing Walking Track
- Watercourses

Constraints

- Land stability/access (high constraint)
- Watercourse (high constraint)
- HBT's (high constraint)
- Vegetation (high constraint)
- NSW Wetlands
- Biodiversity Values older than 90 days
- Biodiversity Values added in the last 90 days



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Constraints Maps - Detailed Map 8

Light to Light REF

Study area (30m buffer for walking track and trails, and accommodation locations)

Existing Walking Track

Watercourses

Constraints

Land stability/access (high constraint)

Watercourse (high constraint)

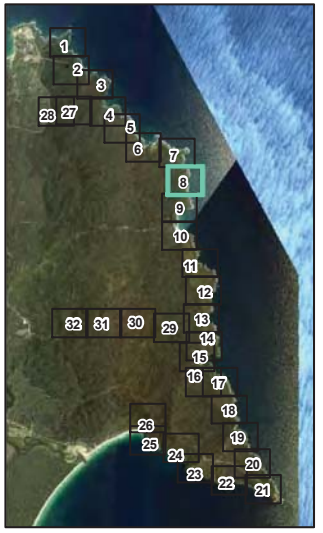
HBT's (high constraint)

Vegetation (high constraint)

NSW Wetlands

Biodiversity Values older than 90 days

Biodiversity Values added in the last 90 days



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Constraints Maps - Detailed Map 9

Light to Light REF

Study area (30m buffer for walking track and trails, and accommodation locations)

Existing Walking Track

Watercourses

Constraints

Land stability/access (high constraint)

Watercourse (high constraint)

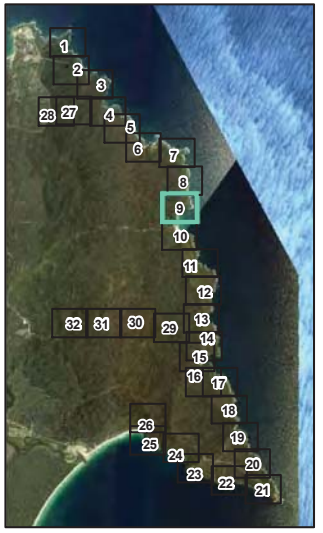
HBT's (high constraint)

Vegetation (high constraint)

NSW Wetlands

Biodiversity Values older than 90 days

Biodiversity Values added in the last 90 days



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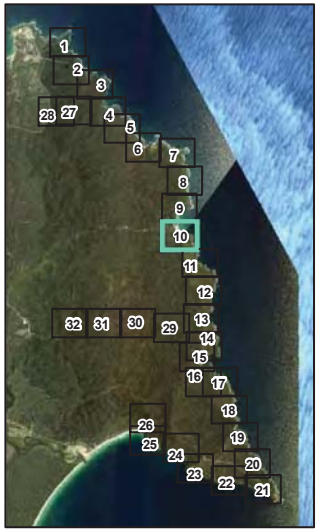
Constraints Maps - Detailed Map 10

Light to Light REF

- Study area (30m buffer for walking track and trails, and accommodation locations)
- Existing Walking Track
- Watercourses

Constraints

- Land stability/access (high constraint)
- Watercourse (high constraint)
- HBT's (high constraint)
- Vegetation (high constraint)
- NSW Wetlands
- Biodiversity Values older than 90 days
- Biodiversity Values added in the last 90 days



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Constraints Maps - Detailed Map 11

Light to Light REF

Study area (30m buffer for walking track and trails, and accommodation locations)

Existing Walking Track

Watercourses

Constraints

Land stability/access (high constraint)

Watercourse (high constraint)

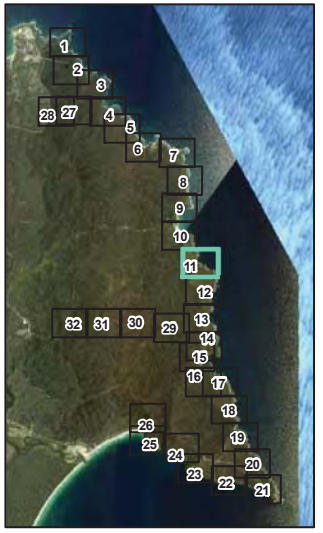
HBT's (high constraint)

Vegetation (high constraint)

NSW Wetlands

Biodiversity Values older than 90 days

Biodiversity Values added in the last 90 days



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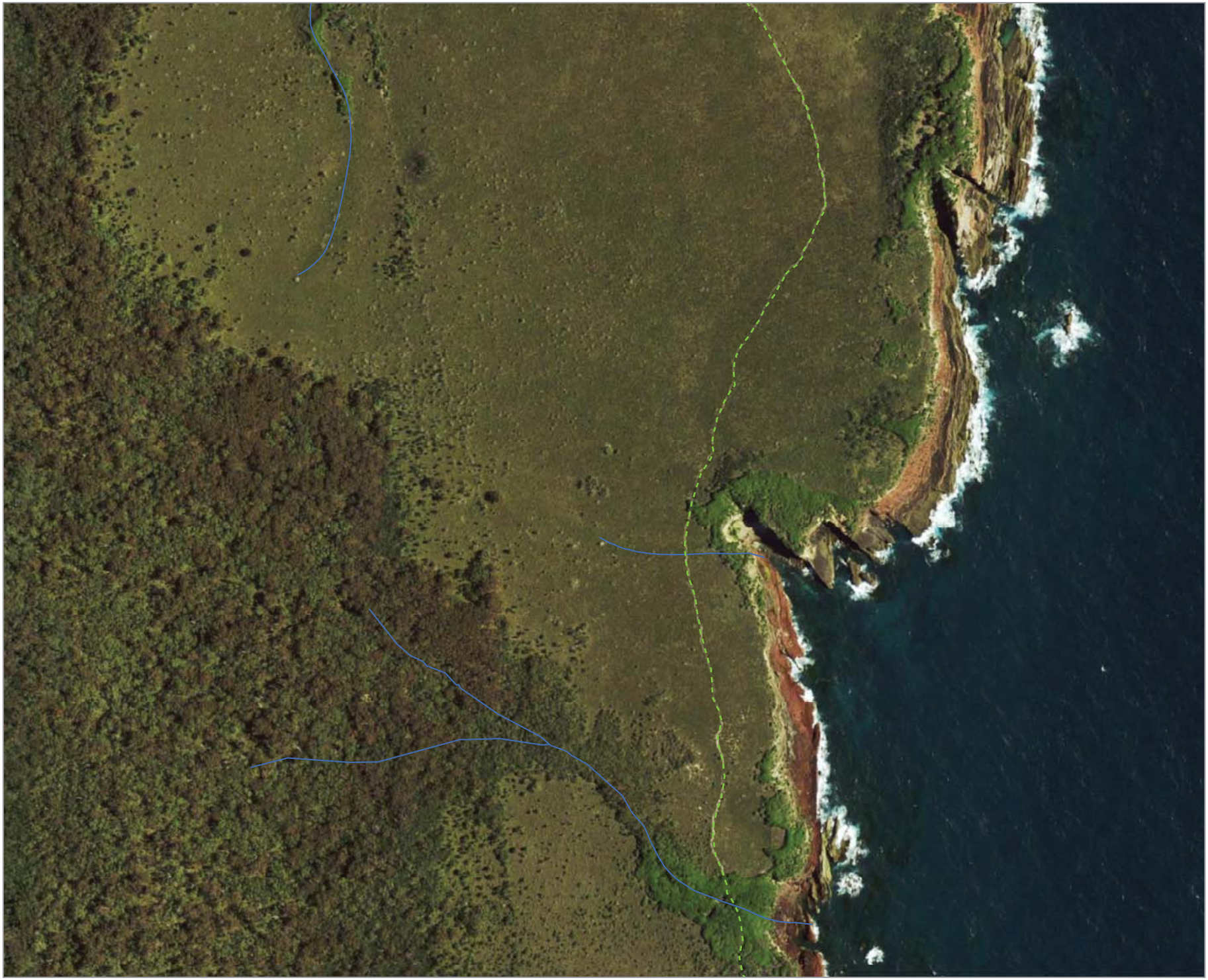


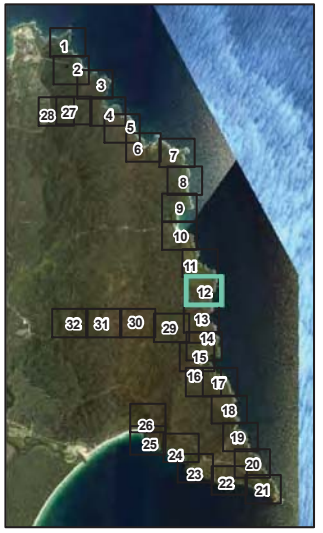
Constraints Maps - Detailed Map 12

Light to Light REF

- Study area (30m buffer for walking track and trails, and accommodation locations)
- Existing Walking Track
- Watercourses

Constraints

- Land stability/access (high constraint)
- Watercourse (high constraint)
- HBT's (high constraint)
- Vegetation (high constraint)
- NSW Wetlands
- Biodiversity Values older than 90 days
- Biodiversity Values added in the last 90 days



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Constraints Maps - Detailed Map 13

Light to Light REF

Study area (30m buffer for walking track and trails, and accommodation locations)

Existing Walking Track

Watercourses

Constraints

Land stability/access (high constraint)

Watercourse (high constraint)

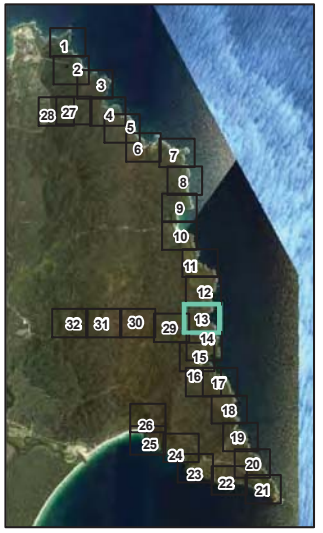
HBT's (high constraint)

Vegetation (high constraint)

NSW Wetlands

Biodiversity Values older than 90 days

Biodiversity Values added in the last 90 days



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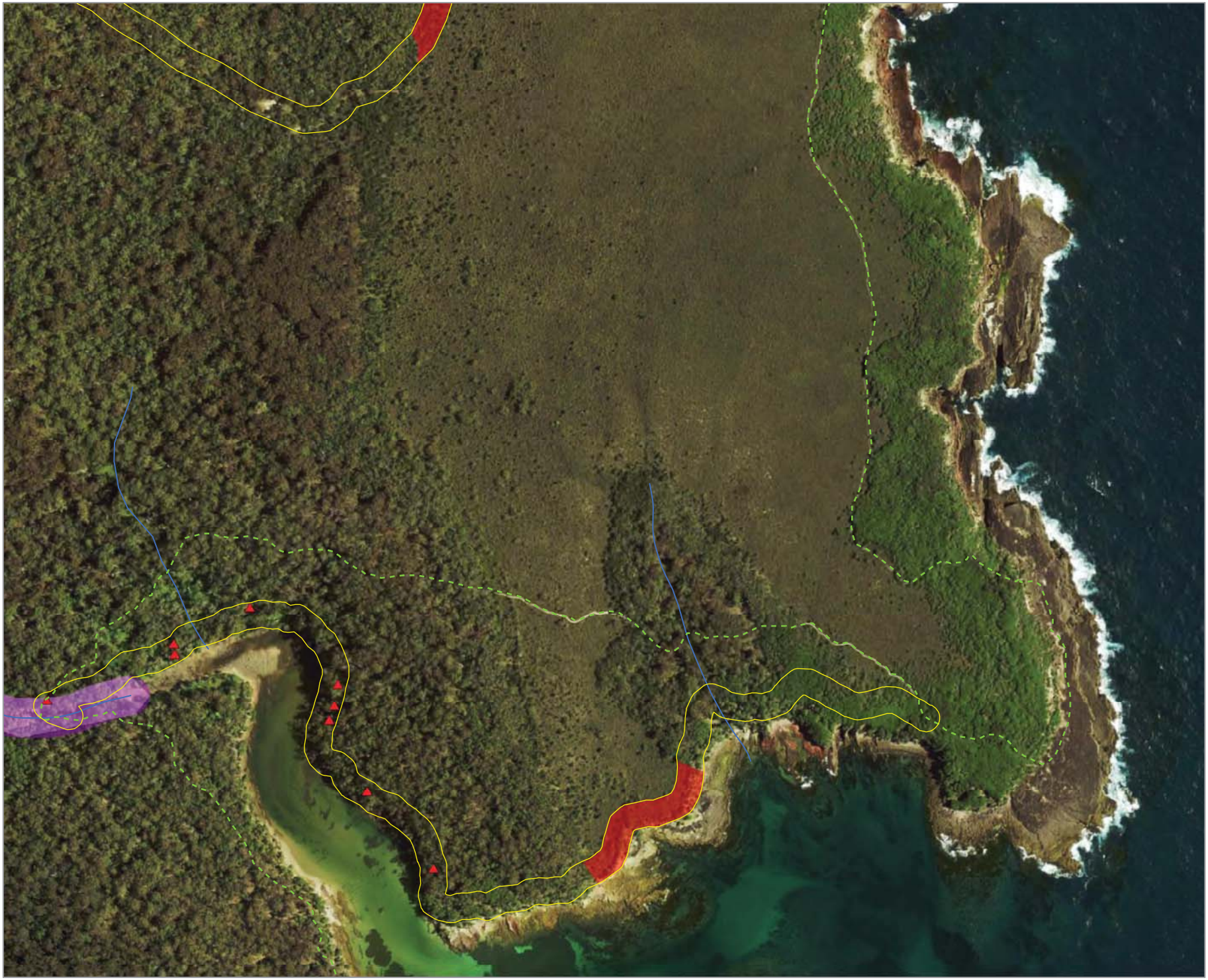


