

**ECOLOGICAL ASSESSMENT OF THE QUOIN, KILLIECRANKIE,
FLINDERS ISLAND, TASMANIA**



**Environmental Consulting Options Tasmania (ECOtas) for
the Quoin Trust
8 June 2015**

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COVER ILLUSTRATIONS

View north across the dune scrub along Killiecrankie Beach with Mount Killiecrankie and "K2" in the background.

Please note: the blank pages in this document are deliberate to facilitate double-sided printing.

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SUMMARY

General

Quoin Trust (Jo & Tom Youl) engaged Environmental Consulting Options Tasmania (ECOtas) to undertake an assessment of the ecological values of private property and Crown land proposed for development as an accommodation facility at Killiecrankie, Flinders Island, Tasmania, to inform project planning in the context of the ecological values of the site.

The assessment was undertaken on 19, 20 & 21 March 2015 by Mark Wapstra.

Summary of key findings

Threatened flora

- No plant species listed as threatened on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* were detected, or are known from database records, from the assessment area. The assessment area does not support significant potential habitat of EPBCA-listed species such that further surveys are not warranted.
- Seven plant species listed as threatened, all as "rare" (Schedule 5), on the Tasmanian *Threatened Species Protection Act 1995* were detected from the assessment area, as follows:
 - *Acacia uncifolia* ("coast wirilda");
 - *Cynoglossum australe* ("coast houndstongue");
 - *Gyrostemon thesioides* ("broom wheelfruit");
 - *Leucopogon affinis* ("lanceleaf beardheath");
 - *Ranunculus sessiliflorus* var. *sessiliflorus* ("rockplate buttercup");
 - *Stuckenia pectinata* ("fennel pondweed"); and
 - *Zygophyllum billardierei* ("coast twinleaf").
- Of these species, only sites supporting *Cynoglossum australe*, *Acacia uncifolia* and *Zygophyllum billardierei* may be affected by the proposed works, with all other species located at sites away from areas likely to be disturbed.
- No special management is recommended for *Cynoglossum australe*, which has been recommended for removals from the Act (this may need to be checked closer to the time of a formal permit application).
- Where practical, avoiding mature plants of *Acacia uncifolia* is recommended but where this is not feasible, the local population that will remain unaffected is suggested as adequate to allow removal of a small number of individuals from other sites while still retaining the viability of the local population.
- It is likely to be impractical to avoid disturbance to *Zygophyllum billardierei* but this disturbance-loving species will not require special management prescriptions to maintain its local viability (likely to be benefited by any disturbance).
- Four additional species listed as threatened (all also rare except *Isopogon ceratophyllus*, which is listed as vulnerable) on the Tasmanian *Threatened Species Protection Act 1995* are

known from database records from the vicinity of the assessment area (i.e. within a distance to be considered as part of the assessment area), as follows:

- *Isopogon ceratophyllus* (“horny conebush”);
- *Phyllangium distylis* (“tiny mitrewort”);
- *Phylloglossum drummondii* (“pygmy clubmoss”); and
- *Stylidium beaugleholei* (“fan triggerplant”).

Threatened fauna

- Two fauna species listed as threatened on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* were detected from the fringe of the assessment area (Killiecrankie Beach) or are known from a database record from the same area; as follows:
 - *Thinornis cucullatus* (“hooded plover”); and
 - *Vombatus ursinus* subsp. *ursinus* (“Flinders Island wombat”).
- Marginal potential habitat is present for an additional two species listed on this Act, as follows:
 - *Lathamus discolor* (“swift parrot”); and
 - *Litoria raniformis* (“green and golden frog”).
- No fauna species listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* were detected from the assessment area. The assessment area is within the predicted/known range of several species, and supports potential habitat of these species, as follows:
 - *Lathamus discolor* (“swift parrot”); and
 - *Litoria raniformis* (“green and golden frog”).
- Recommendations are provided in relation to the management of potential habitat of the swift parrot (minimise loss of *Eucalyptus globulus*).
- The Flinders Island wombat is unlikely to be deleteriously affected by the proposal – some discussion on the management of this species is provided.
- Some suggestions on the management of the minimising increased disturbance to the hooded plover along Killiecrankie Beach are provided for consideration.
- No special management actions are recommended in relation to the green and golden frog (unlikely to be present based on distribution).

Vegetation types

- The assessment area supports ten TASVEG mapping units:
 - *Eucalyptus viminalis* – *Eucalyptus globulus* coastal forest and woodland (DVC);
 - *Eucalyptus nitida* Furneaux forest (DNF);
 - *Allocasuarina verticillata* forest (NAV);
 - *Melaleuca ericifolia* swamp forest (NME);
 - coastal heathland (SCH);
 - coastal scrub on alkaline sands (SCA);
 - *Melaleuca squarrosa* scrub (SMR);
 - coastal grass and herbfield (GHC);

- agricultural land (FAG); and
- weed infestation (FWU).
- DVC and NME are classified as threatened under Schedule 3A of the Tasmanian *Nature Conservation Act 2002*. DVC is unlikely to be affected by the project (may occur close to one of the villa sites). NME will be affected by an access route and its extent will need to be further mapped.
- SCA will be the main vegetation type affected by the project. There are no legislative or policy constraints on clearing and/or modification of this vegetation community.

Weeds

- One species classified as a “declared weed” within the meaning of the Tasmanian *Weed Management Act 1999* was detected from within the assessment area: *Lycium ferocissimum* (african boxthorn) was localised to a dense clump on the southern side of the sandy track to the beach.
- One additional “environmental weed: was detected: *Euphorbia paralias* (sea spurge) is locally frequent along Killiecrankie Beach
- Recommendations are provided in relation to management of weeds, primarily to maximise the chance of the site remaining free from declared weed species.

Plant disease

- No evidence of plant disease (*Phytophthora cinnamomi*, rootrot fungus; myrtle wilt; myrtle rust) was detected.
- Some management recommendations are made to minimise the risk of introducing plant pathogens, especially rootrot fungus (mainly machinery hygiene protocols).

Animal disease (chytrid)

- The assessment area is not known to support the frog chytrid pathogen.
- Some management recommendations are made to minimise the risk of introducing the pathogen.

Recommendations

The recommendations provided below are a summary of those provided in relation to each of the ecological features described in the main report. The main text of the report, and supported appendices, provide the relevant context for the recommendations.

Vegetation types

The building clusters are all located in vegetation types not classified as threatened/priority vegetation communities at a Commonwealth, State or local government level. There are no constraints to clearing (construction) and modification (fire management zones) in these vegetation types. One of the villa clusters (shown as site 2 on the Master Plan) is close to forest/woodland dominated by *Eucalyptus globulus*. My understanding is that there is no intent to disturb such forest (which would be classified as “*Eucalyptus viminalis-Eucalyptus globulus* coastal forest and woodland” (DVC), a threatened vegetation type) and that the building site is probably within tall dune scrub (non-threatened) – this may need to be confirmed by additional site assessment (because the site was not subject to an element-level site survey).

The broader assessment area supports a range of other vegetation types, including some classified as threatened under Schedule 3A of the Tasmanian *Nature Conservation Act 2002*. Only the access routes are likely to pass through threatened vegetation in the area of the basin/amphitheatre ("Melaleuca ericifolia swamp forest", NME) but the mosaic of vegetation types present means that the surveyed route of the access would need to be walked and the vegetation transitions mapped to determine the extent of each vegetation type requiring clearing.

Threatened flora

A permit under the Tasmanian *Threatened Species Protection Act 1995* will be required for disturbance to some species of threatened flora through application to the Policy Conservation & Advice Branch (PCAB, DPIPWE).

As a set of general guidelines, the following actions are recommended for species identified (or previously known from database records) from the broader project area:

- *Acacia uncifolia* ("coast wirilda"): avoid, where practical, individuals of this species, especially those greater than 3 m in height;
- *Cynoglossum australe* ("coast houndstongue"): no special management actions required;
- *Gyrostemon thesioides* ("broom wheelfruit"): avoid identified sites, where practical;
- *Leucopogon affinis* ("lanceleaf beardheath"): avoid identified sites, where practical;
- *Ranunculus sessiliflorus* var. *sessiliflorus* ("rockplate buttercup"): avoid identified site (granite outcrop close to granite cliffs), where practical;
- *Stuckenia pectinata* ("fennel pondweed"): avoid identified site (small dam in dunes), where practical;
- *Zygophyllum billardierei* ("coast twinleaf"): no special management actions required;
- *Isopogon ceratophyllus* ("horny conebrush"): known site outside project area, only conduct targeted search if potential habitat will be affected (not considered likely at this stage);
- *Phyllangium distylis* ("tiny mitrewort"): known site will not be affected, only conduct timed targeted search if potential habitat will be affected (not considered likely at this stage);
- *Phylloglossum drummondii* ("pygmy clubmoss"): known site will not be affected, no special management required; and
- *Styliidium beagleholei* ("fan triggerplant"): as above for *Phyllangium distylis*.

Threatened fauna – swift parrot (Lathamus discolor)

While the assessment area may be of relatively low importance (from a Statewide perspective) as potential foraging habitat for the swift parrot (highly unlikely to be used for breeding given its geographic position and stature of trees), minimising loss of such habitat should be a key management objective. This can be achieved by:

- minimising the felling of *Eucalyptus globulus*.

Where removal of blue gums is unavoidable, a mitigation strategy is recommended to offset the loss of individuals (with the intent of achieving a long-term net gain of individuals of blue gum and hence potential foraging habitat), as follows:

- keep a record of the number of *Eucalyptus globulus* felled;
- for every individual of *Eucalyptus globulus* felled, re-plant five (5) times as many elsewhere within the general vicinity of the assessment area;

- locally sourced seed (to maintain genetic characteristics) should be used;
- the precise position of the plantings is not critical – some example sites include: (1) ornamental plantings around new buildings or existing farm buildings; (2) a possible grove/line of plantings along the access road to the main facility (even from as far back as the gate on Palana Road) and internal access tracks; and/or (3) supplementary plantings in and around existing stands of eucalypt forest (or other forest types) on the property;
- seedlings will need to be protected from browsing until well-established (i.e. greater than the height of the average wallaby);
- maintain a record of the sites where plantings occur and their success;
- if survival rates drop below a set threshold, supplement plant further individuals (possibly selecting sites where a greater success rate has been achieved) – the 5:1 offset ratio is suggested because of the possible loss of individuals so setting the threshold at 3:1 will still result in a net gain outcome.

Management of individuals of *Eucalyptus globulus*

Maintaining the genetic representation of *Eucalyptus globulus* within and adjacent to the assessment area is considered important from a biogeographic perspective. This can be achieved by:

- minimising the felling of *Eucalyptus globulus* (the loss of a small number of individuals and/or the lopping of some limbs is considered acceptable).

Weeds and disease

It is recommended that a weed and hygiene management plan be developed as part of any project proposal for the site. This plan should include, as a minimum:

- machinery and vehicle hygiene protocols in accordance with Rudman et al. (2004), Rudman (2005) and Allan & Gartenstein (2010);
- provisions for the removal of *Lycium ferocissimum* (african boxthorn), which is highly localised and practically removed with on-site farm vehicles and machinery;
- provisions to monitor and control *Euphorbia paralias* (sea spurge) within and adjacent to the project area, with the long-term objective being the maintenance of the project area as weed-free;
- consideration of a broader multi-party resource-managed program of control of *Euphorbia paralias* (sea spurge) from along Killiecrankie Beach and adjacent dunes within the Crown reserve;
- provisions for attending to other weeds that may establish post-works (e.g. a 5-year weed monitoring and control plan); and
- an indication of plant species that should not be utilised in ornamental plantings (i.e. those that have the potential to become weedy).