Constraints Maps - Detailed Map 14

Light to Light REF

Study area (30m buffer for walking track and trails, and accommodation locations)

Existing Walking Track

Watercourses

Constraints

Land stability/access (high constraint)

Watercourse (high constraint)

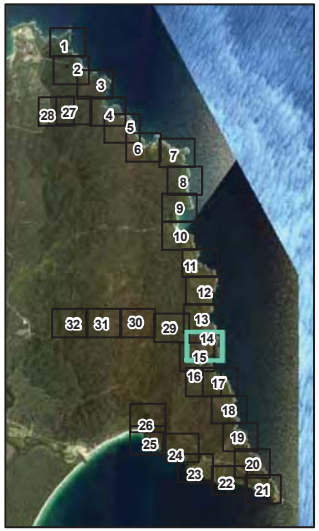
HBT's (high constraint)

Vegetation (high constraint)

NSW Wetlands

Biodiversity Values older than 90 days

Biodiversity Values added in the last 90 days



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Constraints Maps - Detailed Map 15

Light to Light REF

Study area (30m buffer for walking track and trails, and accommodation locations)

Existing Walking Track

Watercourses

Constraints

Land stability/access (high constraint)

Watercourse (high constraint)

HBT's (high constraint)

Vegetation (high constraint)

NSW Wetlands

Biodiversity Values older than 90 days

Biodiversity Values added in the last 90 days

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Constraints Maps - Detailed Map 16

Light to Light REF

Study area (30m buffer for walking track and trails, and accommodation locations)

Existing Walking Track

Watercourses

Constraints

Land stability/access (high constraint)

Watercourse (high constraint)

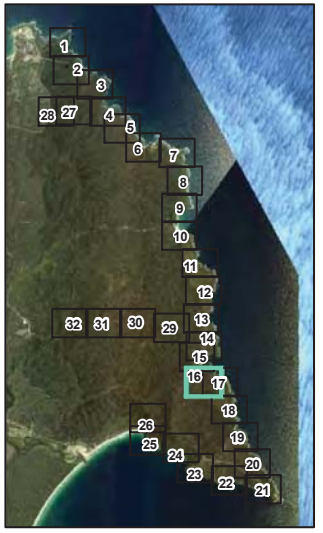
HBT's (high constraint)

Vegetation (high constraint)

NSW Wetlands

Biodiversity Values older than 90 days

Biodiversity Values added in the last 90 days



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Constraints Maps - Detailed Map 17

Light to Light REF

Study area (30m buffer for walking track and trails, and accommodation locations)

Existing Walking Track

Watercourses

Constraints

Land stability/access (high constraint)

Watercourse (high constraint)

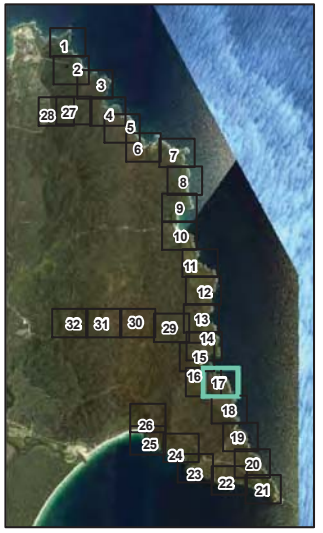
HBT's (high constraint)

Vegetation (high constraint)

NSW Wetlands

Biodiversity Values older than 90 days

Biodiversity Values added in the last 90 days



Notes:
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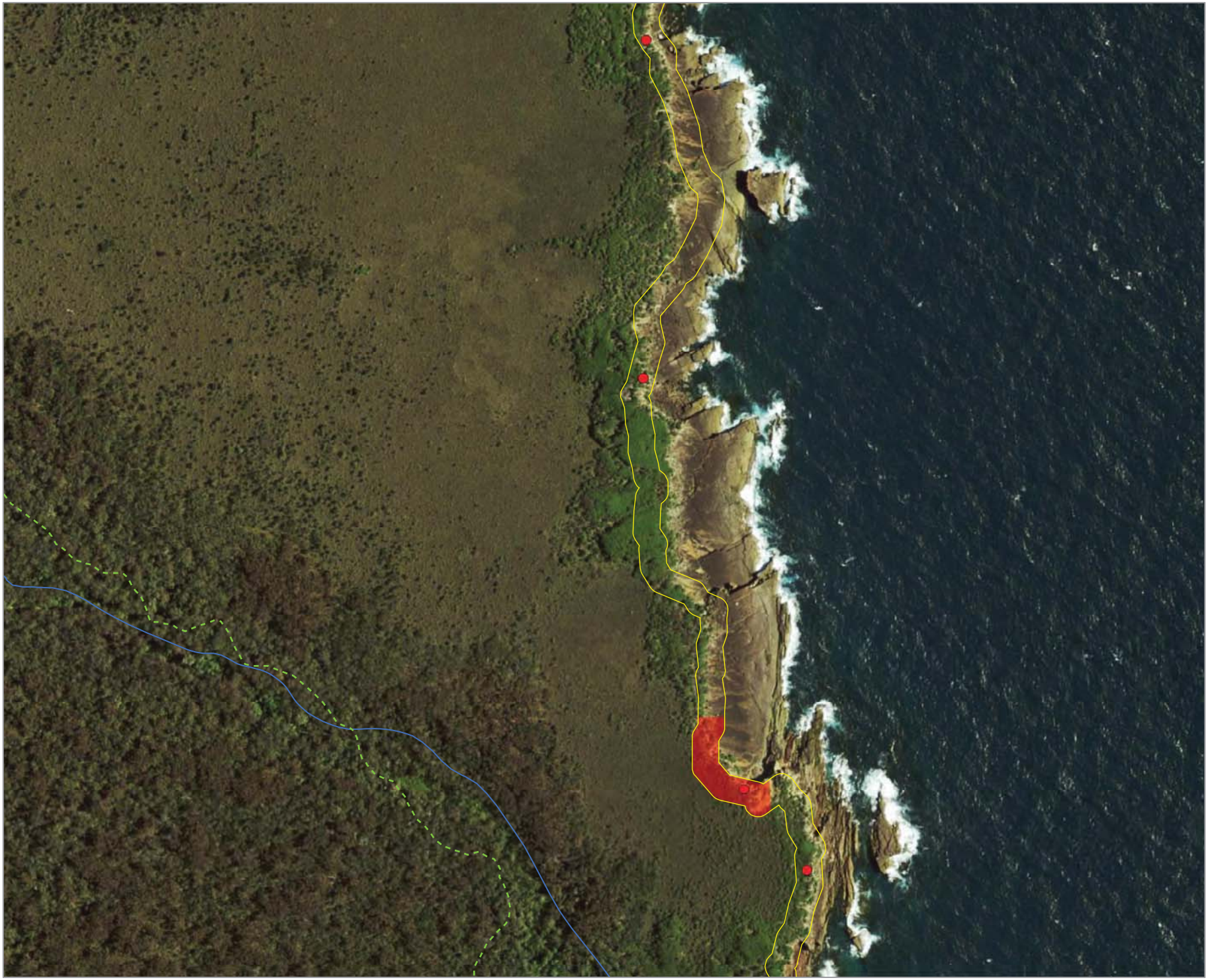


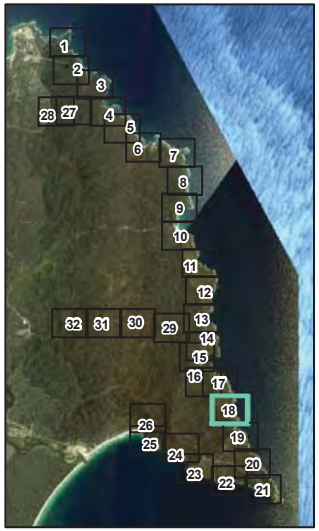
Constraints Maps - Detailed Map 18

Light to Light REF

- Study area (30m buffer for walking track and trails, and accommodation locations)
- Existing Walking Track
- Watercourses

Constraints

- Land stability/access (high constraint)
- Watercourse (high constraint)
- HBT's (high constraint)
- Vegetation (high constraint)
- NSW Wetlands
- Biodiversity Values older than 90 days
- Biodiversity Values added in the last 90 days



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Constraints Maps - Detailed Map 19

Light to Light REF

Study area (30m buffer for walking track and trails, and accommodation locations)

Existing Walking Track

Watercourses

Constraints

Land stability/access (high constraint)

Watercourse (high constraint)

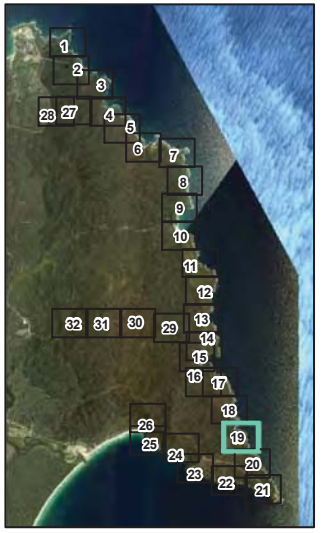
HBT's (high constraint)

Vegetation (high constraint)

NSW Wetlands

Biodiversity Values older than 90 days

Biodiversity Values added in the last 90 days



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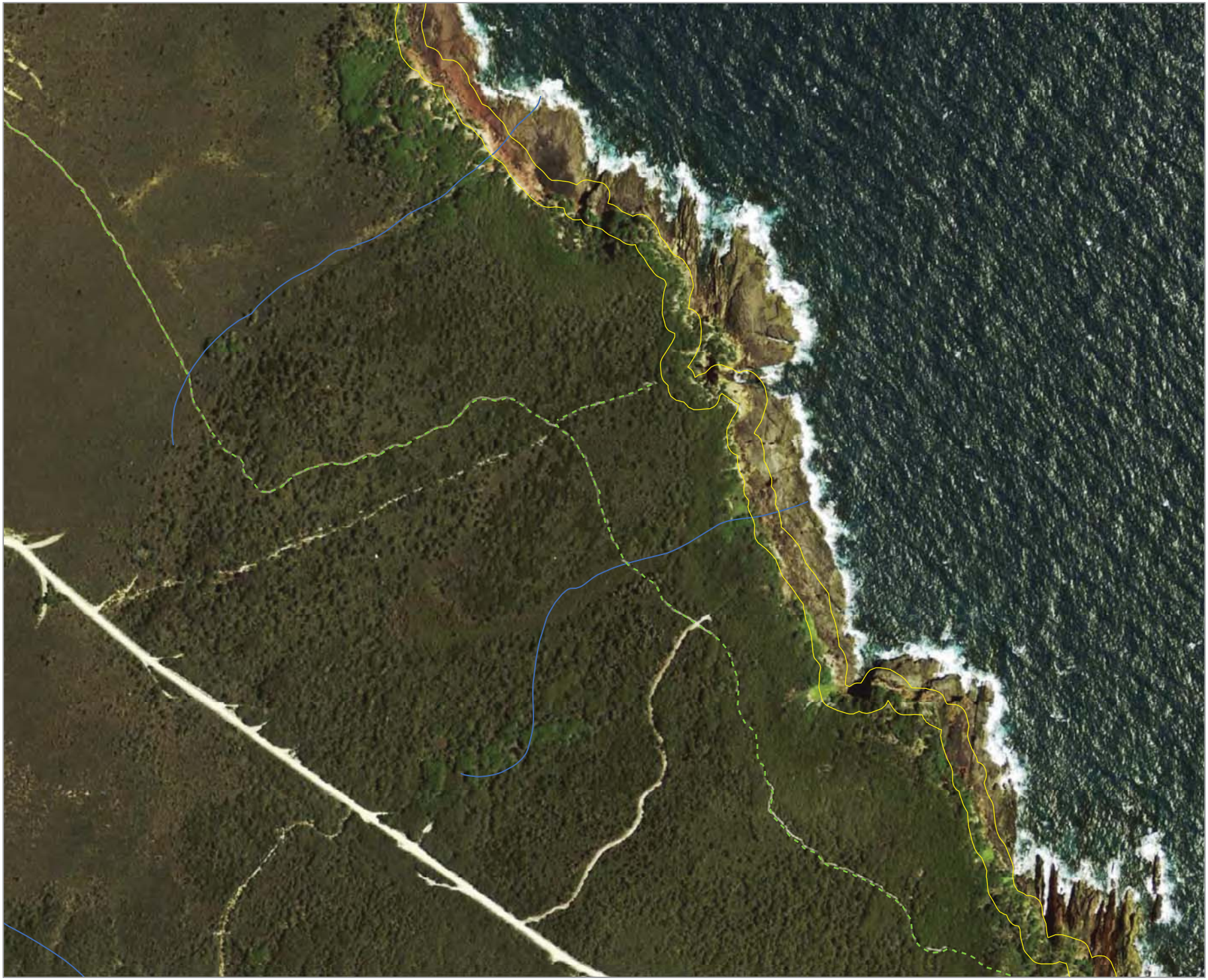


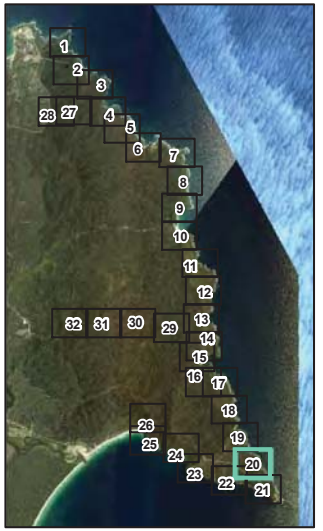
Constraints Maps - Detailed Map 20

Light to Light REF

- Study area (30m buffer for walking track and trails, and accommodation locations)
- Existing Walking Track
- Watercourses

Constraints

- Land stability/access (high constraint)
- Watercourse (high constraint)
- HBT's (high constraint)
- Vegetation (high constraint)
- NSW Wetlands
- Biodiversity Values older than 90 days
- Biodiversity Values added in the last 90 days



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Constraints Maps - Detailed Map 21

Light to Light REF

Study area (30m buffer for walking track and trails, and accommodation locations)

Existing Walking Track

Watercourses

Constraints

Land stability/access (high constraint)

Watercourse (high constraint)

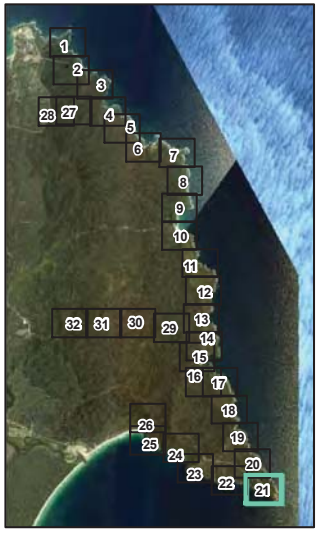
HBT's (high constraint)

Vegetation (high constraint)

NSW Wetlands

Biodiversity Values older than 90 days

Biodiversity Values added in the last 90 days



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Constraints Maps - Detailed Map 22

Light to Light REF

Study area (30m buffer for walking track and trails, and accommodation locations)

Existing Walking Track

Watercourses

Constraints

Land stability/access (high constraint)

Watercourse (high constraint)

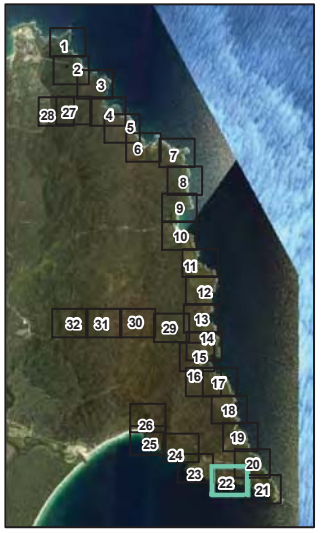
HBT's (high constraint)

Vegetation (high constraint)

NSW Wetlands

Biodiversity Values older than 90 days

Biodiversity Values added in the last 90 days



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Constraints Maps - Detailed Map 23

Light to Light REF

Study area (30m buffer for walking track and trails, and accommodation locations)

Existing Walking Track

Watercourses

Constraints

Land stability/access (high constraint)

Watercourse (high constraint)

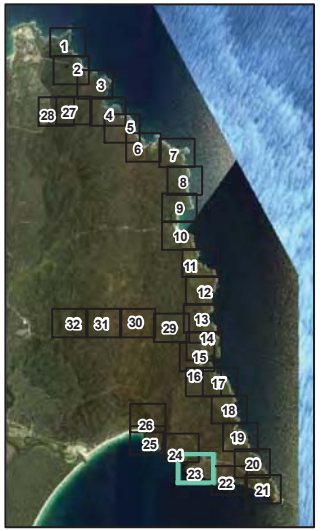
HBT's (high constraint)

Vegetation (high constraint)

NSW Wetlands

Biodiversity Values older than 90 days

Biodiversity Values added in the last 90 days



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Constraints Maps - Detailed Map 24

Light to Light REF

Study area (30m buffer for walking track and trails, and accommodation locations)

Existing Walking Track

Watercourses

Constraints

Land stability/access (high constraint)

Watercourse (high constraint)

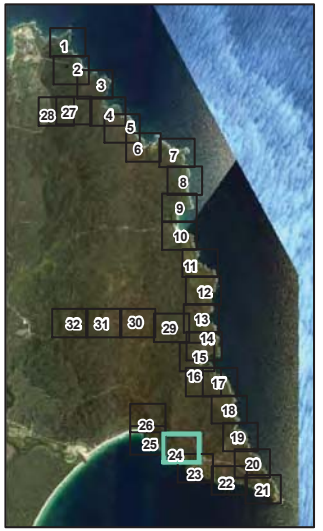
HBT's (high constraint)

Vegetation (high constraint)

NSW Wetlands

Biodiversity Values older than 90 days

Biodiversity Values added in the last 90 days



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Constraints Maps - Detailed Map 25

Light to Light REF

Study area (30m buffer for walking track and trails, and accommodation locations)

Existing Walking Track

Watercourses

Constraints

Land stability/access (high constraint)

Watercourse (high constraint)

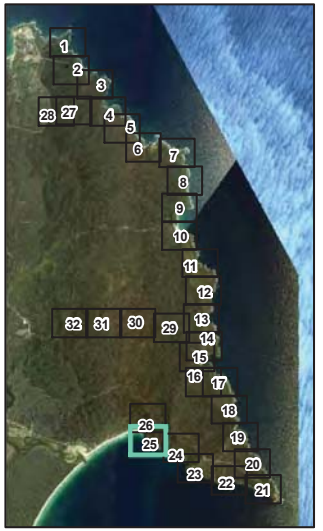
HBT's (high constraint)

Vegetation (high constraint)

NSW Wetlands

Biodiversity Values older than 90 days

Biodiversity Values added in the last 90 days



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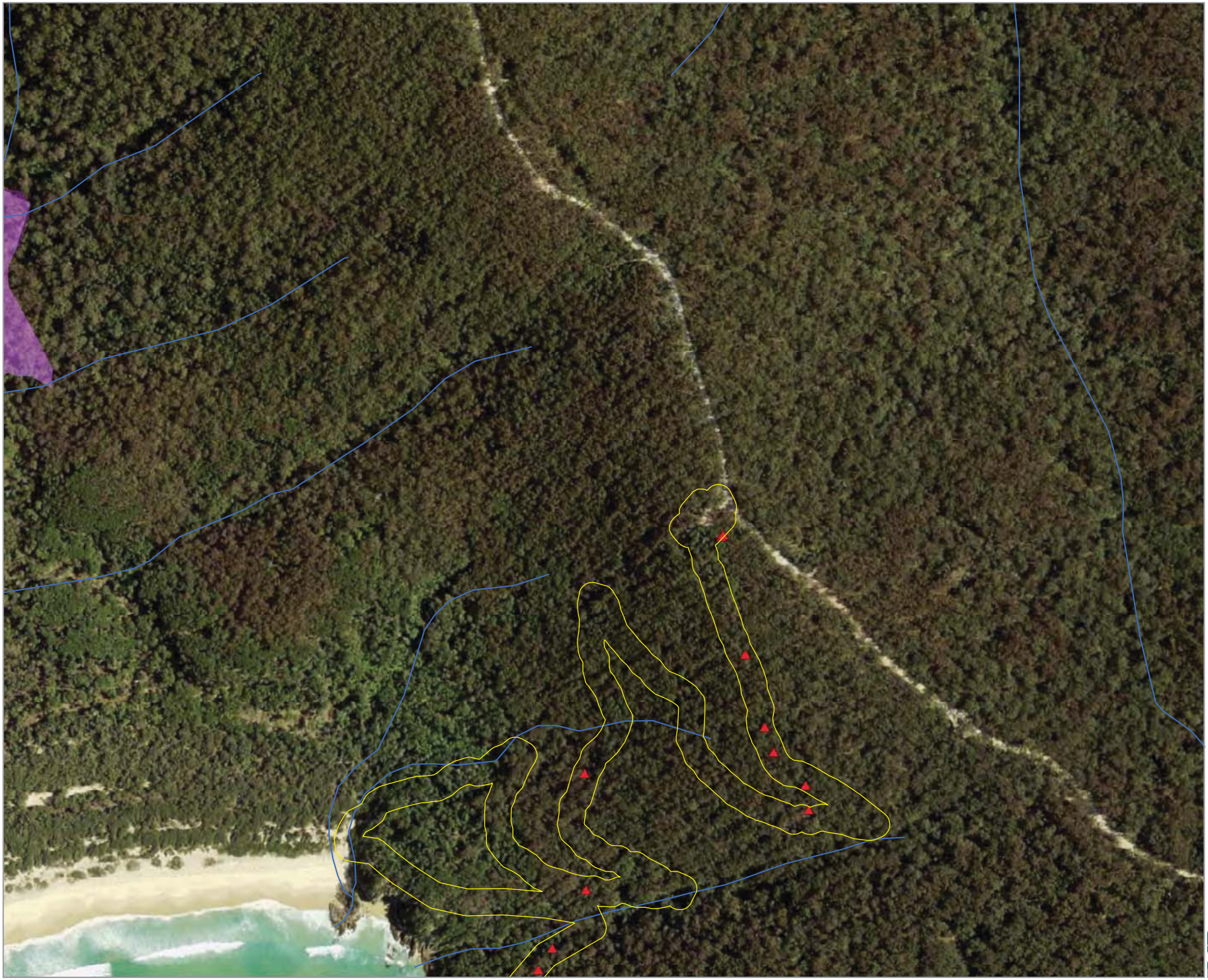


Constraints Maps - Detailed Map 26

Light to Light REF

Study area (30m buffer for walking track and trails, and accommodation locations)

Existing Walking Track

Watercourses

Constraints

Land stability/access (high constraint)

Watercourse (high constraint)

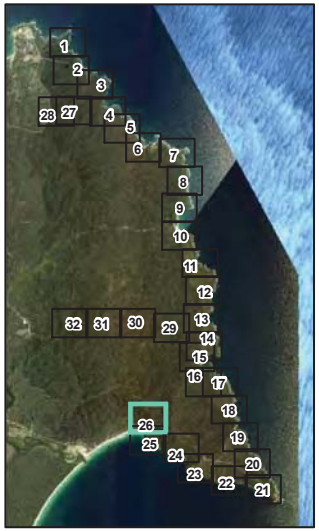
HBT's (high constraint)

Vegetation (high constraint)

NSW Wetlands

Biodiversity Values older than 90 days

Biodiversity Values added in the last 90 days



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Constraints Maps - Detailed Map 27

Light to Light REF

Study area (30m buffer for walking track and trails, and accommodation locations)

Existing Walking Track

Watercourses

Constraints

Land stability/access (high constraint)

Watercourse (high constraint)

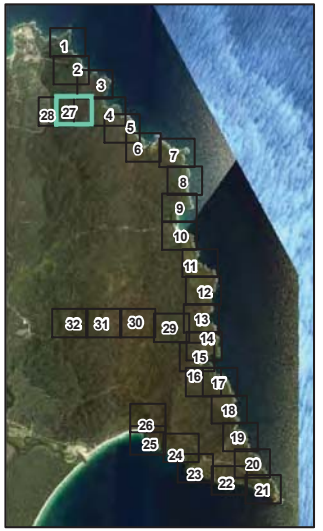
HBT's (high constraint)

Vegetation (high constraint)

NSW Wetlands

Biodiversity Values older than 90 days

Biodiversity Values added in the last 90 days



Notes:
- Data collected by nghenvironmental (Jan 2019)
- Client data courtesy of OEH, received 2018
- Base map and layers
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0 25 50 100 150 Metres

A3 @ 1:4000
Ref: 18569 Light to Light REF
Author: TH

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Constraints Maps - Detailed Map 28

Light to Light REF

Study area (30m buffer for walking track and trails, and accommodation locations)

Existing Walking Track

Watercourses

Constraints

Land stability/access (high constraint)

Watercourse (high constraint)

HBT's (high constraint)

Vegetation (high constraint)

NSW Wetlands

Biodiversity Values older than 90 days

Biodiversity Values added in the last 90 days

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0 25 50 100 150 Metres

A3 @ 1:4000
Ref: 18569 Light to Light REF
Author: TH

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Constraints Maps - Detailed Map 29