Follow-up surveys

The present report is based on initial ecological surveys that aimed to cover the broad project area, and where known, specific project elements. Since the time of the survey, the position of some project elements has been altered markedly such that some sites have not been subject to an element-level ecological survey. This is not considered a “fatal flaw” to continued planning because based on the broader level assessment, these sites are considered highly unlikely to support values not considered elsewhere.

However, to inform a formal threatened flora permit application, some more detailed element-level site surveys are considered warranted to better estimate the extent of disturbance to populations of threatened flora. Note that my initial advice is that the populations of threatened flora so far identified should not constrain the project at the level of planning, rather at the micro-site level (e.g. literally shifting a proposed access by matters of metres to avoid, for example, a patch of mature *Acacia uncifolia*), because most species will either be entirely avoided or are locally abundant and will not be deleteriously affected.

To inform the development of any offset/mitigation strategy in relation to threatened vegetation types, it is recommended that the sites of project elements, especially the access routes (which were not known at the time of initial survey), be surveyed to map vegetation transitions and the extent of each vegetation type to be affected. For most elements, only non-threatened vegetation will be affected so this comment is mainly in relation to the access through the basin/amphitheatre and in areas that may support eucalypt forest/woodland.

In my opinion, the recommendation for follow-up surveys should not restrict further project planning because these could be conditioned on any planning permit. Ideally, such surveys would be undertaken in spring (e.g. late October to early December) to maximise the opportunity of detecting ephemeral herbs and spring/summer-flowering grasses. Based on the initial surveys, I do not believe that ecological values will be identified that will significantly constrain the project and that element-level surveys are best undertaken when the final design is effectively approved, as this will avoid multiple iterations and maximise the opportunity for site-level management of any key values.

Legislation and policy

No formal referral to the relevant Commonwealth government agency under the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* is considered warranted.

A permit under the Tasmanian *Threatened Species Protection Act 1995* will be required for disturbance to some species of threatened flora through application to the Policy Conservation & Advice Branch (PCAB, DPIPWE).

A permit under the Tasmanian *Wildlife (General) Regulations 2010* may be required if products (e.g. nests, burrows) of specially protected wildlife can be demonstrated to be physically disturbed (not identified at this stage of assessment and planning).

PURPOSE, SCOPE, LIMITATIONS AND QUALIFICATIONS OF THE SURVEY

Purpose

Quoin Trust (Jo & Tom Youl) engaged Environmental Consulting Options Tasmania (ECOtas) to undertake an assessment of the ecological values of private property and Crown land proposed for development as an accommodation facility at Killiecrankie, Flinders Island, Tasmania, to inform project planning in the context of the ecological values of the site.

Scope

This report relates to:

- flora and fauna species of conservation significance, including a discussion of listed threatened species (under the Tasmanian *Threatened Species Protection Act 1995* and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*) potentially present, and other species of conservation significance/interest;
- vegetation types (forest and non-forest, native and exotic) present, including a discussion of the distribution, condition, extent, composition and conservation significance of each community;
- plant and animal disease management issues;
- weed management issues; and
- a discussion of some of the policy and legislative implications of the identified ecological values.

This report follows, in a general sense, the government-produced *Guidelines for Natural Values Assessments* (DPIPWE 2009) in anticipation that the report (or extracts of it) will be used as part of various approval processes that will be required for works at the site.

The assessment also complies, in a general sense, with the Tasmanian EPA's *Environmental Effects Report* requirements. The report format will also be applicable to other assessment protocols as required the Commonwealth Department of the Environment (for any referral/approval that may be required under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*), should such referral be warranted. The combination of these assessment standards means that ecological matters usually considered under the local planning scheme are also addressed.

Limitations

Many plant species have ephemeral or seasonal growth or flowering habits, or patchy distributions (at varying scales), and it is possible that some species were not recorded for this reason. However, every effort was made to sample the range of habitats present in the survey area to maximise the opportunity of recording the majority of species present (particular those of conservation significance). Late spring and into summer is usually regarded as the most suitable period to undertake the majority of botanical assessments. While some species have more restricted flowering periods, a discussion of the potential for the site to support these is presented.

Limited parts of the proposed assessment area support habitat types potentially associated with threatened flora with ephemeral growth habits, and recommendations are made in relation to these

sites/species. In addition, some grass species could not be identified with certainty (due to absence of fertile material because of the time of year and the high level of browsing) and this is also considered in the report.

The survey was also limited to vascular species: species of mosses, lichens and liverworts were not recorded. However, a consideration is made of species (vascular and non-vascular) likely to be present (based on habitat information and database records) and reasons presented for their apparent absence.

Surveys for threatened fauna were practically limited to an examination of “potential habitat” (i.e. comparison of on-site habitat features to habitat descriptions for threatened fauna), and detection of tracks, scats and other signs.

The large survey area and the extremely thick windswept dune scrub in many places made traversing the assessment area difficult. The assessment is by its very nature not a metre by metre survey; rather it aims to determine the habitats and sites with the greatest likelihood of supporting key ecological values (such as threatened flora and vegetation types) that may require a higher level of assessment/consideration. That said, my initial reconnaissance has been quite comprehensive and I am confident the following report appropriately identifies key sites and/or locations where further investigation is warranted.

Qualifications

Except where otherwise stated, the opinions and interpretations of legislation and policy expressed in this report are made by the author and do not necessarily reflect those of the relevant agency. The client should confirm management prescriptions with the relevant agency before acting on the content of this report.

Permit

Any plant material was collected under DPIPWE permit TFL 13066 (in the name of Mark Wapstra). **Relevant data will be entered into DPIPWE’s *Natural Values Atlas*** database by the author. Some plant material will be lodged at the Tasmanian Herbarium by the author.

No vertebrate or invertebrate material was collected.

PROPOSAL

The proposal is outlined in the Quoin Concept Design (Figure 1), which is indicative only, subject to variation based on various field assessments and consultations. However, it provides an excellent overview of the proposed project, which includes a wellness centre and a number of villas (in clusters), with associated access vehicle tracks, walking paths, parking areas and storage areas.

For the purposes of the initial ecological assessment, it was assumed that there could be changes to the position of various project elements so the broad assessment area was assessed, with some specific sites examined in more detail (e.g. location of building clusters – some identified in person on the ground by the project proponent).

The intent was to cover as much ground as possible in the broader assessment area **to “get a handle” on the critical ecological values that may constrain particular project elements and those that may require further targeted assessments as part of project design and implementation.** Obviously with such a large assessment area, covering every square metre is a practical

impossibility and therefore this report should be considered preliminary and should be used to inform project design (except where specific comments are made in regard to particular project elements).



Figure 1. Draft master plan

ASSESSMENT AREA

The assessment area (Figures 1-3) comprises private property and Crown land situated between Killiecrankie Creek and Mount Killiecrankie, in the dunes and slopes behind Killiecrankie Beach and the rocky coastline between the north end of the beach and the base of the Mount Killiecrankie range system. The approximate centre of the assessment area is 572850mE 5590975mN (GDA94, Palana 5659 & Tanner 5658 1:25,000 series Tasmaps).

The majority of the assessment area supports native vegetation in moderate to excellent ecological condition, with only minor weed infestations (essentially restricted to the Crown coastal reserve where *Euphorbia paralias* (sea spurge) is prevalent). Vegetation varies from grassy to shrubby windswept dune scrubs to low eucalypt forests and swamp forests. Fire has been excluded for a very long period. The broader property of the Quoin is used for primary production and is a mosaic of pasture and forest/scrub remnants.

There are no defined drainage features within the assessment area. Killiecrankie Creek forms the southern boundary of the assessment area: this is a wide and deep creek with heavily vegetated riparian banks that outfalls across the southern end of Killiecrankie Beach (blocked by sand at time of assessment). Diamond Gully is a steep erosion-prone gully that runs almost direct south of the western face of Mount Killiecrankie, and this extends as a deep and wide flood-prone (but dry at the time of assessment) gully that runs west towards the coast: this feature is a well-known site **for the famed "Killiecrankie diamond"**. There is a small dam nestled amongst the hinter-dunes in the central southern part of the assessment area (assumed to have been once constructed but now appearing very natural).

Quoin Road (so-named on some maps) runs from Palana Road to the north end of Killiecrankie Beach but is in fact a private "track" through pasture and dense dune scrub. This road extends to just beyond a residence on a separate private title. The track is shown as extending around the coast but is in fact a relatively minor walking track that is used to access Stackys Bight and beyond. Note that the access to the Mount Killiecrankie walk usually involves people crossing the Quoin private property, either from Palana Road or Killiecrankie Beach and then accessing the start of the walking track via Quoin Road and some private property tracks up the ridgeline (on private property).

Elevation of the assessment area varies from 0 m a.s.l. (coastline) to about 50 m a.s.l. (approximate location of wellness centre). Topography is gentle to steeply undulating dunes south of Quoin Road, forming a series of east-west rises and swales and steep frontages on to Killiecrankie Beach. North of Quoin Road, the dunes are more stabilised and undulating with less defined ridges and swales. There is a gentle to moderate rise to the granite-based slopes below Mount Killiecrankie in a broad basin **surrounded by the granite "amphitheatre" formed by the sheer granite cliffs of the west face of Mount Killiecrankie and the massive granite exposures of the lower slopes of "K2"**.

Geology (which is discussed briefly here as it can affect classification of vegetation, and potential for threatened flora, and to a lesser extent threatened fauna) is mapped as (see also Figure 4):

- Devonian-age "dominantly alkali-feldspar granite (S-type)" (geocode: Dgafs): Mount Killiecrankie and associated range down to coastline;
- Quaternary-age "limestone" (geocode: Qpl): extensive areas of the Quoin property including the majority of the dune hinterlands; and
- Quaternary-age "sand gravel and mud of alluvial, lacustrine and littoral origin" (geocode: Qh): majority of southern section of dunes including Killiecrankie Creek area.