Light to Light REF

Study area (30m buffer for walking track and trails, and accommodation locations)

Existing Walking Track

Watercourses

Constraints

Land stability/access (high constraint)

Watercourse (high constraint)

HBT's (high constraint)

Vegetation (high constraint)

NSW Wetlands

Biodiversity Values older than 90 days

Biodiversity Values added in the last 90 days

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0 25 50 100 150 Metres

A3 @ 1:4000
Ref: 18569 Light to Light REF
Author: TH

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Constraints Maps - Detailed Map 30

Light to Light REF

- Study area (30m buffer for walking track and trails, and accommodation locations)
- Existing Walking Track
- Watercourses

Constraints

- Land stability/access (high constraint)
- Watercourse (high constraint)
- HBT's (high constraint)
- Vegetation (high constraint)
- NSW Wetlands
- Biodiversity Values older than 90 days
- Biodiversity Values added in the last 90 days

Notes:
- Data collected by nghenvironmental (Jan 2019)
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- Base map and layers
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0 25 50 100 150 Metres

A3 @ 1:4000
Ref: 18569 Light to Light REF
Author: TH

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Constraints Maps - Detailed Map 31

Light to Light REF

Study area (30m buffer for walking track and trails, and accommodation locations)

Existing Walking Track

Watercourses

Constraints

Land stability/access (high constraint)

Watercourse (high constraint)

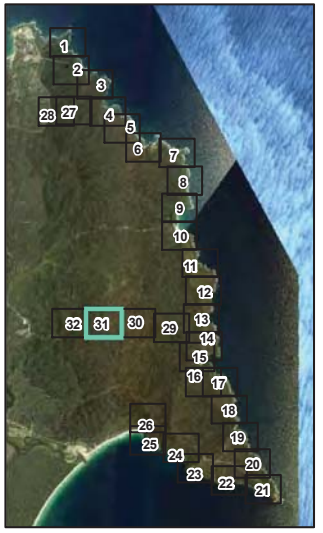
HBT's (high constraint)

Vegetation (high constraint)

NSW Wetlands

Biodiversity Values older than 90 days

Biodiversity Values added in the last 90 days



Notes:
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- Base map and layers
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0 25 50 100 150 Metres

A3 @ 1:4000
Ref: 18569 Light to Light REF
Author: TH

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Constraints Maps - Detailed Map 32

Light to Light REF

Study area (30m buffer for walking track and trails, and accommodation locations)

Existing Walking Track

Watercourses

Constraints

Land stability/access (high constraint)

Watercourse (high constraint)

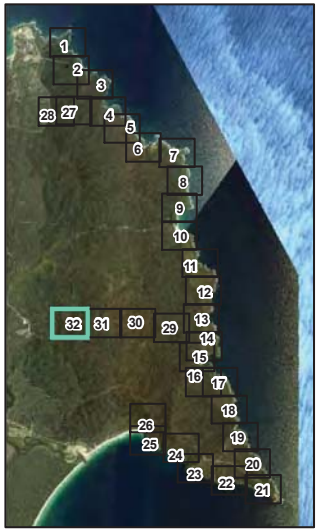
HBT's (high constraint)

Vegetation (high constraint)

NSW Wetlands

Biodiversity Values older than 90 days

Biodiversity Values added in the last 90 days



Notes:
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- Base map and layers
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0 25 50 100 150 Metres

A3 @ 1:4000
Ref: 18569 Light to Light REF
Author: TH

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Appendix E Flora Species List

The following flora species were identified to determine the relevant Plant Community Types; this does not represent a complete list of all flora within the study area.

PCT 721 Bracelet Honey-myrtle - Coast Tea tree tall shrubland on headlands, South East corner bioregion

- Top stratum (closed condition type):
    - Melaleuca armillaris (dominant)
- Top stratum (open condition type):
    - *Banksia integrifolia*
    - *Allocasuarina littoralis*
    - *Allocasuarina stricta*
- Middle stratum/shrubs (open condition type):
    - *Allocasuarina littoralis*
    - *Allocasuarina stricta*
    - *Monotoca elliptica*
    - *Persoonia levis*
    - *Hakea decurrens*
    - *Leptospermum laevigatum*
    - *Westringea fruticosa*
    - *Myoprum boninense*
    - *Alyxia buxifolia*
- Ground cover (open condition type):
    - *Lasiopetalum macrophyllum* (in disturbed areas, e.g. recent fire)
    - *Ghania radula*
    - *Ghania melanocarpa*
    - *Patersonia glabrata*
    - *Carex spp.*

Additional species:

> *Westringia fruticosa, Myoporum boninense, Chenopodium candolleanum, Ziera littoralis. Monotoca elliptica*, *Kunzea ambigua, Persoonia levis. Allocasuarina verticillata* and *Banksia paludosa, Goodenia ovata, Hibbertia aspera*

PCT 772 Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion

- Top stratum:
    - *Banksia integrifolia* (dominant)
    - *Acacia longifolia subsp. sophora*

  - *Melaleuca armillaris*
  - *Pittosporum undulatum*
  - *Eucalyptus sieberi*
- Middle stratum:
  - *Allocasuarina littoralis*
  - *Hakea decurrens*
  - *Monotoca elliptica*
  - *Leptospermum laevigatum*
- Ground cover:
  - *Lasiopetalum macrophyllum* (in disturbed areas, e.g. recent fire)
  - *Leucopogon parviflorus*
  - *Rahgodia candolleana*
  - *Kennedia rubicunda*
  - *Carex spp.*

Additional species: *E. baxteri*

PCT 777 Coast Grey Box - Mountain Grey Gum - stringybark moist shrubby open forest in coastal gullies, southern South East Corner Bioregion

- Top stratum (dominant top stratum species varied with location):
  - *Eucalyptus longifolia*
  - *Eucalyptus bosistoana*
  - *Eucalyptus cypellocarpa*
- Middle stratum:
  - *Sannantha pluriflora*
  - *Pittosporum undulatum*
  - *Callitris rhomboidea*
  - *Elaeocarpus reticulatus*
  - *Notolea venosa*
  - *Exocarpus cupressiformis*
- Ground stratum:
  - *Dianella caerulea*
  - *Doodia aspera*
  - *Ghania melanocarpa*
  - *Goodenia ovata*
  - *Myoprum boninense*
  - *Lepidosperma laterale*
  - *Lomandra longifolia*
  - *Calochlaena dubia*

- *Marsdenia rostrata*

PCT 1141 Scrub She-oak - Swamp Banksia coastal lowland heath, southern South East Corner Bioregion

- Shrubs/ground stratum:
    - *Banksia paludosa*
    - *Banksia marginata*
    - *Allocasuarina paludosa*
    - *Hakea decurrens*
    - *Hakea dactyloides*
    - *Darwinia camptostylis*
    - *Epacris impressa*
    - *Empodisma minus*
    - *Patersonia glabrata*
    - *Opercularia aspera*
    - *Leptospermum laevigatum*
- Within two riparian zones in PCT 1141 (Day 4):
    - *Blechnum wattsii*
    - *Todea barbera*
    - *Histiopteris incisa*
    - *Glechenia miocrophylla*
    - *Kennedia rubicunda*
    - *Opercularia aspera*

PCT 1084 Red Bloodwood - Silvertop Ash - White Stringybark heathy open forest on coastal foothills, southern South East Corner Bioregion

- Top stratum:
    - *Eucalyptus sieberi* (dominant)
    - *Eucalyptus bosistoana*
- Middle stratum:
    - *Allocasuarina littoralis*
    - *Hakea dactyloides*
    - *Kunzea ambigua*
    - *Elaeocarpus reticulatus*
    - *Banksia serrata*
    - *Acacia suaveolens*
    - *Acacia terminalis*
    - *Riconocarpus pinifolius*
    - *Leptospermum attenuatum*
- Ground stratum:

- *Lomandra longifolia*
- *Pteridium esculentum*
- *Correa reflexa*
- *Lepidosperma laterale*

PCT 1157 Silvertop Ash - Rough-barked Apple shrubby open forest on the hinterland hills, far southern South East Corner Bioregion

- Top stratum:
  - *Angophora floribunda* (dominant)
  - *Eucalyptus sieberi*
  - *Eucalyptus longifolia*
- Middle stratum:
  - *Callitris rhomboidea*
  - *Elaeocarpus reticulatus*
  - *Pittosporum undulatum*
  - *Allocasuarina littoralis*
  - *Acacia longifolia*
  - *Melaleuca armillaris*
  - moist soil: *Banksia serrata and Leptospermum trinervium*
- Ground stratum:
  - *Calochlaena dubia*
  - *Pteridium esculentum*
  - *Lomandra longifolia*
  - *Goodenia ovata*
  - *Marsdenia rostrate*
  - *Lepidosperma sp*

PCT 891 Ironbark - Woollybutt - White Stringybark open forest on coastal hills, South East Corner Bioregion

- Top stratum:
  - *Eucalyptus tricarpa* (dominant)
  - *Eucalyptus longifolia* (co-dominant)
- Middle stratum (disturbed site – regrowth):
  - *Melaleuca armillaris*
  - *Acacia mearnsii*
  - *Kunzea ambigua*
  - *Exocarpus cupressiformis*
  - *Pittosporum undulatum*
  - *Banksia integrifolia*
- Ground stratum (cleared site - used for cattle grazing)

- *Carex longibrachiata*
- Introduced grasses
- *Myoporum boninense*
- *Dichondra repens*

Appendix F Fauna Species List

F.1 Bird species observed

Species	Common Name	Sites observed at
Acanthiza pusilla	Brown Thornbill	LC20 & Campgrounds
Alisterus scapularis	Australia King Parrot	LC49, LC50 & Campgrounds
Anthochaera carunculata	Red Wattlebird	LC1, LC3, LC13, LC20, LC26, LC29, LC34, LC49, LC50 & Campgrounds
Ardea intermedia	Intermediate Egret	Near LC49
Ardea novaehollandiae	White-faced Heron	Incidental observations at/near Mowarry and Bittangabee Bay
Cacatua galerita	Sulphur Crested Cockatoo	Campgrounds
Calyptorhynchus funereus	Yellow-tailed Black-cockatoo	LC20, LC26, LC29
Colluricincla harmonica	Grey Shrike-thrush	LC29, LC50 & Campgrounds
Columba leucomela	White-headed Pigeon	LC1
****Columba livia***	Rock Dove	LC1 & LC49 & SW/BB campgrounds
Coracina novaehollandiae	Black-faced Cuckoo Shrike	Incidental observations at Bittangabee Campground and along existing track near Track 8 (between LC13 & LC15)
Cormobates leucophaeus	White-throated Treecreeper	LC29, LC50
Cracticus tibicen	Australian Magpie	LC13, LC49 & Campgrounds
Dacelo novaeguineae	Laughing Kookaburra	LC3 & Campgrounds
Elanus axillaris	Black-shouldered Kite	LC49
Eolophus roseicapillus	Galah	Campgrounds
Eopsaltria australis	Eastern Yellow Robin	Bittngabee Campground, LC50
Falco cenchroides	Nankeen Kestrel	Incidental observation in cleared woodland along Green Cape Rd, and over some heath

Species	Common Name	Sites observed at
Haliaeetus leucogaster	White-bellied Sea-eagle	LC4, LC7, LC26, LC49, LC50 & regularly along coastal cliffs
Hirundo neoxena	Welcome Swallow	LC1, LC4, LC7, LC26, LC29, LC34, LC49 & Campgrounds & regularly along coastal cliffs
Hylacola pyrrhopygius	Chestnut-rumped Heathwren	LC29
Leucosarcia melanoleuca	Wonga Pigeon	Campgrounds
Lichenostomus leucotis	White-eared Honeyater	Campgrounds
Malurus cyaneus	Superb Fairy-wren	LC1, LC3, LC13, LC20, LC29,
Manorina melanocephala	Noisy Miner	Campgrounds
Manorina melanophrys	Bell Miner	Inc (gullies and near campgrounds)
Meliphaga lewinii	Lewin's honeyeater	Near LC50 (along existing trail)
Menura novaehollandiae	Superb Lyrebird	LC50 & Campgrounds
Myiagra rubecula	Leaden Flycatcher	LC29
Ninox strenua	Powerful Owl (Juv?)	Incidental along main track (shortly after entering woodland from Pulpitt rock turnoff)
Pachycephala pectoralis	Golden Whistler	Heard in woodland walking along existing track near Track 9
Petrochelidon ariel	Fairy Martin	LC49 & Incidental observations along existing track near Track 8 (between LC13 & LC15)
Phaps chalcoptera	Common Bronzewing	Campgrounds
Phylidonyris novaehollandiae	New Holland Honeyeater	(near) LC20, LC29
Platycercus elegans	Crimson Rosella	LC15, LC26, LC29, LC49, LC50
Porphyrio porphyrio	Purple Swamphen	LC50, Mowarry Ck, creek near Leatherjacket Bay
Ptilonorhynchus violaceus	Satin Bowerbird	LC7, Bittangabee and Salt Water Ck Campgrounds
Rhipidura albiscapa	Grey Fantail	LC1, LC3, LC13, LC20, LC29, LC34, LC49, LC50 & Campgrounds