Land tenure and other categorisations of the assessment area are as follows:

- private titles (see Figure 5 – note that for the purposes of the ecological assessment and reporting the confirmed title boundaries was not critical):

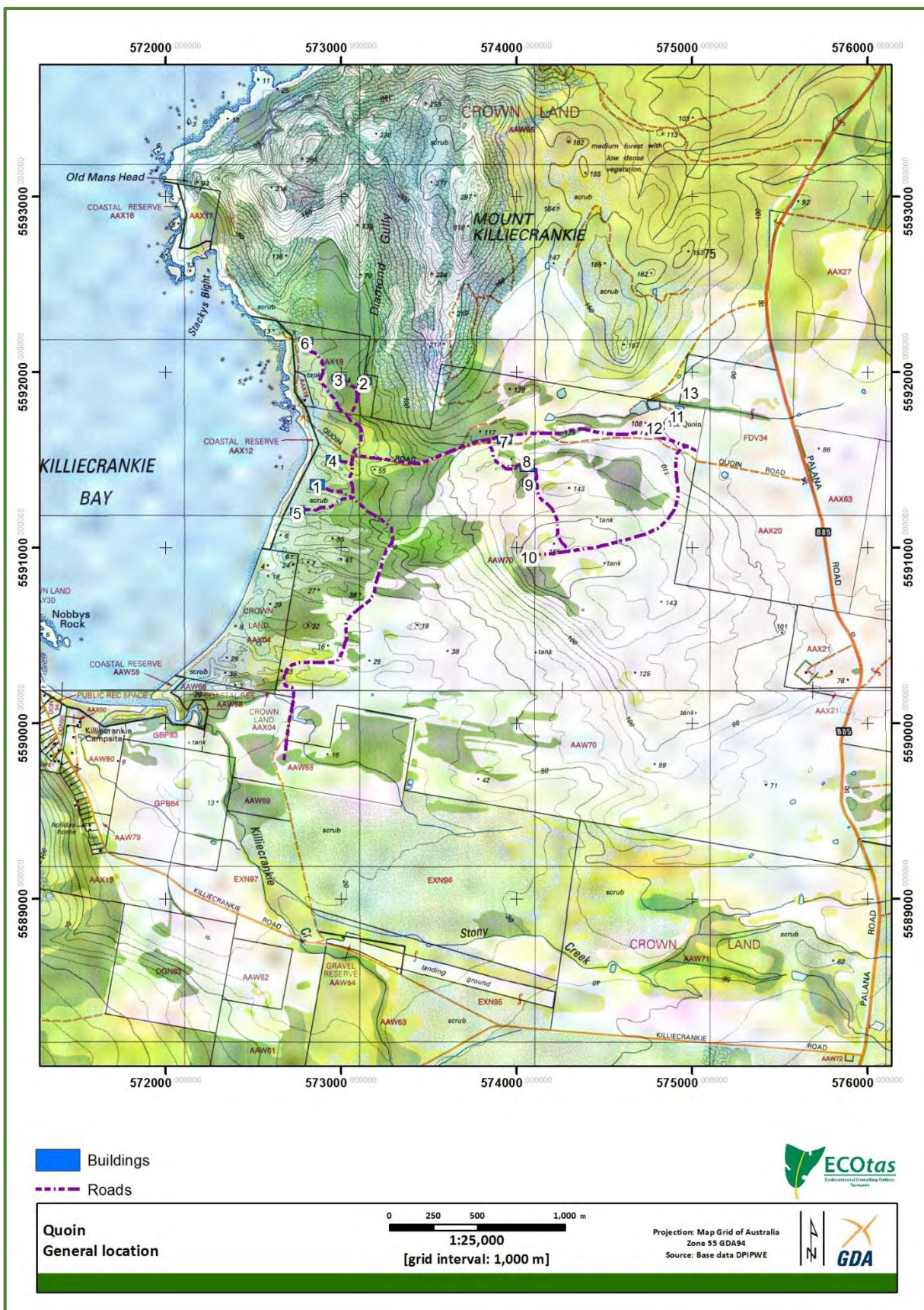


Figure 2a. Project area (general)

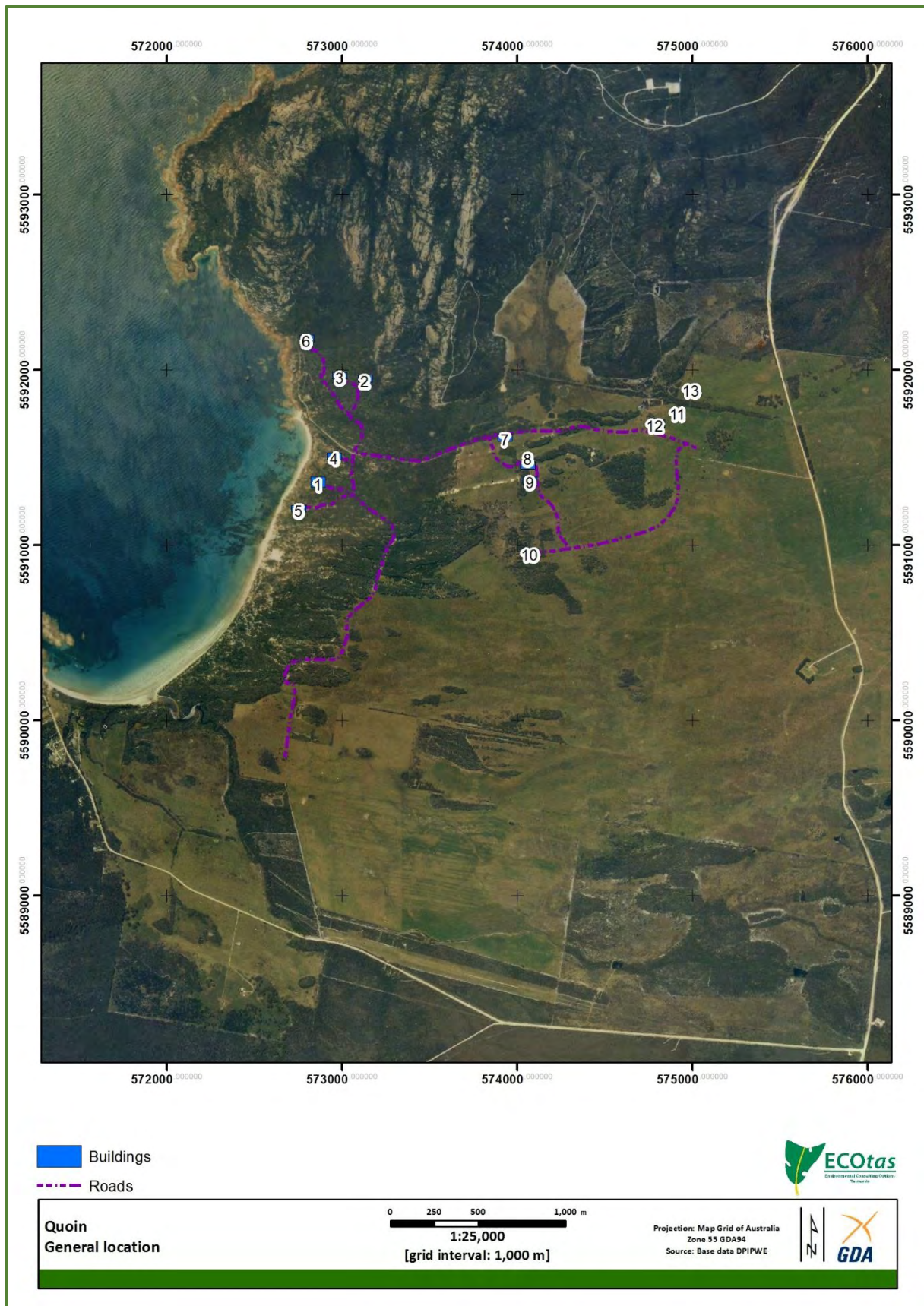


Figure 2b. Project area (aerial)



Figure 3. Project area (detailed)

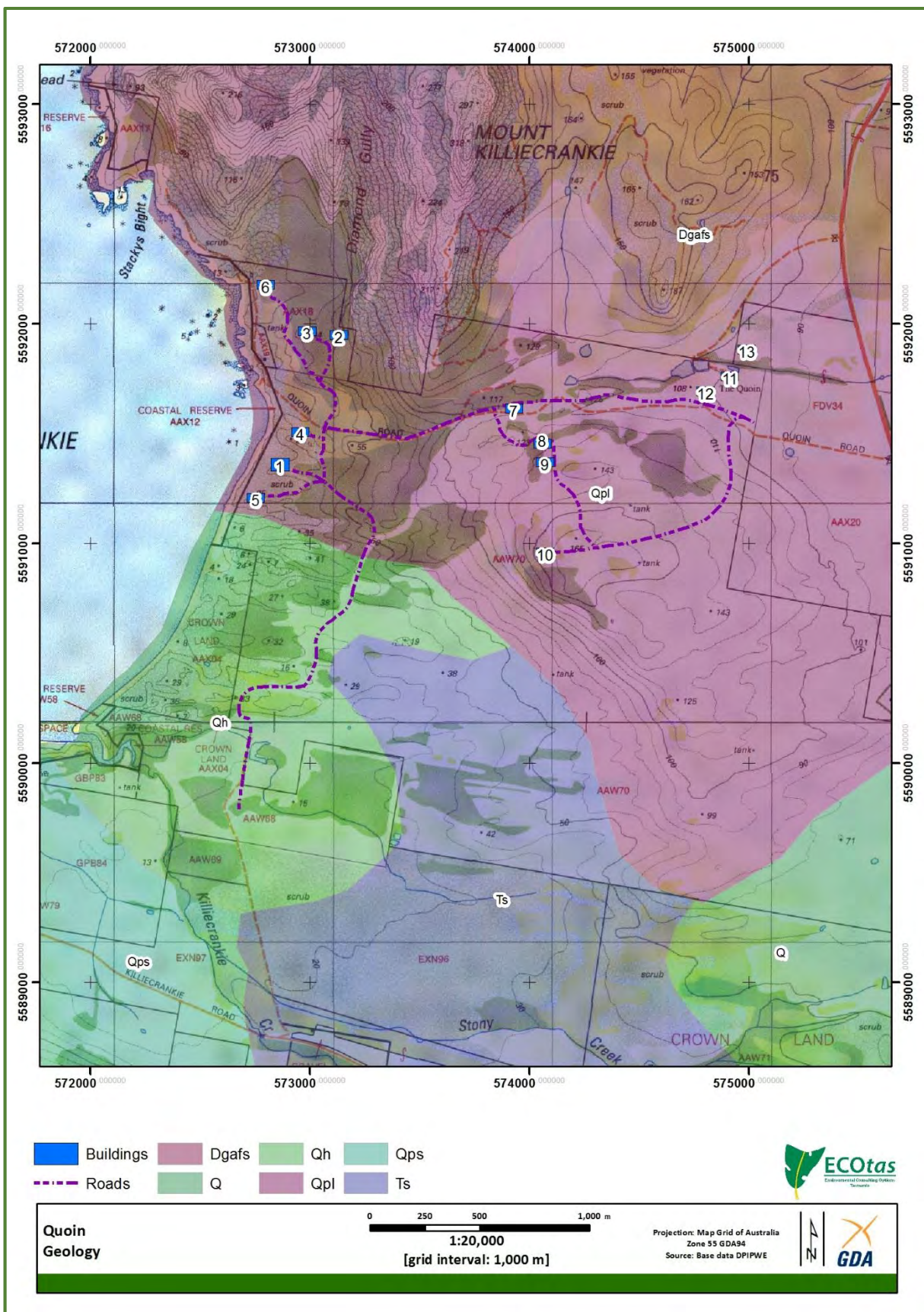


Figure 4. Geology of project area and surrounds

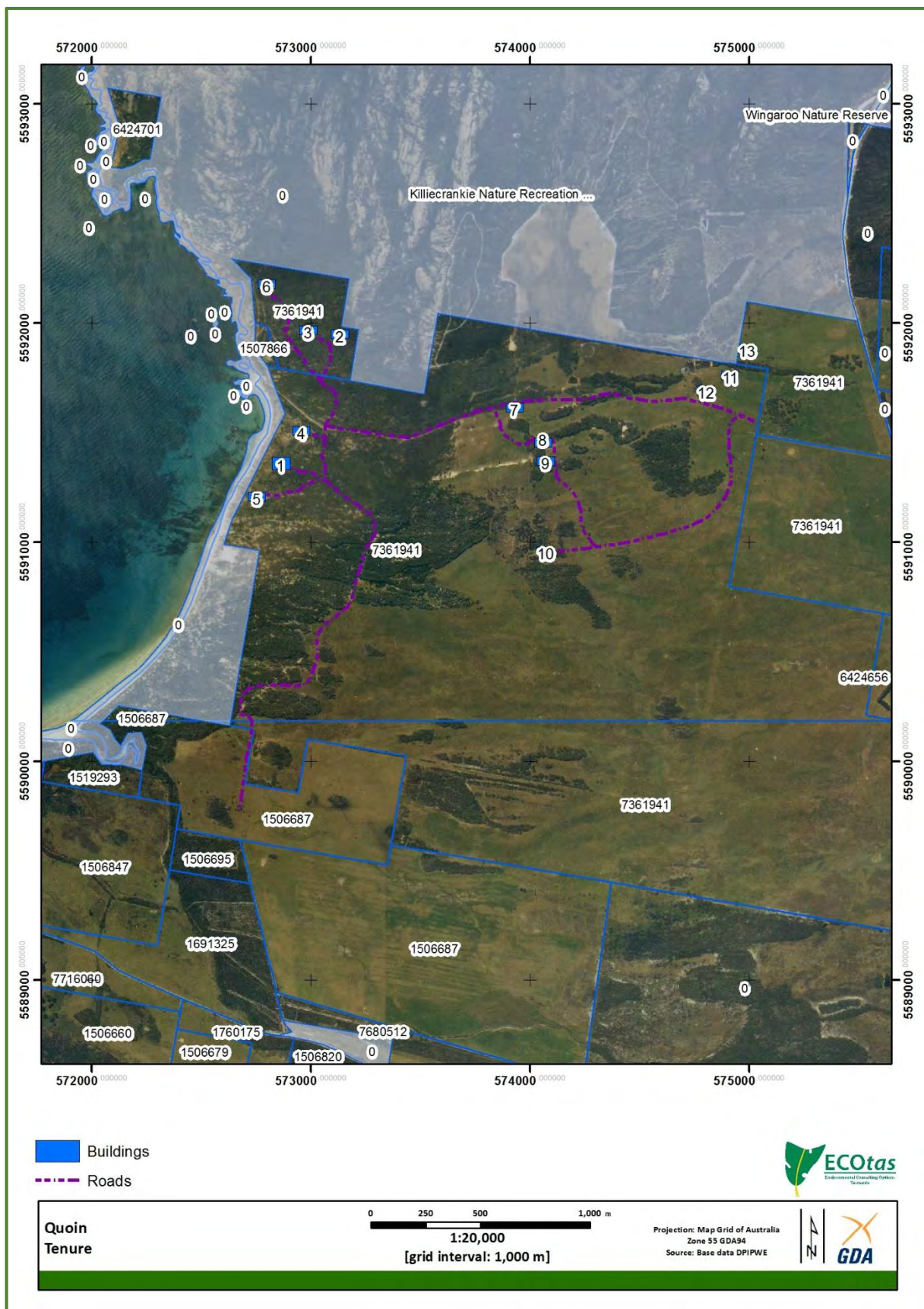


Figure 5. Tenure of project area and surrounds

- PID 7361941, LPI AAW70, Title Reference 250125/1, 3951 Palana Road, Killiecrankie;
- PID 7361941, LPI AAX18, Title Reference 242997/1, 3951 Palana Road, Killiecrankie);
and
- PID 1506687, LPI AAW68, Title Reference 112854/1, 322 Killiecrankie Road, Killiecrankie.
- Killiecrankie Nature Recreation Area, a reserve established under the Tasmanian *Nature Recreation Act 2002* (see Figure 5);
- Flinders Island municipality, zoned as Rural Zone (private titles) and Environmental, Management Recreation (Crown reserve titles), and all areas subject to some form of “Special Area” overlay (viz. Visually Sensitive – private titles behind shoreline; Shoreline Waterbody – 100 m strip across all tenure along Killiecrankie Creek and Killiecrankie Beach and around the rocky coastline; and Ecologically Sensitive – Crown reserve over Mount Killiecrankie area behind shoreline), under the *Flinders Council Planning Scheme 1994*;
- Flinders Bioregion (according to the 5/6.1 boundaries used by most government agencies);
and
- Northern Natural Resource Management (NRM) region.

METHODS

Nomenclature

All grid references in this report are in GDA94, except where otherwise stated.

Vascular species nomenclature follows de Salas & Baker (2014) for scientific names and Wapstra et al. (2005+) for common names. Fauna species scientific and common names follow the listings in the cited *Natural Values Atlas* reports (DPIPWE 2015a).

Vegetation classification follows TASVEG 3.0, as described in *From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation* (Kitchener & Harris 2013).

Preliminary investigation

Available sources of threatened flora records, vegetation mapping and other potential environmental values were interrogated. These sources include:

- Tasmanian Department of Primary Industries, Parks, Water & Environment's *Natural Values Atlas* records for threatened flora and fauna (GIS coverage maintained by the author current as at date of report); and
- Tasmanian Department of Primary Industries, Parks, Water & Environment's *Natural Values Atlas Report No. 62861 ECOTas_Quoin_FlindersIsland* for a polygon defining the approximate assessment area, buffered by 5 km, dated 10 March 2015 (DPIPWE 2015a) – Appendix H;
- Forest Practices Authority's *Biodiversity Values Database* report, specifically the species' information for grid reference centroid 572856mE 5590972mN (nominally the centroid of the *Natural Values Atlas* search area), buffered by 5 km, hyperlinked species' profiles and predicted range boundary maps, dated 10 March 2015 (FPA 2015) – Appendix I;

- Commonwealth Department of the Environment's *Protected Matters Search Tool Report* for a point (39.82783 147.84951) defining the approximate centre of the assessment area, buffered by 5 km, dated 10 March 2015 (CofA 2015) – Appendix J;
- DPIPWE's *Conservation of Freshwater Ecosystem Values* database report for Wetland 22318, River Section 349493 and Karst 124, dated 11 May 2015 (DPIPWE 2015c) – Appendix K;
- the TASVEG 3.0 vegetation coverage (as available through a GIS coverage);
- GoogleEarth and TheList aerial imagery (Figure 2b); and
- other sources listed in tables and text as indicated.

Field assessment

Field assessment was undertaken as follows:

19 Mar. 2015	M. Wapstra	Initial site reconnaissance; Killiecrankie Beach frontage; front part of dunes south of road; initial foray into northern section of swamp and eucalypt forest below cliffs;
20 Mar. 2015	M. Wapstra	Further investigations of northern section; rear half of dunes south of road; dam in dunes; slopes above Killiecrankie Creek; and
21 Mar. 2015	M. Wapstra	Guided tour of proposed locations of infrastructure by Tom Youl i.e. most likely "disturbance footprints" of "villa" and main facility elements of the project.

Botanical survey – threatened flora

The assessment area was assessed by slow-walking meandering transects designed to sample the range of habitat types to maximise the opportunity of detecting populations of threatened flora. Where threatened flora were detected, hand-held GPS (Garmin Oregon 650) was used to waypoint the approximate centre and/or extent of the population (for more extensive populations). Absolute counts of individuals were made, where practical (although this was impractical for *Cynoglossum australe* and *Zygodphyllum billardierei* in many locations due to their localised dominance).

All areas likely to be affected by known elements of the project were assessed in greater detail (these areas were identified in the field by the client), and the same protocols applied.

Where there was uncertainty over the identification of a particular species (e.g. *Leucopogon* species) that may have been later identified as a threatened species, the same recording protocols were applied such that a follow-up site visit could be avoided. However, samples were taken for later laboratory identification.

Botanical survey – declared and environmental weeds

Where "declared weeds" within the meaning of the Tasmanian *Weed Management Act 1999* or "environmental weeds" as considered by the author were detected, hand-held GPS (Garmin Oregon 650) was used to waypoint the location of individuals (for single individuals or small but discrete patches) or approximate centre and/or extent of the population (for more extensive populations).

Botanical survey – vegetation classification

Vegetation classification follows TASVEG 3.0, as described in *From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation* (Kitchener & Harris 2013). Vegetation was classified by meandering transects to identify vegetation transitions and marking with hand-held GPS (Garmin Oregon 650) for later comparison to aerial photography or key features (e.g. road verges, property boundaries, distinctive trees, drainage features, dams, etc.).

In practice, only the areas surrounding the major project elements have been formally classified and mapped to inform the management of these sites with respect to vegetation management legislation and policies. However, descriptions are provided of other vegetation mapping units identified from the broader assessment area to provide context to the ecological findings.

Zoological survey

Surveys for threatened fauna were practically limited to an examination of “potential habitat” (i.e. comparison of on-site habitat features to habitat descriptions for threatened fauna), and detection of tracks, scats and other signs, except as indicated below.

All areas likely to be affected by known elements of the project were assessed in greater detail (these areas were identified in the field by the client), and the same protocols applied.

Where specific habitat features or elements (e.g. dreys (nests) of ringtail possums) were detected, sites were pinpointed with hand-held GPS (Garmin Oregon 650).

RESULTS

Vegetation types

Comments on TASVEG mapping

This section, which comments on the existing TASVEG 3.0 mapping for the assessment area, is included to highlight the differences between existing mapping and the more recent mapping from the present study to ensure that any parties assessing land use proposals (via this report) do not rely on existing mapping. Note that TASVEG mapping, which was mainly a desktop mapping exercise based on aerial photography, is often substantially different to ground-truthed vegetation mapping, especially at a local scale. An examination of existing vegetation mapping is usually a useful pre-assessment exercise to gain an understanding of the range of habitat types likely to be present and the level of previous botanical surveys.

TASVEG 3.0 maps the assessment area as (see also Figure 6):

- “*Eucalyptus nitida* Furneaux forest” (TASVEG code: DNF): northeastern portion of basin/amphitheatre below Mount Killiecrankie and “K2”;
- “*Eucalyptus viminalis* – *Eucalyptus globulus* coastal forest and woodland” (TASVEG code: DAS): eastern fringing toeslopes of Mount Killiecrankie between the DNF polygon and c. 100 m north of Quoin Road;
- “coastal scrub on alkaline sands” (TASVEG code: SCA): extensive areas of dune scrub;

- “heathland on calcareous substrates” (TASVEG code: SCL): narrow coastal strip along Killiecrankie Beach and extending around rocky coastline and then a broad area of the western part of the basin/amphitheatre below Mount Killiecrankie and “K2”;
- “*Melaleuca squarrosa* scrub” (TASVEG code: SMR): relatively large area of basin/amphitheatre below Mount Killiecrankie and “K2”;
- “*Allocasuarina verticillata* forest” (TASVEG code: NAV): polygon straddling Quoin Road; and
- “agricultural areas” (TASVEG code: FAG): extensive areas of pasture on the Quoin property – Quoin Road passes through some FAG.

Preliminary site assessment indicated that the current vegetation mapping is variably accurate, with the most significant erroneous information being the presence (and therefore extent) of the SCL mapping unit. This is significant because SCL is listed as threatened under Schedule 3A of the Tasmanian *Nature Conservation Act 2002* and there would be planning implications if it were present. The primary reason this vegetation type has not been mapped as part of the present assessment is that any areas of low vegetation on calcarenite substrates are limited in extent and do not match the description of SCL (see below for a detailed discussion of this). In addition, the current SCL polygon extends across areas mapped as granite and clearly outcropping granite in the field, meaning classification as SCL is not tenable. In addition, the area of SMR is probably better mapped as a mosaic of different scrub types (see below for a more detailed discussion of this).