Species	Common Name	Sites observed at
Rhipidura rufifrons	Rufous Fantail	LC15, LC29, LC50 & Campgrounds
Strepera graculina	Pied Currawong	Campgrounds
Zosterops lateralis	Silvereye	LC1, LC20, LC49 & Bittangabee campgrounds

F.2 Motion-detecting camera result summary

Species	Common name
Amphibolurus muricatus	Jacky lizard
Cervus timorensis	Rusa deer
Corvus spp.	Raven
Felis catus	Feral cat
Isoodon obesulus	Southern brown bandicoot
Macropus giganteus	Eastern grey kangaroo
Macropus rufogriseus	Red-necked wallaby
Menura novaehollandiae	Superb lyrebird
Oryctolagus cuniculus	Rabbit
Perameles nasuta	Long-nosed bandicoot
Potorous tridactylus	Long-nosed potoroo
Pseudocheirus peregrinus	Common ring-tailed possum
Rattus fuscipes	Bush rat
Rattus rattus	Black rat
Trichosurus vulpecula	Common brush-tail possum
Varanus varius	Lace monitor
Vombatus ursinus	Wombat
Vulpes vulpes	Fox
Wallabia bicolor	Swamp wallaby

Appendix G Motion-detecting camera full results

Site	Camera	Bait	date	easting	northing	Common name	Species	Time	Comment
LC01	scout3	quoll		5889635	762436	tourist	Homo sapien		30 of
LC02	reconyx10	bandi	11/03/2019	5889370	762320	wallaby	*Wallabia bicolor or Macropus rufogriseus*	6.19.25	blurry
LC02	reconyx10	bandi	12/03/2019	5889370	762320	wallaby	*Wallabia bicolor or Macropus rufogriseus*	5.57.54	dark
LC02	reconyx10	bandi	12/03/2019	5889370	762320	wallaby	*Wallabia bicolor or Macropus rufogriseus*	6.45.38	noclear head shot
LC02	reconyx10	bandi	12/03/2019	5889370	762320	wallaby	*Wallabia bicolor or Macropus rufogriseus*	8.05.56	partial
LC02	reconyx10	bandi	12/03/2019	5889370	762320	wallaby	*Wallabia bicolor or Macropus rufogriseus*	14.54.41	partial
LC02	reconyx10	bandi	12/03/2019	5889370	762320	wallaby	*Wallabia bicolor or Macropus rufogriseus*	15.48.47	partial
LC02	reconyx10	bandi	12/03/2019	5889370	762320	wallaby	*Wallabia bicolor or Macropus rufogriseus*	20.17.02	partial dark
LC02	reconyx10	bandi	13/03/2019	5889370	762320	wallaby	*Wallabia bicolor or Macropus rufogriseus*	8.44.48	
LC02	reconyx10	bandi	13/03/2019	5889370	762320	deer	unknown	20.07.07	no visible markings or antlers
LC02	reconyx10	bandi	14/03/2019	5889370	762320	wallaby	*Wallabia bicolor or Macropus rufogriseus*	5.21.54	
LC02	reconyx10	bandi	14/03/2019	5889370	762320	wallaby	*Wallabia bicolor or Macropus rufogriseus*	20.36.44	adult + young

Site	Camera	Bait	date	easting	northing	Common name	Species	Time	Comment
LC02	reconyx10	bandi	15/03/2019	5889370	762320	wallaby	*Wallabia bicolor or Macropus rufogriseus*	19.31.35	
LC02	reconyx10	bandi	16/03/2019	5889370	762320	red-necked wallaby	*Macropus rufogriseus*	16.36.13	
LC02	reconyx10	bandi	16/03/2019	5889370	762320	wallaby	*Wallabia bicolor or Macropus rufogriseus*	17.29.23	
LC02	reconyx10	bandi	17/03/2019	5889370	762320	red-necked wallaby	*Macropus rufogriseus*	18.56.10	
LC02	reconyx10	bandi	20/03/2019	5889370	762320	red-necked wallaby	*Macropus rufogriseus*	10.36.25	
LC02	reconyx10	bandi	20/03/2019	5889370	762320	red-necked wallaby	*Macropus rufogriseus*	19.17.36	
LC02	reconyx10	bandi	21/03/2019	5889370	762320	wallaby	*Wallabia bicolor or Macropus rufogriseus*	4.01.23	
LC02	reconyx10	bandi	21/03/2019	5889370	762320	wallaby	*Wallabia bicolor or Macropus rufogriseus*	19.00.09	
LC03	scout9	bandi	12/03/2019	5876691	767933	red-necked wallaby	*Macropus rufogriseus*	15.04.56	
LC03	scout9	bandi	12/03/2019	5876691	767933	red-necked wallaby	*Macropus rufogriseus*	18.45.30	
LC03	scout9	bandi	12/03/2019	5876691	767933	long-nosed potoroo	*Potorous tridactylus*	22.21.32	
LC03	scout9	bandi	12/03/2019	5876691	767933	long-nosed potoroo	*Potorous tridactylus*	22.41.53	
LC03	scout9	bandi	13/03/2019	5876691	767933	common ring-tailed possum	*Pseudocheirus peregrinus*	5.30.43	

Site	Camera	Bait	date	easting	northing	Common name	Species	Time	Comment
LC03	scout9	bandi	13/03/2019	5876691	767933	red-necked wallaby	*Macropus rufogriseus*	9.55.39	
LC03	scout9	bandi	13/03/2019	5876691	767933	tourists	*Homo sapien*	11.02.40	
LC03	scout9	bandi	13/03/2019	5876691	767933	red-necked wallaby	*Macropus rufogriseus*	19.35.00	
LC03	scout9	bandi	14/03/2019	5876691	767933	red-necked wallaby	*Macropus rufogriseus*	10.47.16	adult + joey
LC03	scout9	bandi	15/03/2019	5876691	767933	red-necked wallaby	*Macropus rufogriseus*	19.37.52	
LC03	scout9	bandi	15/03/2019	5876691	767933	wombat	*Vombatus ursinus*	20.12.12	
LC03	scout9	bandi	18/03/2019	5876691	767933	red-necked wallaby	*Macropus rufogriseus*	15.48.06	
LC03	scout9	bandi	19/03/2019	5876691	767933	red-necked wallaby	*Macropus rufogriseus*	13.01.50	
LC03	scout9	bandi	23/03/2019	5876691	767933	Superb Lyrebird	*Menura novaehollandiae*	10.24.46	
LC03	scout9	bandi	23/03/2019	5876691	767933	Lace monitor	*Varanus varius*	13.38.25	
LC04	recon13	bandi	12/03/2019	5876425	768299	tourists	*Homo sapien*	14.55.09	camera angle moved
LC04	recon13	bandi	20/03/2019	5876425	768299	rabbit	*Oryctolagus cuniculus*	12.36.59	
LC04	recon13	bandi	26/03/2019	5876425	768299	rabbit	*Oryctolagus cuniculus*	12.05.30	
LC05	recon12	bandi	13/03/2019	5876079	768569	bush rat	*Rattus fuscipes*	3.17.12	camera moved & pointed to ground
LC05	recon12	bandi	15/03/2019	5876079	768569	jacky lizard	*Amphibolurus muricatus*	8.59.50	
LC05	recon12	bandi	16/03/2019	5876079	768569	bush rat	*Rattus fuscipes*	2.10.40	

Site	Camera	Bait	date	easting	northing	Common name	Species	Time	Comment
LC05	recon12	bandi	21/03/2019	5876079	768569	bush rat	*Rattus fuscipes*	12.33.18	
LC05	recon12	bandi	21/03/2019	5876079	768569	rabbit/potoroo/ bandicoot	unknown	12.49.47	partial image
LC06	scout11	quoll		5875964	768617				images of setuo & retrieval only
LC07	recon11	quoll	25/03/2019	5875422	768751	wombat	*Vombatus ursinus*	11.00.50	many empty shots due to camera on moving branch
LC08	scout8	bandi	13/03/2019	5874924	768786	red-necked wallaby	*Macropus rufogriseus*	8.52.49	
LC08	scout8	bandi	15/03/2019	5874924	768786	raven	*Corvus spp.*	9.16.17	
LC09	scout2	bandi	13/03/2019	5874819	768815	red-necked wallaby	*Macropus rufogriseus*	8.59.53	
LC09	scout2	bandi	17/03/2019	5874819	768815	red-necked wallaby	*Macropus rufogriseus*	18.32.04	
LC09	scout2	bandi	20/03/2019	5874819	768815	rabbit	*Oryctolagus cuniculus*	21.28.48	
LC10	recon14	bandi	12/03/2019	5874730	768904	bush rat	*Rattus fuscipes*	22.30.36	
LC10	recon14	bandi	14/03/2019	5874730	768904	Long-nosed bandicoot	*Perameles nasuta*	4.42.49	at distance, not at bait
LC10	recon14	bandi	24/03/2019	5874730	768904	Long-nosed bandicoot	*Perameles nasuta*	12.39.10	at bait
LC11	scout7	quoll	13/03/2019	5874351	768896	bush rat	*Rattus fuscipes*	22.28.55	bait up tree
LC12	recon15	bandi	12/03/2019	5874204	769100	Long-nosed bandicoot	*Perameles nasuta*	21.34.45	did not approach bait
LC12	recon15	bandi	12/03/2019	5874204	769100	bush rat	*Rattus fuscipes*	22.23.44	

Site	Camera	Bait	date	easting	northing	Common name	Species	Time	Comment
LC12	recon15	bandi	13/03/2019	5874204	769100	Long-nosed bandicoot	*Perameles nasuta*	14.21.57	
LC12	recon15	bandi	13/03/2019	5874204	769100	common brush-tail possum	*Trichosurus vulpecula*	22.00.44	
LC12	recon15	bandi	13/03/2019	5874204	769100	Black rat	*Rattus rattus*	22.53.13	
LC12	recon15	bandi	13/03/2019	5874204	769100	Black rat	*Rattus rattus*	23.41.55	
LC12	recon15	bandi	14/03/2019	5874204	769100	Black rat	*Rattus rattus*	3.20.53	
LC12	recon15	bandi	15/03/2019	5874204	769100	Black rat	*Rattus rattus*	5.22.05	
LC13	recon9	bandi	13/03/2019	5881913	766970	raven	*Corvus spp.*	12.31.31	
LC13	recon9	bandi	14/03/2019	5881913	766970	bush rat	*Rattus fuscipes*	5.07.15	
LC14	scout12	bandi	20/03/2019	5881397	767233	red-necked wallaby	*Macropus rufogriseus*	11.26.27	adult + joey
LC14	scout12	bandi	20/03/2019	5881397	767233	red-necked wallaby	*Macropus rufogriseus*	11.37.07	
LC14	scout12	bandi	24/03/2019	5881397	767233	red-necked wallaby	*Macropus rufogriseus*	8.30.59	very interested in bait
LC14	scout12	bandi	26/03/2019	5881397	767233	red-necked wallaby	*Macropus rufogriseus*	11.02.58	
LC15	recon5	bandi	13/03/2019	5880891	767214	red-necked wallaby	*Macropus rufogriseus*	17.38.15	camera tilted up; ground not seen
LC16	recon8	bandi	13/03/2019	5886750	763983	red-necked wallaby	*Macropus rufogriseus*	14.37.26	very interested in bait
LC16	recon8	bandi	17/03/2019	5886750	763983	wallaby	*Wallabia bicolor or Macropus rufogriseus*	21.15.50	

Site	Camera	Bait	date	easting	northing	Common name	Species	Time	Comment
LC16	recon8	bandi	26/03/2019	5886750	763983	wallaby	*Wallabia bicolor or Macropus rufogriseus*	0.22.50	
LC16	recon8	bandi	27/03/2019	5886750	763983	red-necked wallaby	*Macropus rufogriseus*	6.43.48	
LC16	recon8	bandi	27/03/2019	5886750	763983	deer	unknown	6.59.38	no markings or antlers
LC17	recon4	quoll	13/03/2019	5886874	764259	red-necked wallaby	*Macropus rufogriseus*	16.44.54	
LC17	recon4	quoll	15/03/2019	5886874	764259	bush rat	*Rattus fuscipes*	0.43.00	short thick tail
LC17	recon4	quoll	16/03/2019	5886874	764259	bush rat	*Rattus fuscipes*	1.53.26	
LC17	recon4	quoll	16/03/2019	5886874	764259	red-necked wallaby	*Macropus rufogriseus*	17.57.37	
LC17	recon4	quoll	17/03/2019	5886874	764259	red-necked wallaby	*Macropus rufogriseus*	15.05.16	
LC17	recon4	quoll	18/03/2019	5886874	764259	bush rat	*Rattus fuscipes*	0.31.00	
LC17	recon4	quoll	20/03/2019	5886874	764259	bush rat	*Rattus fuscipes*	1.09.04	
LC17	recon4	quoll	27/03/2019	5886874	764259	bush rat	*Rattus fuscipes*	2.01.14	
LC18	scout15	bandi	13/03/2019	5886510	764396	red-necked wallaby	*Macropus rufogriseus*	22.16.52	
LC18	scout15	bandi	15/03/2019	5886510	764396	red-necked wallaby	*Macropus rufogriseus*	2.30.24	
LC18	scout15	bandi	15/03/2019	5886510	764396	red-necked wallaby	*Macropus rufogriseus*	5.53.55	
LC18	scout15	bandi	19/03/2019	5886510	764396	red-necked wallaby	*Macropus rufogriseus*	18.42.55	