Vegetation types recorded as part of the present study

Vegetation types have been classified according to TASVEG 3.0, as described in *From Forest to Fjaeldmark: Descriptions of Tasmania’s Vegetation* (Kitchener & Harris 2013). Table 1 provides information on the vegetation types identified with notes on extent, composition and condition. Appendix A provides detailed descriptions of the vegetation mapping units identified from sites that will be affected by clearing/modification of vegetation.

At this stage of planning, the precise positions of vegetation transitions and the extent of each vegetation type have not been determined with a high degree of precision (for most vegetation types). This is because the assessment area is large and much of the vegetation very dense. In addition, there are quite subtle transitions between some vegetation types (most notably swamp forest and scrub units such as SMR and NME, which virtually merge into one another and form a tight mosaic, in turn grading into forest and scrub units including SCA, DVC and DNF). The transition between DNF (forest and woodland dominated by *Eucalyptus nitida*) and DVC (forest and woodland dominated by *Eucalyptus globulus*) is also not definitive. As part of further project planning, the extent of some vegetation types may need to be clarified, mainly in relation to those classified as threatened. However, the vegetation types associated with the building clusters has been accurately mapped to inform decision-making.

Given that roads and tracks present are all minor (essentially sandy tracks) and the fact that they are either overgrown or native vegetation extends over their margins and even across the road/track surface, all such features have not been mapped as a separate unit but rather subsumed into the surrounding vegetation types.

Of the vegetation types present, two are classified as threatened on Schedule 3A of the Tasmanian *Nature Conservation Act 2002* (see below), but none on schedules of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

“*Eucalyptus viminalis* – *Eucalyptus globulus* coastal forest and woodland” (TASVEG code: DVC) and “*Melaleuca ericifolia* swamp forest” (TASVEG code: NME) are both present within the broader assessment area: the former is probably just outside any areas likely to be disturbed, but the latter

may be affected by access tracks. There are constraints on clearing these vegetation types – see **DISCUSSION Legislative and policy implications** for more details.

Existing TASVEG 3.0 vegetation mapping (see Figure 6) also maps some “heathland on calcareous substrates” (TASVEG code: SCL), which is classified as threatened under Schedule 3A of the Tasmanian *Nature Conservation Act 2002*.

Kitchener & Harris (2013) provide detail on the separation of SCL (which I have not mapped within the assessment area) from SCA (the latter I have mapped extensively across the assessment area).

SCA keys out in the intersectional key in two places: (1) “scrub dominated by *Leptospermum laevigatum*” as part of the “*Leptospermum*-dominated lowland/coastal scrub” part of the key (this accounts for the taller scrub to near forest facies I have mapped on the higher hinter-dunes); and (2) “scrub on alkaline sands dominated by *Myoporum insulare* or *Beyeria lechenaultii* var. *latifolia*” as part of the “scrub in close proximity to the coast” part of the key (this accounts for the windswept more near-coastal facies of SCA I have mapped as a mosaic with coastal grass and herbfield (GHC). On this basis alone, I cannot justify the mapping of any areas of the assessment area as the threatened “heathland on calcarenite” (SCL). However, given the localised outcrops of calcarenite along Killiecrankie Beach and the more exposed steeper slopes above the rocky coastline north of the end of Quoin Road, I examined the description of SCL further.

In the intersectional; key of Kitchener & Harris (2013), SCL is part of the “coastal and lowland heathlands” section of the key, and is defined as “heathland on calcareous substrates with any of *Eutaxia microphylla*, *Acrotriche cordata*, *Threlkeldia diffusa*, *Hibbertia* spp. and *Pomaderris paniculosa*” that occur on “Furneaux Islands and other Bassian coasts”. None of these key indicator species were identified from any part of the assessment area. In the more detailed description of SCL, Kitchener & Harris (2013) state that “SCL is not associated with the deep sands and dune systems characteristic of SCA”. The small pockets of sparse vegetation on the calcarenite outcrops and the areas of bare soil are unlike the example sites provided for SCA such as Trousers Point (which I examined to compare to the assessment area, which revealed the high fidelity of the key indicator species to the SCL mapping unit).

The extent of the SCL mapping on TASVEG extends to the northern part of the study area but much of this is on granite-derived soils (with several granite outcrops) and this is better classified as “coastal heathland” (TASVEG code: SCH), which is separated in the intersectional key of Kitchener & Harris (2013) at the same point as SCL, with SCH being defined as “heathland on (peaty) sands and siliceous gravel; species of Fabaceae, Mimosaceae, Myrtaceae, Asteraceae, Dilleniaceae, Proteaceae and Epacridaceae prominent, and/or an extensive sedgeland and other graminoid component (e.g. *Lomandra longifolia*, *Xanthorrhoea* spp. and *Lepidosperma* spp.)”.

On this basis, I have not mapped any parts of the assessment area as the threatened mapping unit “heathland on calcareous substrates” (SCL), rather allocating areas previously mapped as this to other units including GCH, SCA and SCH. For the record, no areas of the calcarenite outcrops will be affected by the project, such that these somewhat distinctive sites will remain protected and undisturbed, irrespective of their classification.

See DISCUSSION Recommendations for more detail on the suggestion for element-level targeted surveys to determine the precise extent of each vegetation type that will be cleared/modified as part of the project. This is especially important for any areas of forest/woodland dominated by *Eucalyptus globulus* and *Melaleuca ericifolia* as both form vegetation classified as threatened. The areas likely to be affected will be small and site-level management actions (e.g. minor shifting of works to avoid blue gum) and/or a project-level offset/mitigation (e.g. offset an area of NME forest elsewhere on the property).

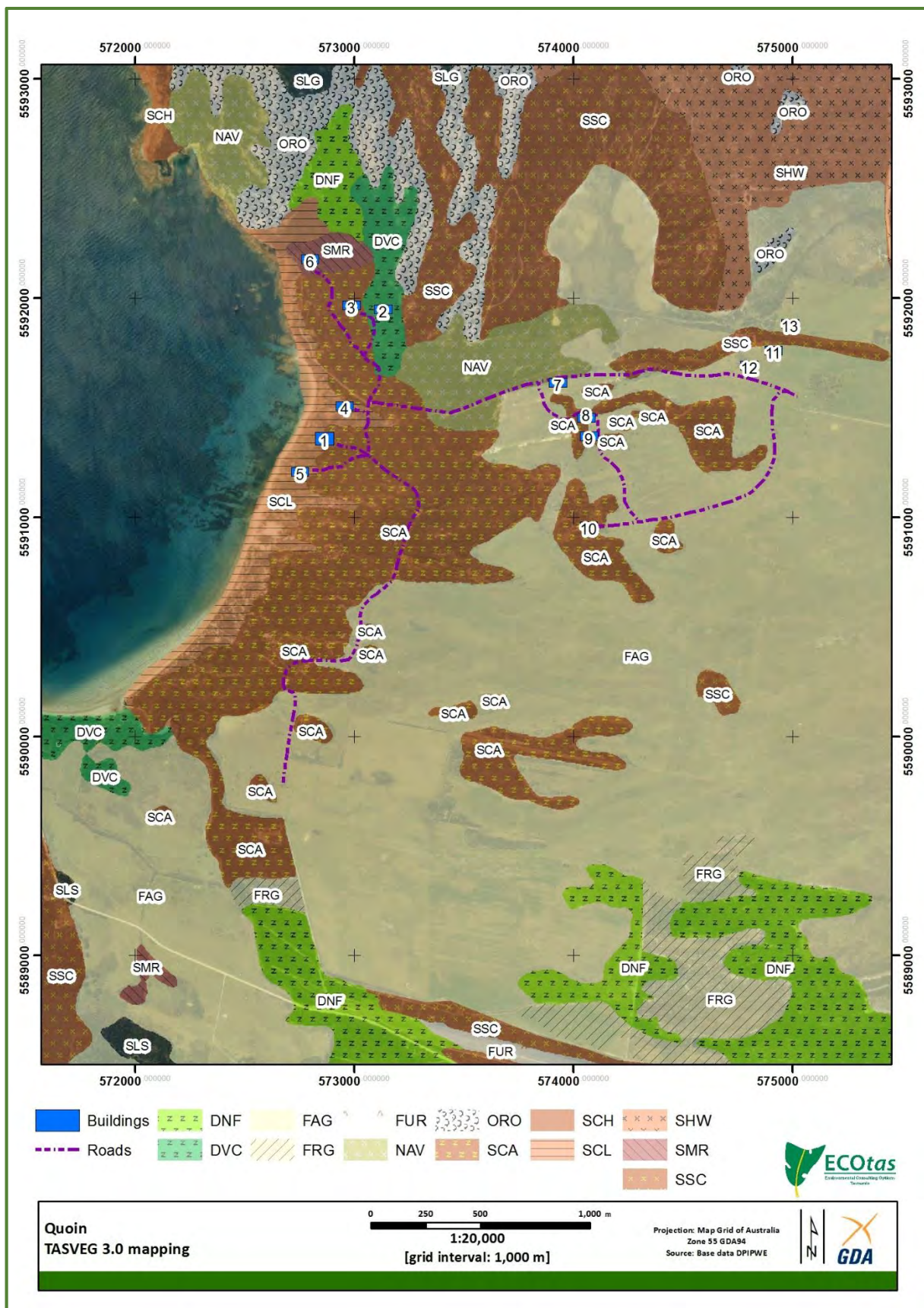


Figure 6. Existing TASVEG 3.0 vegetation mapping for project area and surrounds

Table 1. Vegetation mapping units present in assessment area

[conservation priorities: NCA – as per Schedule 3A of the Tasmanian *Nature Conservation Act 2002*, using units described by Kitchener & Harris (2013), relating to TASVEG mapping units only (DPIPWE 2015b); table headings are as per modules in Kitchener & Harris (2013); EPBCA – as per the listing of ecological communities on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, relating to communities as described under that Act, but with equivalencies to TASVEG units]