Site	Camera	Bait	date	easting	northing	Common name	Species	Time	Comment
LC18	scout15	bandi	24/03/2019	5886510	764396	red-necked wallaby	*Macropus rufogriseus*	10.38.09	
LC18	scout15	bandi	25/03/2019	5886510	764396	red-necked wallaby	*Macropus rufogriseus*	18.37.10	
LC19	reconPMNQ11	bandi	16/03/2019	5886587	764416	red-necked wallaby	*Macropus rufogriseus*	4.23.37	
LC19	reconPMNQ11	bandi	17/03/2019	5886587	764416	bush rat	*Rattus fuscipes*	0.47.39	
LC19	reconPMNQ11	bandi	19/03/2019	5886587	764416	Lace monitor	*Varanus varius*	16.24.18	
LC19	reconPMNQ11	bandi	20/03/2019	5886587	764416	Superb Lyrebird	*Menura novaehollandiae*	12.05.37	
LC19	reconPMNQ11	bandi	20/03/2019	5886587	764416	red-necked wallaby	*Macropus rufogriseus*	15.01.43	
LC19	reconPMNQ11	bandi	22/03/2019	5886587	764416	red-necked wallaby	*Macropus rufogriseus*	12.29.50	
LC20	recon3	quoll	13/03/2019	5886363	764509	common brush-tail possum	*Trichosurus vulpecula*	23.53.58	
LC20	recon3	quoll	15/03/2019	5886363	764509	red-necked wallaby	*Macropus rufogriseus*	20.49.30	
LC20	recon3	quoll	17/03/2019	5886363	764509	Superb Lyrebird	*Menura novaehollandiae*	7.15.25	
LC20	recon3	quoll	18/03/2019	5886363	764509	bush rat	*Rattus fuscipes*	5.19.51	
LC20	recon3	quoll	21/03/2019	5886363	764509	Lace monitor	*Varanus varius*	11.22.41	
LC20	recon3	quoll	23/03/2019	5886363	764509	Lace monitor	*Varanus varius*	14.38.02	

Site	Camera	Bait	date	easting	northing	Common name	Species	Time	Comment
LC21	scout393	bandi	18/03/2019	5886345	764757	red-necked wallaby	*Macropus rufogriseus*	17.44.10	
LC21	scout393	bandi	24/03/2019	5886345	764757	red-necked wallaby	*Macropus rufogriseus*	8.21.58	
LC22	scout385/4	bandi		5886245	764828				recorded grass moving & collection only
LC23	recon2	bandi	13/03/2019	5885930	764933	rabbit/potoroo/ bandicoot	unknown	23.14.24	blurry head & tail image
LC23	recon2	bandi	18/03/2019	5885930	764933	red-necked wallaby	*Macropus rufogriseus*	15.49.54	
LC23	recon2	bandi	21/03/2019	5885930	764933	red-necked wallaby	*Macropus rufogriseus*	12.53.12	
LC23	recon2	bandi	25/03/2019	5885930	764933	red-necked wallaby	*Macropus rufogriseus*	17.57.25	
LC24	recon6	bandi	14/03/2019	5885539	765170	red-necked wallaby	*Macropus rufogriseus*	15.56.26	
LC24	recon6	bandi	15/03/2019	5885539	765170	red-necked wallaby	*Macropus rufogriseus*	16.16.05	
LC24	recon6	bandi	17/03/2019	5885539	765170	red-necked wallaby	*Macropus rufogriseus*	18.59.59	picked up bait from ground
LC24	recon6	bandi	23/03/2019	5885539	765170	red-necked wallaby	*Macropus rufogriseus*	7.42.54	adult + joey
LC24	recon6	bandi	23/03/2019	5885539	765170	red-necked wallaby	*Macropus rufogriseus*	16.41.54	
LC24	recon6	bandi	24/03/2019	5885539	765170	red-necked wallaby	*Macropus rufogriseus*	8.54.00	

Site	Camera	Bait	date	easting	northing	Common name	Species	Time	Comment
LC24	recon6	bandi	24/03/2019	5885539	765170	red-necked wallaby	*Macropus rufogriseus*	10.27.12	
LC24	recon6	bandi	26/03/2019	5885539	765170	red-necked wallaby	*Macropus rufogriseus*	13.45.47	
LC25	recon4	quoll	13/03/2019	5885376	765275	red-necked wallaby	*Macropus rufogriseus*	18.23.53	
LC25	recon4	quoll	13/03/2019	5885376	765275	red-necked wallaby	*Macropus rufogriseus*	19.01.29	
LC25	recon4	quoll	14/03/2019	5885376	765275	red-necked wallaby	*Macropus rufogriseus*	11.50.14	
LC25	recon4	quoll	14/03/2019	5885376	765275	red-necked wallaby	*Macropus rufogriseus*	17.29.36	
LC25	recon4	quoll	14/03/2019	5885376	765275	deer / unidentified	unknown	8.59.49	partial image
LC25	recon4	quoll	15/03/2019	5885376	765275	red-necked wallaby	*Macropus rufogriseus*	18.45.40	
LC25	recon4	quoll	26/03/2019	5885376	765275	wombat	*Vombatus ursinus*	4.37.07	
LC25	recon4	quoll	27/03/2019	5885376	765275	red-necked wallaby	*Macropus rufogriseus*	5.32.52	
LC26	recon1	bandi	13/03/2019	5885252	765468	wallaby	*Wallabia bicolor or Macropus rufogriseus*	23.20.52	
LC26	recon1	bandi	13/03/2019	5885252	765468	Black rat	*rattus rattus*	23.27.36	small size, long tail
LC26	recon1	bandi	14/03/2019	5885252	765468	wombat	*Vombatus ursinus*	1.11.08	
LC26	recon1	bandi	14/03/2019	5885252	765468	red-necked wallaby	*Macropus rufogriseus*	18.26.40	

Site	Camera	Bait	date	easting	northing	Common name	Species	Time	Comment
LC26	recon1	bandi	14/03/2019	5885252	765468	bush rat	*Rattus fuscipes*	23.58.37	
LC26	recon1	bandi	15/03/2019	5885252	765468	bush rat	*Rattus fuscipes*	4.26.11	
LC26	recon1	bandi	16/03/2019	5885252	765468	red-necked wallaby	*Macropus rufogriseus*	9.26.15	
LC26	recon1	bandi	16/03/2019	5885252	765468	common brush-tail possum	*Trichosurus vulpecula*	22.23.25	
LC26	recon1	bandi	17/03/2019	5885252	765468	red-necked wallaby	*Macropus rufogriseus*	6.02.58	
LC26	recon1	bandi	17/03/2019	5885252	765468	Superb Lyrebird	*Menura novaehollandiae*	8.23.54	
LC26	recon1	bandi	17/03/2019	5885252	765468	Superb Lyrebird	*Menura novaehollandiae*	9.49.43	
LC26	recon1	bandi	19/03/2019	5885252	765468	Black rat	*Rattus rattus*	4.47.22	
LC26	recon1	bandi	21/03/2019	5885252	765468	red-necked wallaby	*Macropus rufogriseus*	2.04.15	
LC26	recon1	bandi	21/03/2019	5885252	765468	Superb Lyrebird	*Menura novaehollandiae*	9.52.06	
LC26	recon1	bandi	25/03/2019	5885252	765468	common brush-tail possum	*Trichosurus vulpecula*	1.24.49	
LC26	recon1	bandi	26/03/2019	5885252	765468	red-necked wallaby	*Macropus rufogriseus*	18.24.53	
LC27	reconN-08	bandi	14/03/2019	5871816	770419	wallaby	*Wallabia bicolor or Macropus rufogriseus*	21.55.37	

Site	Camera	Bait	date	easting	northing	Common name	Species	Time	Comment
LC27	reconN-08	bandi	22/03/2019	5871816	770419	red-necked wallaby	*Macropus rufogriseus*	11.02.04	
LC27	reconN-08	bandi	25/03/2019	5871816	770419	wallaby	*Wallabia bicolor or Macropus rufogriseus*	19.38.08	
LC27	reconN-08	bandi	26/03/2019	5871816	770419	red-necked wallaby	*Macropus rufogriseus*	11.30.34	
LC28	reconSC2	quoll	14/03/2019	5887998	763508	red-necked wallaby	*Macropus rufogriseus*	19.16.23	
LC29	reconN-05	quoll+bandi	14/03/2019	5888043	763343	wallaby	*Wallabia bicolor or Macropus rufogriseus*	20.39.40	
LC29	reconN-05	quoll+bandi	15/03/2019	5888043	763343	red-necked wallaby	*Macropus rufogriseus*	18.21.10	
LC29	reconN-05	quoll+bandi	15/03/2019	5888043	763343	eastern grey kangaroo	*Macropus giganteus*	19.11.28	
LC29	reconN-05	quoll+bandi	15/03/2019	5888043	763343	eastern grey kangaroo	*Macropus giganteus*	20.04.47	
LC29	reconN-05	quoll+bandi	17/03/2019	5888043	763343	eastern grey kangaroo	*Macropus giganteus*	20.05.34	
LC29	reconN-05	quoll+bandi	17/03/2019	5888043	763343	common brush-tail possum	*Trichosurus vulpecula*	23.45.13	
LC29	reconN-05	quoll+bandi	19/03/2019	5888043	763343	eastern grey kangaroo	*Macropus giganteus*	6.19.56	
LC29	reconN-05	quoll+bandi	21/03/2019	5888043	763343	common brush-tail possum	*Trichosurus vulpecula*	2.50.32	

Site	Camera	Bait	date	easting	northing	Common name	Species	Time	Comment
LC29	reconN-05	quoll+bandi	27/03/2019	5888043	763343	Fox	*Vulpes vulpes*	20.53.05	
LC30	scout9	bandi	4/04/2019	5885099	766872	red-necked wallaby	*Macropus rufogriseus*	2.53.35	
LC30	scout9	bandi	4/04/2019	5885099	766872	red-necked wallaby	*Macropus rufogriseus*	3.02.29	
LC30	scout9	bandi	4/04/2019	5885099	766872	red-necked wallaby	*Macropus rufogriseus*	18.56.23	
LC30	scout9	bandi	5/04/2019	5885099	766872	red-necked wallaby	*Macropus rufogriseus*	9.09.54	
LC30	scout9	bandi	9/04/2019	5885099	766872	red-necked wallaby	*Macropus rufogriseus*	7.29.03	
LC30	scout9	bandi	10/04/2019	5885099	766872	wombat	*Vombatus ursinus*	2.55.12	
LC30	scout9	bandi	11/04/2019	5885099	766872	red-necked wallaby	*Macropus rufogriseus*	20.18.37	
LC31	recon15	quoll	2/04/2019	5885038	766742	wombat	*Vombatus ursinus*	12.38.43	
LC31	recon15	quoll	3/04/2019	5885038	766742	red-necked wallaby	*Macropus rufogriseus*	3.15.16	
LC31	recon15	quoll	4/04/2019	5885038	766742	red-necked wallaby	*Macropus rufogriseus*	10.15.06	
LC31	recon15	quoll	7/04/2019	5885038	766742	Black rat	*Rattus rattus*	1.18.36	
LC31	recon15	quoll	7/04/2019	5885038	766742	Black rat	*Rattus rattus*	10.40.49	
LC31	recon15	quoll	8/04/2019	5885038	766742	Black rat	*Rattus rattus*	12.52.56	
LC31	recon15	quoll	8/04/2019	5885038	766742	Black rat	*Rattus rattus*	2.29.09	