TASVEG mapping unit (Kitchener & Harris 2013)	Conservation priority NCA EPBCA	Comments
Dry eucalypt forest and woodland		
<i>Eucalyptus viminalis</i> – <i>Eucalyptus globulus</i> coastal forest and woodland (DVC)	Threatened Not threatened	<p>DVC occurs on granite-derived soils and calcareous/granite soils in the amphitheatre/basin below Mount Killiecrankie. It occurs on the better-drained soils on flat to gentle slopes. DVC is long unburnt and has a multi-aged structure with a variable density eucalypt canopy from tall straight stands (below the vertical cliffs) to gnarled sprawling open stands (on sandier old dune rises).</p> <p>In places, DVC has a shared canopy of <i>Eucalyptus globulus</i> (blue gum) and <i>Callitris rhomboidea</i> (oyster bay pine), but the latter species was not identified as a canopy dominant anywhere within the assessment area. The understorey varies from swamp forest (<i>Melaleuca</i> and <i>Leptospermum</i> species) to very open (with virtually no understorey species) to heathy/shrubby (on granite-derived soils on slopes).</p> <p>DVC grades into NME as drainage becomes more impeded. It also grades into SCA on steeper dune rises on deeper sands. Further west into the amphitheatre/basin below Mount Killiecrankie and "K2", DVC grades into DNF.</p> <p>No areas of DVC are included in sites to be cleared/modified. There may be occasional individuals of <i>Eucalyptus globulus</i> (blue gum) within/close to the proposed building cluster sites but no actual forest definitively dominated by blue gum. These statements are based on the initial design – a follow-up element-level survey may be needed for villa site 2 under the cliffs, which is close to areas of DVC.</p>
<i>Eucalyptus nitida</i> Furneaux forest (DNF)	Not threatened Not threatened	<p>DNF occurs in the far northern section of the amphitheatre/basin below Mount Killiecrankie and "K2". It has a much lower canopy than DVC, with the upper canopy being quite tall mallee-form individuals of <i>Eucalyptus nitida</i> (western peppermint).</p> <p>Closer to the coast, DNF grades into a windswept coastal heathland/scrub with only sparse <i>Eucalyptus nitida</i> (of very low stature). Further south, DNF grades into DVC.</p> <p>No areas of DNF are included in sites to be cleared/modified.</p>
Non-eucalypt forest and woodland		
<i>Allocasuarina verticillata</i> forest (NAV)	Not threatened Not threatened	<p>NAV occurs as a distinct patch on the higher old dune rises south of Quoin Road, closer to the forest/pasture boundary. <i>Allocasuarina verticillata</i> (drooping sheoak) forms a dense canopy dominant, now quite tall due to a long period without fire. The understorey is sparse, mainly supporting the pioneer <i>Senecio linearifolius</i>, and low ground covers.</p> <p>The distinction between NAV and other vegetation types is quite sharp for the most part but is somewhat transitional with SCA closer to the coast.</p> <p>No areas of NAV are included in sites to be cleared/modified, although some sites south of Quoin Road get close to grading into NAV (but are still classified as SCA).</p>
<i>Melaleuca ericifolia</i> swamp forest (NME)	Threatened Not threatened	<p>NME occurs as a tight mosaic with SMR in the basin below Mount Killiecrankie and "K2". It occupies the sites with the most impeded drainage, extending from close to the coast to where the virtually flat terrain starts to slope up towards the granite cliffs. In places, <i>Leptospermum lanigerum</i> (woolly teatree) is locally dominant but at this stage all "swamp" vegetation types have been classified as a mosaic of NME and SMR. There are also areas of NME close to Killiecrankie Creek.</p>

TASVEG mapping unit (Kitchener & Harris 2013)	Conservation priority NCA EPBCA	Comments
		<p>The understorey of NME and SMR varies from extremely dense (cutting grass, coral fern, ground ferns, fireweed, etc.) to very open, depending on drainage. All areas are long unburnt.</p> <p>Separating NME and SMR would be an exercise involving complex mapping and GPS surveys because the mosaic pattern is not very evident on aerial imagery. Technically, NME has a higher priority for conservation management (listed as threatened on the Tasmanian <i>Nature Conservation Act 2002</i>) than SMR but the mosaic of the two vegetation types in the context is considered to be of high conservation significance. In my opinion, more detailed mapping would only become necessary if areas of NME were proposed for clearing.</p> <p>NME/SMR grade into DNF, DVC, SCA and other vegetation types to varying degrees, the sharpness of the transition dependent on fire history (the northern boundary seems to be a sharper fire boundary) and drainage/exposure (southern areas merge into SAC on steeper and higher sandy dune rises).</p> <p>Some areas of NME/SMR are included in sites to be cleared/modified (access route to northern villa site) and the specific area of each may need to be determined by walking the surveyed access route.</p>
Scrub, heathland and coastal complexes		
coastal heathland (SCH)	Not threatened Not threatened	<p>SCH occurs on the exposed granite outcrops and plates and granite-derived soils in the northernmost part of the assessment area, where the walking track to Stackys Bight passes through it. The community is windswept heathy scrub with high diversity of Myrtaceae, Fabaceae and Ericaceae species with several bare earth/rock gaps and leads between virtually impenetrable scrub.</p> <p>SCH grades into DNF further east into the amphitheatre/basin below "K2" and into various facies of NME, SMR and SCA further south, the latter vegetation types occurring on the sandier calcareous substrate rather than the granite-derived more gravelly soils.</p> <p>A small area of SCH may be included in a site to be cleared/modified (northwestern villa site).</p>
coastal scrub on alkaline sands (SCA)	Not threatened Not threatened	<p>SCA occupies the majority of the assessment area, although it varies in form markedly. Most of the hinter-dune rises and swales mapped as SCA support a long unburnt tall and dense canopy dominated by <i>Leptospermum laevigatum</i> (coast teatree), with occasional pockets replaced by other scrub species. The understorey of this taller facies of SCA is usually quite dense (with massive individuals of species such as <i>Myoporum insulare</i> and <i>Alyxia buxifolia</i>; or dense swathes of species such as <i>Leucopogon parviflorus</i>). As exposure to the westerly winds increases (e.g. on the dune rises directly overlooking the coast), the canopy height is reduced but the species composition is similar.</p> <p>In dune swales and the lower slopes of dune rises, SCA becomes more diverse with species such as <i>Correa alba</i>, <i>Ozothamnus turbinatus</i>, <i>Olearia axillaris</i> and <i>Acacia uncifolia</i> becoming more prevalent. These areas are a true "scrub" facies of SCA, whereas the hinter-due areas are close to a "forest" facies. All areas of native vegetation to be cleared/modified support the taller facies of SCA.</p> <p>The distinction between SCA and other vegetation types (especially NAV, DVC, DNF, NME and SMR) is usually quite clear, with SCA generally occurring on the calcareous sands on dune rises.</p> <p>However, the distinction between SCA and GHC is somewhat more complex, reflecting a probably ever-shifting succession between grass-dominated areas with shrub-dominated areas. Some areas are distinctly dominated by grass with only sparse shrubs, quite easily allocated to GHC. However, as shrubs become dominant, reducing the impact of natural wind erosion (which seems to maintain the density of grass cover), GHC grades into SCA. Aerial imagery is actually quite a useful indicator of the mosaic of GHC and SCA in the areas of dunes closer to the coast. Because no areas of the GHC/SCA mosaic will be affected by the project, separating the two at this stage of planning is not considered warranted.</p> <p>Note that the small dam nestled in the dune swales south of Quoin Road has not been mapped separately as the TASVEG mapping unit "water, sea" (TASVEG code: OAQ) because it is very small and is best subsumed as a highly localised and minor variation of the SCA mapping unit.</p>

TASVEG mapping unit (Kitchener & Harris 2013)	Conservation priority NCA <i>EPBCA</i>	Comments
<i>Melaleuca squarrosa</i> scrub (SMR)	Not threatened <i>Not threatened</i>	See discussion above under NME.
Native grassland		
coastal grass and herbfield (GHC)	Not threatened <i>Not threatened</i>	See also discussion above under SCA. Large swathes of the near-coastal dune system are dominated by <i>Poa poiformis</i> (coastal tussockgrass) and other native grasses typical of coastal and salt-laden dune soils. The proportion of low shrubs varies greatly, reflecting an ever-shifting succession dictated by wind. Some of the most coastal locations are dominated by <i>Euphorbia paralias</i> (sea spurge), and these have been mapped separately as a weed infestation (see below). On the immediate dune front above Killiecrankie Beach and also the rockier coastline further north, the mosaic of GHC/SCA opens out on highly localised outcrops of calcarenite. These sites were all examined closely to determine if they could be mapped as SCL (and were not classified as such) or supported additional species of flora (including threatened species) not represented elsewhere (also not realised). Some areas of GHC are included in sites to be cleared/modified (e.g. wellness centre, southern villa site), although the sites are more likely in a mosaic of GHC/SCA, and the extent of each determined by an element-level survey.
Agricultural, urban and exotic vegetation		
agricultural land (FAG)	Not threatened <i>Not threatened</i>	FAG is used to map all areas managed for primary production
weed infestation (FWU)	Not threatened <i>Not threatened</i>	FWU has been applied to a small area of dune immediately behind Killiecrankie Beach dominated by <i>Euphorbia paralias</i> (sea spurge) because its dominance is such that unless it is removed, the patch will be self-sustaining and continue to exclude native species, further reducing the species diversity.

Plant species

General observations (flora)

A total of 118 vascular plant species were recorded from the assessment area (Appendix B), comprising 85 dicotyledons (including 4 endemic and 6 exotic species), 24 monocotyledons (including 2 exotic species), 1 gymnosperm (native) and 8 pteridophytes (all native). The surveys undertaken as part of the present assessment were designed to maximise the opportunity to record as many species as possible. Additional surveys at different times of the year will undoubtedly detect additional short-lived herbs and grasses. There may be targeted follow-up surveys of selected locations, and the project is likely to be relatively long-term in its design and implementation phase and additional opportunities may arise to re-sample parts of the assessment area – the list provided at Appendix B will be progressively updated and maintained.

Priority flora species known from the assessment area

No plant species listed as threatened on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* were detected, or are known from database records, from the assessment area.

Four species listed as threatened (all rare except *Isopogon ceratophyllus*, which is listed as vulnerable) on the Tasmanian *Threatened Species Protection Act 1995* are known from database records (DPIPWE 2015a) from the vicinity of the assessment area (i.e. within a distance to be considered as part of the assessment area – other more distant records are considered separately), as follows (Figure 7):

- *Isopogon ceratophyllus* (“horny conebrush”);
- *Phyllangium distylis* (“tiny mitrewort”);
- *Phylloglossum drummondii* (“pygmy clubmoss”); and
- *Stylidium beaugleholei* (“fan triggerplant”).

Seven additional plant species listed as threatened, all as “rare” (Schedule 5), on the Tasmanian *Threatened Species Protection Act 1995* were detected from the assessment area, as follows (Figure 8a for overview and Figures 8b-f for detailed distributions):

- *Acacia uncifolia* (“coast wirilda”);
- *Cynoglossum australe* (“coast houndstongue”);
- *Gyrostemon thesioides* (“broom wheelfruit”);
- *Leucopogon affinis* (“lanceleaf beardheath”);
- *Ranunculus sessiliflorus* var. *sessiliflorus* (“rockplate buttercup”);
- *Stuckenia pectinata* (“fennel pondweed”); and
- *Zygophyllum billardierei* (“coast twinleaf”).

In addition, specific information is provided on the following species because of taxonomic complexities that need to be considered:

- *Eucalyptus globulus* subsp. *pseudoglobulus* (“gippsland blue gum”).

Further information on each of these species is provided below. Information sheets on each of these species is also provided as attachments to the report for further information. Refer also to Appendix E for tables of locations and Appendix D of annotated images of the species, supporting habitat and potential locations. Figures xxx-xxx indicates the location of known records and new records of threatened flora relative to the position of the proposed project elements and other features.

- ***Acacia uncifolia* (“coast wirilda”)**

In Tasmania, *Acacia uncifolia* is restricted to Flinders Island and King Island, although populations on the latter are considered to be introduced (this is under some contention).

Prior to the present surveys, the species was not known from the assessment area but there was a report from the Killiecrankie area (M. Visoiu, 28 Mar. 2002, 571812mE 5589933mN ± 20 m). The sites within the assessment area represent a minor range extension, although the significance of this is tempered by the fact that it is likely that surveys between Killiecrankie and Palana will

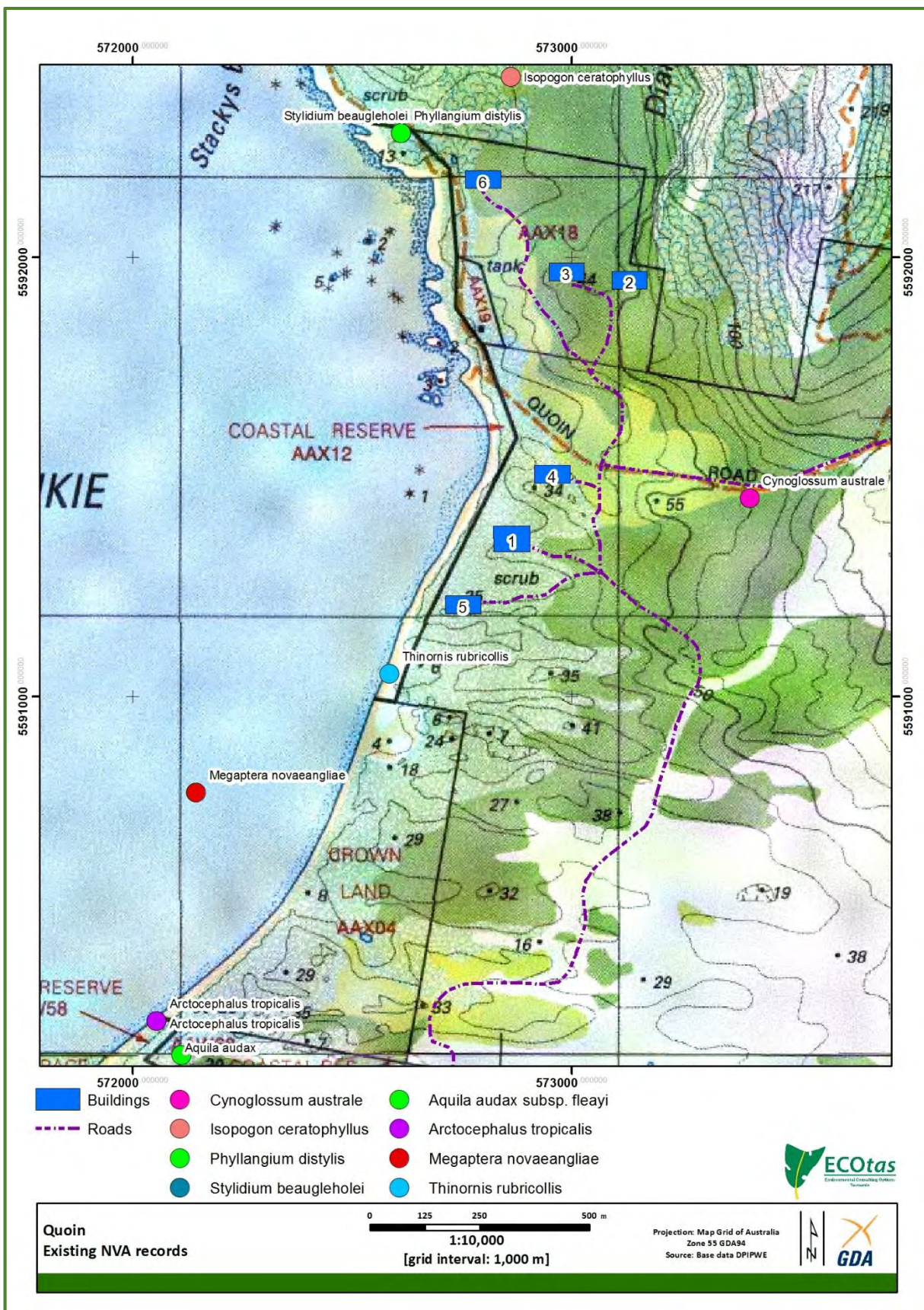


Figure 7. Existing threatened flora and fauna records from within and close to the project area