Site	Camera	Bait	date	easting	northing	Common name	Species	Time	Comment
LC32	scout5	quoll	7/04/2019	5884442	766989	red-necked wallaby	*Macropus rufogriseus*	23.19.50	
LC33	recon N-08	bandi	1/04/2019	5884371	767008	Black rat	*Rattus rattus*	23.12.38	
LC33	recon N-08	bandi	3/04/2019	5884371	767008	red-necked wallaby	*Macropus rufogriseus*	18.39.54	
LC33	recon N-08	bandi	9/04/2019	5884371	767008	Black rat	*Rattus rattus*	12.33.33	
LC33	recon N-08	bandi	12/04/2019	5884371	767008	Black rat	*Rattus rattus*	1.25.38	
LC34	recon14	bandi	7/04/2019	5884154	766888	wombat	*Vombatus ursinus*	22.10.36	
LC34	recon14	bandi	13/04/2019	5884154	766888	Black rat	*Rattus rattus*	3.35.02	
LC35	reconSC3	bandi	1/04/2019	5883943	766970	Black rat	*Rattus rattus*	20.56.08	
LC35	reconSC3	bandi	1/04/2019	5883943	766970	Black rat	*Rattus rattus*	22.00.36	
LC35	reconSC3	bandi	2/04/2019	5883943	766970	Black rat	*Rattus rattus*	12.27.51	
LC35	reconSC3	bandi	2/04/2019	5883943	766970	Black rat	*Rattus rattus*	2.46.49	
LC35	reconSC3	bandi	3/04/2019	5883943	766970	Black rat	*Rattus rattus*	1.07.10	
LC35	reconSC3	bandi	3/04/2019	5883943	766970	Black rat	*Rattus rattus*	21.19.38	
LC35	reconSC3	bandi	4/04/2019	5883943	766970	Black rat	*Rattus rattus*	3.24.15	
LC35	reconSC3	bandi	4/04/2019	5883943	766970	Black rat	*Rattus rattus*	20.19.03	
LC35	reconSC3	bandi	5/04/2019	5883943	766970	Black rat	*Rattus rattus*	3.02.11	
LC35	reconSC3	bandi	5/04/2019	5883943	766970	Black rat	*Rattus rattus*	20.38.57	
LC35	reconSC3	bandi	7/04/2019	5883943	766970	Long-nosed bandicoot	*Perameles nasuta*	22.25.37	
LC35	reconSC3	bandi	10/04/2019	5883943	766970	Black rat	*Rattus rattus*	21.20.18	

Site	Camera	Bait	date	easting	northing	Common name	Species	Time	Comment
LC35	reconSC3	bandi	12/04/2019	5883943	766970	Black rat	*Rattus rattus*	1.13.08	
LC35	reconSC3	bandi	14/04/2019	5883943	766970	Black rat	*Rattus rattus*	12.01.54	
LC36	recon10	bandi	1/04/2019	5883714	766957	Black rat	*rattus rattus*	21.03.45	
LC36	recon10	bandi	1/04/2019	5883714	766957	Black rat	*rattus rattus*	23.35.16	
LC36	recon10	bandi	2/04/2019	5883714	766957	Black rat	*rattus rattus*	4.11.21	
LC36	recon10	bandi	5/04/2019	5883714	766957	Black rat	*rattus rattus*	1.17.58	
LC36	recon10	bandi	9/04/2019	5883714	766957	Black rat	*rattus rattus*	5.25.33	
LC36	recon10	bandi	10/04/2019	5883714	766957	Black rat	*rattus rattus*	3.16.52	
LC36	recon10	bandi	13/04/2019	5883714	766957	Black rat	*rattus rattus*	5.40.24	
LC37	recon4	bandi	9/04/2019	5883508	766983	red-necked wallaby	*Macropus rufogriseus*	18.14.49	
LC37	recon4	bandi	10/04/2019	5883508	766983	red-necked wallaby	*Macropus rufogriseus*	17.11.51	
LC37	recon4	bandi	14/04/2019	5883508	766983	unknown macropod		18.19.54	partial image
LC38	recon6	bandi	2/04/2019	5874100	769174	common brush-tail possum	*Trichosurus vulpecula*	10.27.38	
LC38	recon6	bandi	3/04/2019	5874100	769174	bush rat	*Rattus fuscipes*	3.04.10	
LC38	recon6	bandi	3/04/2019	5874100	769174	Rabbit	*Oryctolagus cuniculus*	19.43.12	
LC38	recon6	bandi	5/04/2019	5874100	769174	bush rat	*Rattus fuscipes*	2.10.53	
LC38	recon6	bandi	5/04/2019	5874100	769174	bush rat	*Rattus fuscipes*	5.56.05	
LC38	recon6	bandi	5/04/2019	5874100	769174	bush rat	*Rattus fuscipes*	23.28.28	

Site	Camera	Bait	date	easting	northing	Common name	Species	Time	Comment
LC38	recon6	bandi	8/04/2019	5874100	769174	Lace monitor	*Varanus varius*	12.34.16	
LC38	recon6	bandi	11/04/2019	5874100	769174	Long-nosed bandicoot	*Perameles nasuta*	3.18.50	
LC38	recon6	bandi	11/04/2019	5874100	769174	Rabbit	*Oryctolagus cuniculus*	7.14.44	
LC38	recon6	bandi	13/04/2019	5874100	769174	Rabbit	*Oryctolagus cuniculus*	6.58.32	
LC38	recon6	bandi	13/04/2019	5874100	769174	Long-nosed bandicoot	*Perameles nasuta*	20.32.21	
LC38	recon6	bandi	15/04/2019	5874100	769174	Lace monitor	*Varanus varius*	11.52.23	
LC39	recon11	quoll	5/04/2019	5873782	769231	Rabbit	*Oryctolagus cuniculus*	6.19.15	
LC39	recon11	quoll	5/04/2019	5873782	769231	Rabbit	*Oryctolagus cuniculus*	7.30.36	
LC39	recon11	quoll	6/04/2019	5873782	769231	common brush-tail possum	*Trichosurus vulpecula*	22.32.56	
LC39	recon11	quoll	6/04/2019	5873782	769231	wombat	*Vombatus ursinus*	23.04.37	
LC39	recon11	quoll	8/04/2019	5873782	769231	Rabbit	*Oryctolagus cuniculus*	5.52.19	
LC39	recon11	quoll	8/04/2019	5873782	769231	common brush-tail possum	*Trichosurus vulpecula*	20.11.24	
LC39	recon11	quoll	13/04/2019	5873782	769231	Feral cat	*Felis catus*	22.53.25	
LC40	scout15	bandi	2/04/2019	5873508	769359	Superb Lyrebird	*Menura novaehollandiae*	10.28.08	
LC40	scout15	bandi	3/04/2019	5873508	769359	Lace monitor	*Varanus varius*	11.12.19	
LC40	scout15	bandi	3/04/2019	5873508	769359	long-nosed potoroo	*Potorous tridactylus*	19.35.17	

Site	Camera	Bait	date	easting	northing	Common name	Species	Time	Comment
LC40	scout15	bandi	4/04/2019	5873508	769359	bush rat	*Rattus fuscipes*	1.02.30	
LC40	scout15	bandi	4/04/2019	5873508	769359	long-nosed potoroo	*Potorous tridactylus*	3.25.53	
LC40	scout15	bandi	4/04/2019	5873508	769359	common ring-tailed possum	*Pseudocheirus peregrinus*	21.49.27	
LC40	scout15	bandi	6/04/2019	5873508	769359	bush rat	*Rattus fuscipes*	20.56.23	
LC40	scout15	bandi	7/04/2019	5873508	769359	long-nosed potoroo	*Potorous tridactylus*	0.04.32	
LC40	scout15	bandi	7/04/2019	5873508	769359	bush rat	*Rattus fuscipes*	2.41.58	
LC40	scout15	bandi	7/04/2019	5873508	769359	common brush-tail possum	*Trichosurus vulpecula*	4.32.59	
LC40	scout15	bandi	8/04/2019	5873508	769359	bush rat	*Rattus fuscipes*	1.04.36	
LC40	scout15	bandi	8/04/2019	5873508	769359	long-nosed potoroo	*Potorous tridactylus*	20.27.42	
LC40	scout15	bandi	9/04/2019	5873508	769359	Long-nosed bandicoot	*Perameles nasuta*	0.10.49	
LC40	scout15	bandi	10/04/2019	5873508	769359	red-necked wallaby	*Macropus rufogriseus*	0.40.36	
LC40	scout15	bandi	10/04/2019	5873508	769359	red-necked wallaby	*Macropus rufogriseus*	1.04.40	
LC40	scout15	bandi	10/04/2019	5873508	769359	bush rat	*Rattus fuscipes*	19.37.51	
LC40	scout15	bandi	10/04/2019	5873508	769359	wombat	*Vombatus ursinus*	23.59.26	
LC40	scout15	bandi	11/04/2019	5873508	769359	bush rat	*Rattus fuscipes*	0.51.17	

Site	Camera	Bait	date	easting	northing	Common name	Species	Time	Comment
LC40	scout15	bandi	11/04/2019	5873508	769359	long-nosed potoroo	*Potorous tridactylus*	1.04.46	
LC40	scout15	bandi	11/04/2019	5873508	769359	long-nosed potoroo	*Potorous tridactylus*	5.37.02	
LC40	scout15	bandi	13/04/2019	5873508	769359	bush rat	*Rattus fuscipes*	19.18.30	
LC40	scout15	bandi	14/04/2019	5873508	769359	bush rat	*Rattus fuscipes*	19.30.13	
LC41	recon8	bandi	3/04/2019	5873323	769535	southern brown bandicoot	*Isoodon obesulus*	21.00.37	
LC41	recon8	bandi	4/04/2019	5873323	769535	southern brown bandicoot	*Isoodon obesulus*	19.32.44	
LC41	recon8	bandi	6/04/2019	5873323	769535	southern brown bandicoot	*Isoodon obesulus*	19.53.09	
LC41	recon8	bandi	6/04/2019	5873323	769535	common brush-tail possum	*Trichosurus vulpecula*	21.31.33	
LC41	recon8	bandi	7/04/2019	5873323	769535	Long-nosed bandicoot	*Perameles nasuta*	5.32.06	
LC41	recon8	bandi	7/04/2019	5873323	769535	Superb Lyrebird	*Menura novaehollandiae*	18.37.47	
LC41	recon8	bandi	7/04/2019	5873323	769535	southern brown bandicoot	*Isoodon obesulus*	19.47.29	

Site	Camera	Bait	date	easting	northing	Common name	Species	Time	Comment
LC41	recon8	bandi	8/04/2019	5873323	769535	southern brown bandicoot	*Isoodon obesulus*	4.57.20	
LC41	recon8	bandi	8/04/2019	5873323	769535	red-necked wallaby	*Macropus rufogriseus*	9.14.10	
LC41	recon8	bandi	8/04/2019	5873323	769535	southern brown bandicoot	*Isoodon obesulus*	19.08.58	
LC41	recon8	bandi	8/04/2019	5873323	769535	common ring-tailed possum	*Pseudocheirus peregrinus*	3.50.31	
LC41	recon8	bandi	10/04/2019	5873323	769535	red-necked wallaby	*Macropus rufogriseus*	8.31.33	
LC41	recon8	bandi	10/04/2019	5873323	769535	Superb Lyrebird	*Menura novaehollandiae*	18.24.53	
LC41	recon8	bandi	10/04/2019	5873323	769535	southern brown bandicoot	*Isoodon obesulus*	20.41.58	
LC41	recon8	bandi	11/04/2019	5873323	769535	southern brown bandicoot	*Isoodon obesulus*	19.05.10	
LC41	recon8	bandi	11/04/2019	5873323	769535	long-nosed potoroo	*Potorous tridactylus*	19.31.53	
LC41	recon8	bandi	12/04/2019	5873323	769535	long-nosed potoroo	*Potorous tridactylus*	1.21.06	
LC41	recon8	bandi	13/04/2019	5873323	769535	lace monitor	*Varanus varius*	9.56.27	
LC41	recon8	bandi	13/04/2019	5873323	769535	common ring-tailed possum	*Pseudocheirus peregrinus*	4.30.20	

Site	Camera	Bait	date	easting	northing	Common name	Species	Time	Comment
LC42	scout12	quoll	null	5873078	769718	null	null	null	
LC43	recon PEMUQ11	bandi	7/04/2019	5872962	769763	red-necked wallaby	*Macropus rufogriseus*	2.26.25	
LC43	recon PEMUQ11	bandi	9/04/2019	5872962	769763	rabbit	*Oryctolagus cuniculus*	8.33.56	
LC43	recon PEMUQ11	bandi	10/04/2019	5872962	769763	swamp wallaby	*Wallabia bicolor*	23.51.56	
LC44	recon2	quoll	8/04/2019	5872780	769938	lace monitor	*Varanus varius*	9.37.22	
LC44	recon2	quoll	10/04/2019	5872780	769938	eastern grey kangaroo	*Macropus giganteus*	2.25.13	
LC44	recon2	quoll	11/04/2019	5872780	769938	Rusa deer	*Cervus timorensis*	1.20.48	
LC44	recon2	quoll	11/04/02019	5872780	769938	red-necked wallaby	*Macropus rufogriseus*	20.21.19	
LC44	recon2	quoll	14/04/2019	5872780	769938	lace monitor	*Varanus varius*	10.35.36	
LC45	scout8	bandi	2/01/2009	5872690	769989	red-necked wallaby	*Macropus rufogriseus*	21.38.18	
LC45	scout8	bandi	3/01/2009	5872690	769989	red-necked wallaby	*Macropus rufogriseus*	19.55.06	
LC45	scout8	bandi	3/01/2009	5872690	769989	red-necked wallaby	*Macropus rufogriseus*	21.01.29	
LC45	scout8	bandi	9/01/2009	5872690	769989	red-necked wallaby	*Macropus rufogriseus*	14.39.13	
LC46	reconSC-2	bandi	4/04/2019	5872565	770030	red-necked wallaby	*Macropus rufogriseus*	0.06.56	

Site	Camera	Bait	date	easting	northing	Common name	Species	Time	Comment
LC46	reconSC-2	bandi	9/04/2019	5872565	770030	eastern grey kangaroo	*Macropus giganteus*	7.01.58	
LC46	reconSC-2	bandi	16/04/2019	5872565	770030	eastern grey kangaroo	*Macropus giganteus*	7.00.08	
LC47	recon13	quoll	4/04/2019	5872364	770201	Long-nosed bandicoot	*Perameles nasuta*	1.53.30	
LC47	recon13	quoll	6/04/2019	5872364	770201	rabbit	*Oryctolagus cuniculus*	21.39.42	
LC47	recon13	quoll	8/04/2019	5872364	770201	red-necked wallaby	*Macropus rufogriseus*	8.21.02	
LC47	recon13	quoll	9/04/2019	5872364	770201	red-necked wallaby	*Macropus rufogriseus*	17.09.32	
LC47	recon13	quoll	9/04/2019	5872364	770201	wombat	*Vombatus ursinus*	20.24.07	
LC47	recon13	quoll	15/04/2019	5872364	770201	red-necked wallaby	*Macropus rufogriseus*	9.27.20	
LC48	scout11	bandi	9/04/2019	5872019	770356	red-necked wallaby	*Macropus rufogriseus*	9.05.10	
LC48	scout11	bandi	10/04/2019	5872019	770356	red-necked wallaby	*Macropus rufogriseus*	17.03.29	
LC49	reconN-05	bandi	4/04/2019	5871932	770397	red-necked wallaby	*Macropus rufogriseus*	0.23.42	
LC49	reconN-05	bandi	7/04/2019	5871932	770397	wombat	*Vombatus ursinus*	7.33.34	
LC49	reconN-05	bandi	10/04/2019	5871932	770397	wombat	*Vombatus ursinus*	2.27.42	
LC49	reconN-05	bandi	10/04/2019	5871932	770397	wombat	*Vombatus ursinus*	8.22.11	
LC49	reconN-05	bandi	10/04/2019	5871932	770397	red-necked wallaby	*Macropus rufogriseus*	22.28.50	

Site	Camera	Bait	date	easting	northing	Common name	Species	Time	Comment
LC49	reconN-05	bandi	12/04/2019	5871932	770397	lace monitor	*Varanus varius*	10.22.53	
LC49	reconN-05	bandi	13/04/2019	5871932	770397	wombat	*Vombatus ursinus*	9.23.25	
LC50	recon3	bandi	5/04/2019	5877379	767083	Superb Lyrebird	*Menura novaehollandiae*	10.45.55	
LC51	scout2	bandi	4/04/2019	5877411	767164	Superb Lyrebird	*Menura novaehollandiae*	10.04.32	
LC51	scout2	bandi	5/04/2019	5877411	767164	Superb Lyrebird	*Menura novaehollandiae*	9.37.17	
LC51	scout2	bandi	5/04/2019	5877411	767164	Superb Lyrebird	*Menura novaehollandiae*	15.18.11	
LC51	scout2	bandi	7/04/2019	5877411	767164	Lace monitor	*Varanus varius*	12.42.30	
LC51	scout2	bandi	8/04/2019	5877411	767164	Superb Lyrebird	*Menura novaehollandiae*	16.29.38	
LC51	scout2	bandi	10/04/2019	5877411	767164	common ring-tailed possum	*Pseudocheirus peregrinus*	2.33.30	
LC51	scout2	bandi	11/04/2019	5877411	767164	Superb Lyrebird	*Menura novaehollandiae*	15.11.05	
LC52	recon9	quoll	2/04/2019	5877457	767261	wombat	*Vombatus ursinus*	22.12.47	
LC52	recon9	quoll	3/04/2019	5877457	767261	Superb Lyrebird	*Menura novaehollandiae*	12.22.59	
LC52	recon9	quoll	3/04/2019	5877457	767261	wombat	*Vombatus ursinus*	19.26.24	
LC52	recon9	quoll	5/04/2019	5877457	767261	red-necked wallaby	*Macropus rufogriseus*	9.51.03	
LC52	recon9	quoll	6/04/2019	5877457	767261	red-necked wallaby	*Macropus rufogriseus*	9.31.42	

Site	Camera	Bait	date	easting	northing	Common name	Species	Time	Comment
LC52	recon9	quoll	6/04/2019	5877457	767261	wombat	*Vombatus ursinus*	19.27.20	
LC52	recon9	quoll	7/04/2019	5877457	767261	Feral cat	*Felis catus*	4.02.34	
LC52	recon9	quoll	9/04/2019	5877457	767261	unknown macropod		8.40.04	rear image
LC52	recon9	quoll	9/04/2019	5877457	767261	common brush-tail possum	*Trichosurus vulpecula*	23.35.03	
LC52	recon9	quoll	9/04/2019	5877457	767261	wombat	*Vombatus ursinus*	5.55.16	
LC52	recon9	quoll	10/04/2019	5877457	767261	red-necked wallaby	*Macropus rufogriseus*	5.59.13	
LC52	recon9	quoll	11/04/2019	5877457	767261	unknown macropod		1.01.34	partial blurry image
LC52	recon9	quoll	14/04/2019	5877457	767261	red-necked wallaby	*Macropus rufogriseus*	8.05.14	
LC52	recon9	quoll	15/04/2019	5877457	767261	Unknown rat	*Rattus spp*	0.30.00	eyeshine only
LC52	recon9	quoll	15/04/2019	5877457	767261	Superb Lyrebird	*Menura novaehollandiae*	14.15.49	
LC53	recon1	quoll	3/04/2019	5877147	767560	long-nosed potoroo	*Potorous tridactylus*	4.23.59	
LC53	recon1	quoll	5/04/2019	5877147	767560	common brush-tail possum	*Trichosurus vulpecula*	1.35.24	
LC53	recon1	quoll	5/04/2019	5877147	767560	eastern grey kangaroo	*Macropus giganteus*	12.26.02	
LC53	recon1	quoll	6/04/2019	5877147	767560	eastern grey kangaroo	*Macropus giganteus*	21.15.23	

Site	Camera	Bait	date	easting	northing	Common name	Species	Time	Comment
LC53	recon1	quoll	8/04/2019	5877147	767560	unknown macropod		4.09.25	partial blurry image
LC53	recon1	quoll	9/04/2019	5877147	767560	Long-nosed bandicoot	*Perameles nasuta*	22.31.59	
LC53	recon1	quoll	13/04/2019	5877147	767560	eastern grey kangaroo	*Macropus giganteus*	0.53.56	
LC54	scout3	bandi	2/04/2019	5877150	767558	common brush-tail possum	*Trichosurus vulpecula*	22.29.05	
LC54	scout3	bandi	2/04/2019	5877150	767558	common brush-tail possum	*Trichosurus vulpecula*	22.46.58	
LC54	scout3	bandi	2/04/2019	5877150	767558	common brush-tail possum	*Trichosurus vulpecula*	23.36.28	
LC54	scout3	bandi	3/04/2019	5877150	767558	common brush-tail possum	*Trichosurus vulpecula*	1.16.33	
LC54	scout3	bandi	4/04/2019	5877150	767558	common brush-tail possum	*Trichosurus vulpecula*	23.49.24	
LC54	scout3	bandi	8/04/2019	5877150	767558	eastern grey kangaroo	*Macropus giganteus*	10.07.24	
LC54	scout3	bandi	10/04/2019	5877150	767558	eastern grey kangaroo	*Macropus giganteus*	22.38.33	
LC54	scout3	bandi	16/04/2019	5877150	767558	wombat	*Vombatus ursinus*	3.23.34	

Site	Camera	Bait	date	easting	northing	Common name	Species	Time	Comment
LC55	recon5	bandi	2/04/2019	5877190	767717	Long-nosed bandicoot	*Perameles nasuta*	19.13.56	
LC55	recon5	bandi	2/04/2019	5877190	767717	Long-nosed bandicoot	*Perameles nasuta*	22.53.16	
LC55	recon5	bandi	3/04/2019	5877190	767717	Black Rat	*Rattus rattus*	3.46.13	
LC55	recon5	bandi	3/04/2019	5877190	767717	Long-nosed bandicoot	*Perameles nasuta*	19.19.07	
LC55	recon5	bandi	3/04/2019	5877190	767717	Black Rat	*Rattus rattus*	21.37.24	
LC55	recon5	bandi	5/04/2019	5877190	767717	long-nosed potoroo	*Potorous tridactylus*	6.41.51	
LC55	recon5	bandi	5/04/2019	5877190	767717	long-nosed potoroo	*Potorous tridactylus*	19.08.57	
LC55	recon5	bandi	6/04/2019	5877190	767717	red-necked wallaby	*Macropus rufogriseus*	20.40.24	
LC55	recon5	bandi	7/04/2019	5877190	767717	bush rat	*Rattus fuscipes*	0.08.51	
LC55	recon5	bandi	7/04/2019	5877190	767717	common brush-tail possum	*Trichosurus vulpecula*	23.11.41	
LC55	recon5	bandi	7/04/2019	5877190	767717	common brush-tail possum	*Trichosurus vulpecula*	23.32.53	
LC55	recon5	bandi	8/04/2019	5877190	767717	Long-nosed bandicoot	*Perameles nasuta*	19.02.42	
LC55	recon5	bandi	9/04/2019	5877190	767717	long-nosed potoroo	*Potorous tridactylus*	23.51.28	

Site	Camera	Bait	date	easting	northing	Common name	Species	Time	Comment
LC55	recon5	bandi	10/04/2019	5877190	767717	long-nosed potoroo	*Potorous tridactylus*	1.57.20	
LC55	recon5	bandi	12/04/2019	5877190	767717	common brush-tail possum	*Trichosurus vulpecula*	1.50.05	
LC55	recon5	bandi	13/04/2019	5877190	767717	red-necked wallaby	*Macropus rufogriseus*	20.41.36	
LC55	recon5	bandi	16/04/2019	5877190	767717	rabbit	*Oryctolagus cuniculus*	3.53.26	
LC56	recon7	bandi	3/04/2019	5877280	767807	Long-nosed bandicoot	*Perameles nasuta*	0.42.20	
LC56	recon7	bandi	4/04/2019	5877280	767807	Feral cat	*Felis catus*	1.10.10	
LC56	recon7	bandi	6/04/2019	5877280	767807	red-necked wallaby	*Macropus rufogriseus*	18.46.23	
LC56	recon7	bandi	8/04/2019	5877280	767807	long-nosed potoroo	*Potorous tridactylus*	6.58.58	
LC56	recon7	bandi	10/04/2019	5877280	767807	long-nosed potoroo	*Potorous tridactylus*	1.32.12	
LC56	recon7	bandi	10/04/2019	5877280	767807	long-nosed potoroo	*Potorous tridactylus*	6.28.00	
LC56	recon7	bandi	10/04/2019	5877280	767807	red-necked wallaby	*Macropus rufogriseus*	17.49.30	
LC56	recon7	bandi	12/04/2019	5877280	767807	long-nosed potoroo	*Potorous tridactylus*	4.07.25	
LC57	scout4	quoll	4/04/2019	5877375	767850	long-nosed potoroo	*Potorous tridactylus*	6.02.47	
LC58	recon12	bandi	3/04/2019	5877375	767977	bush rat	*Rattus fuscipes*	6.05.52	

Site	Camera	Bait	date	easting	northing	Common name	Species	Time	Comment
LC58	recon12	bandi	3/04/2019	5877375	767977	long-nosed potoroo	*Potorous tridactylus*	21.07.11	
LC58	recon12	bandi	5/04/2019	5877375	767977	Long-nosed bandicoot	*Perameles nasuta*	3.57.48	
LC58	recon12	bandi	5/04/2019	5877375	767977	long-nosed potoroo	*Potorous tridactylus*	22.51.05	
LC58	recon12	bandi	6/04/2019	5877375	767977	red-necked wallaby	*Macropus rufogriseus*	5.39.08	
LC58	recon12	bandi	7/04/2019	5877375	767977	wombat	*Vombatus ursinus*	5.04.24	
LC58	recon12	bandi	9/04/2019	5877375	767977	long-nosed potoroo	*Potorous tridactylus*	5.50.18	
LC58	recon12	bandi	12/04/2019	5877375	767977	Long-nosed bandicoot	*Perameles nasuta*	4.12.49	
LC58	recon12	bandi	14/04/2019	5877375	767977	red-necked wallaby	*Macropus rufogriseus*	17.57.12	
LC59	scout7	bandi	3/04/2019	5877357	768058	long-nosed potoroo	*Potorous tridactylus*	6.37.37	
LC59	scout7	bandi	7/04/2019	5877357	768058	Black Rat	*Rattus rattus*	2.42.20	
LC59	scout7	bandi	10/04/2019	5877357	768058	red-necked wallaby	*Macropus rufogriseus*	7.07.56	
LC59	scout7	bandi	16/04/2019	5877357	768058	Long-nosed bandicoot	*Perameles nasuta*	6.46.28	