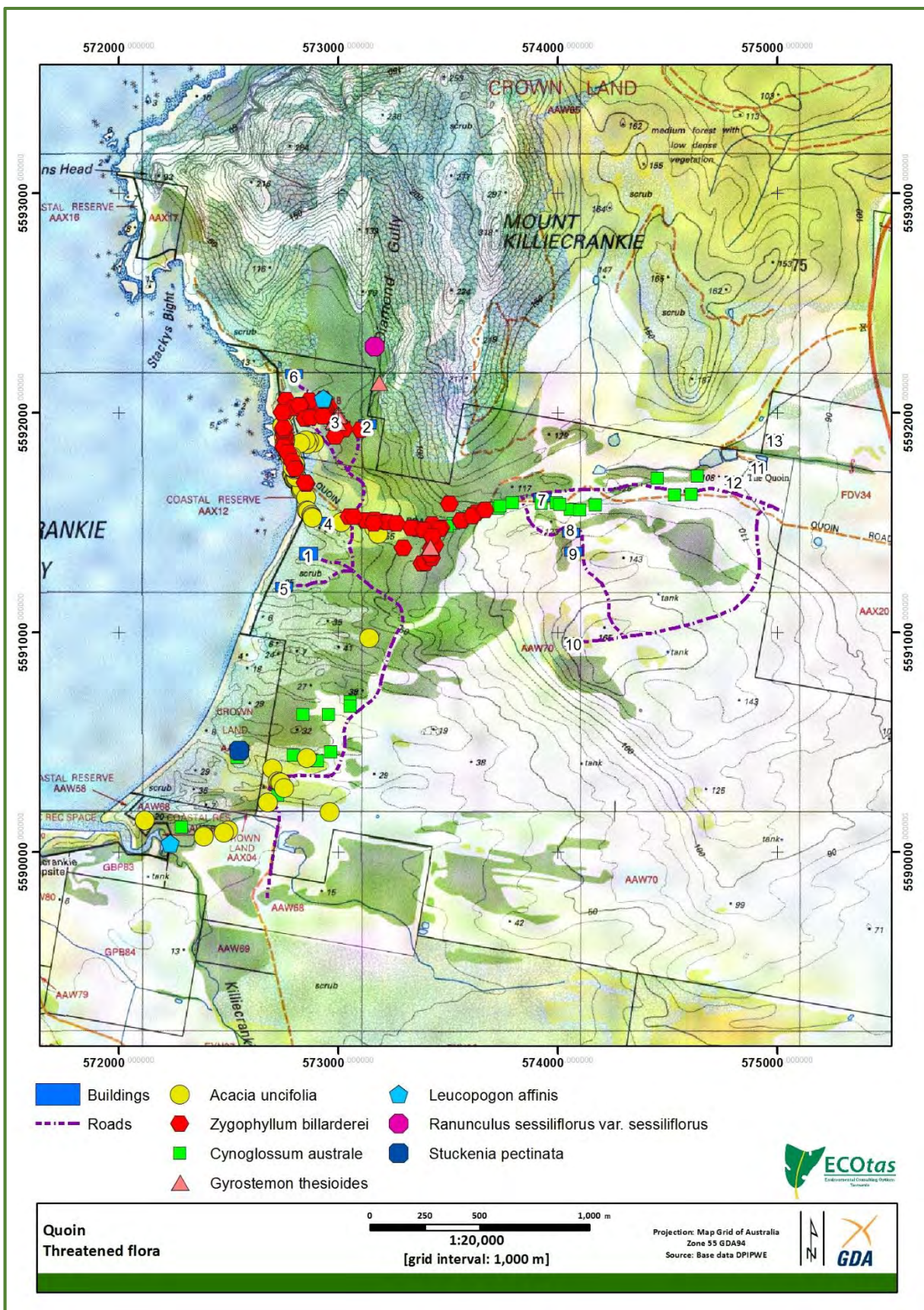


Figure 8a. Overview of threatened flora recorded from present assessment

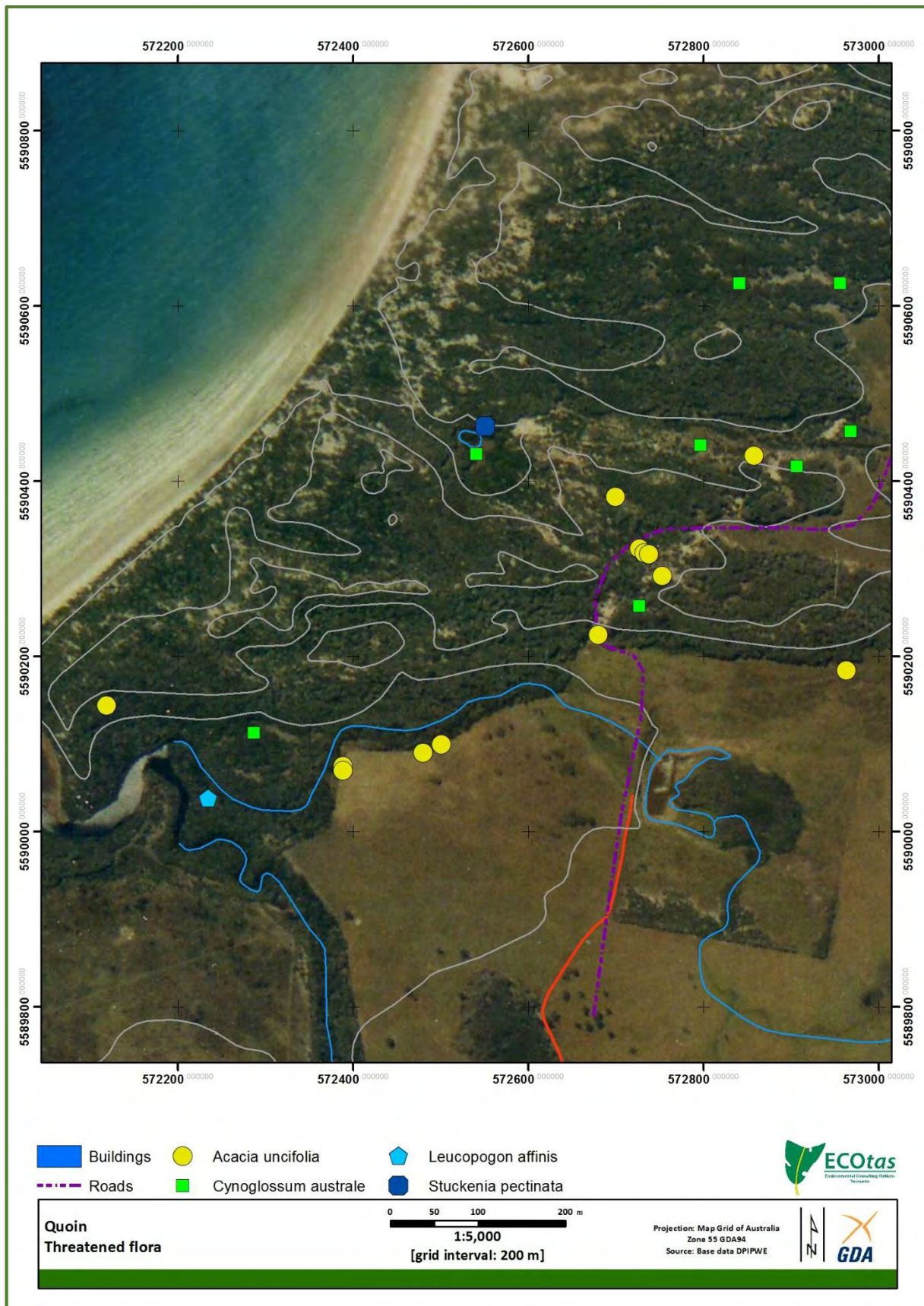


Figure 8b. Detailed distribution of threatened flora

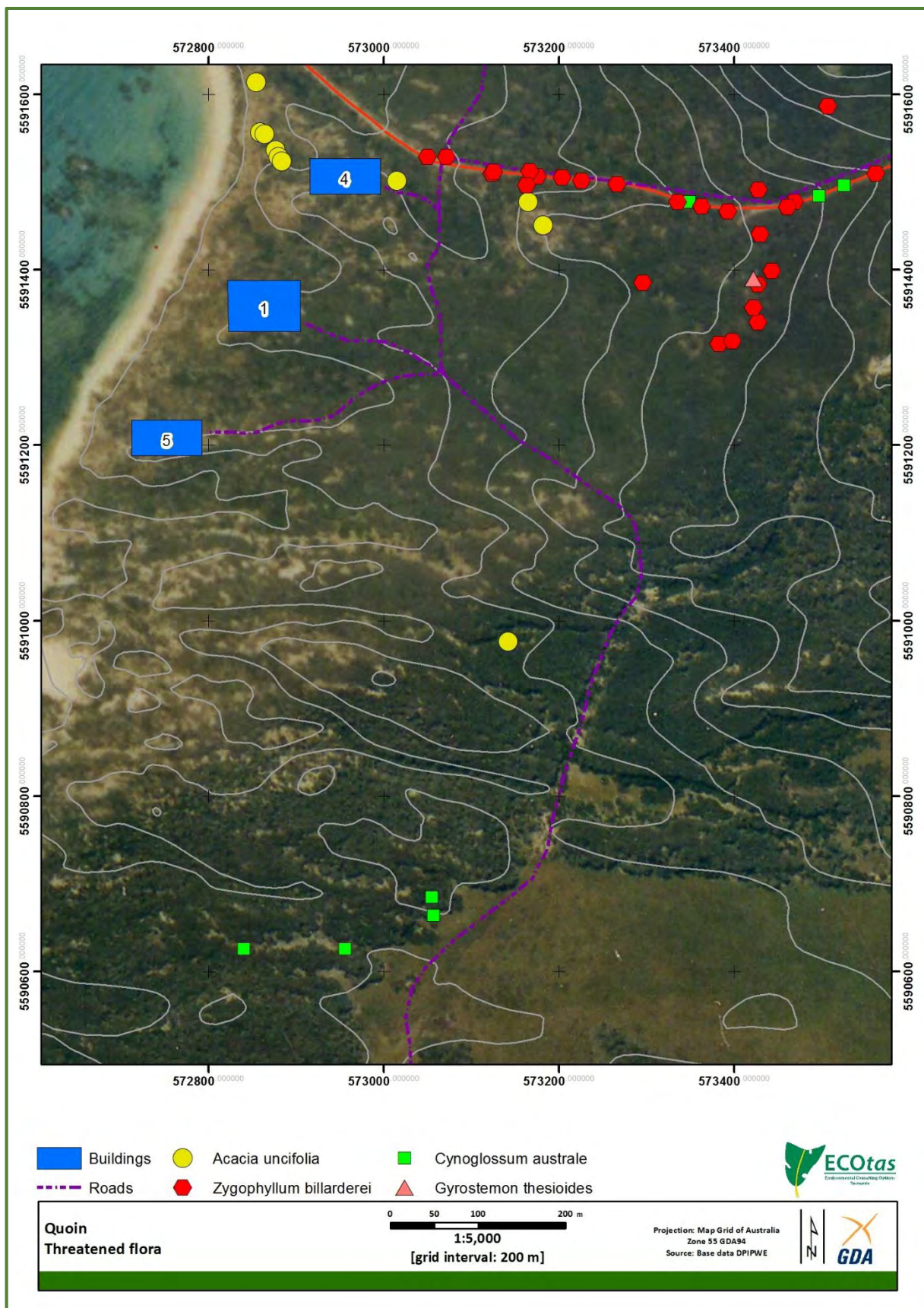


Figure 8c. Detailed distribution of threatened flora

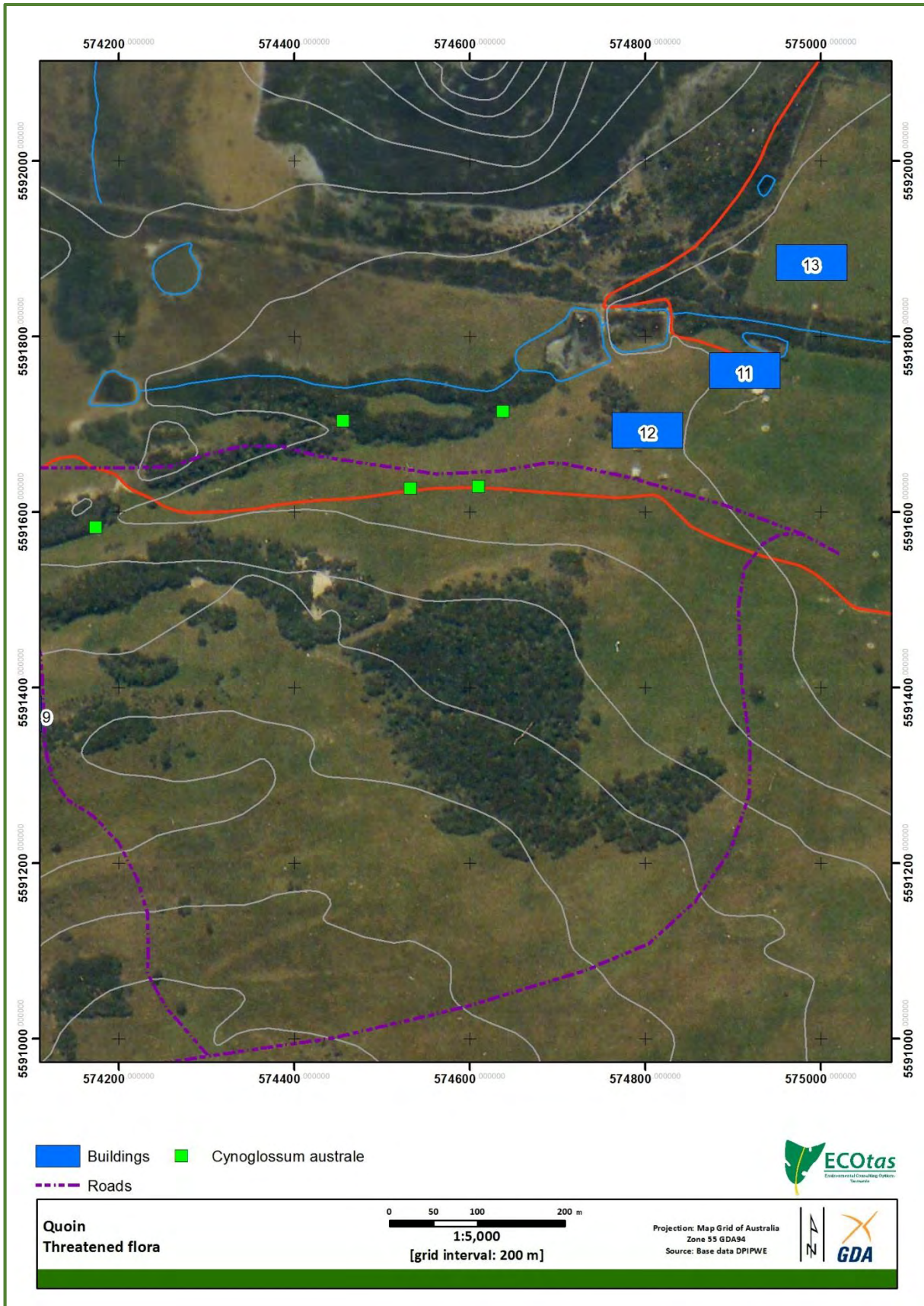


Figure 8d. Detailed distribution of threatened flora

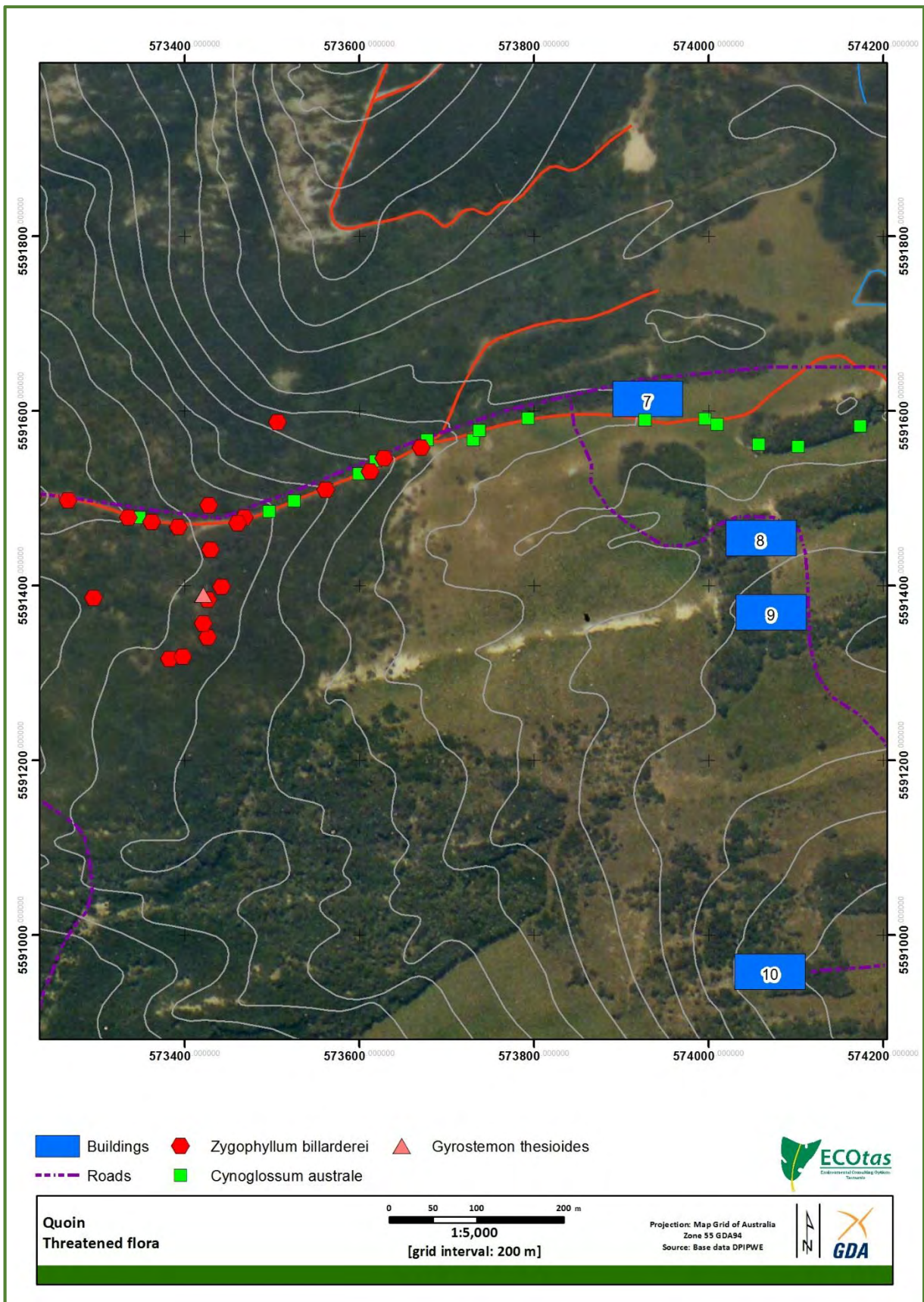


Figure 8e. Detailed distribution of threatened flora

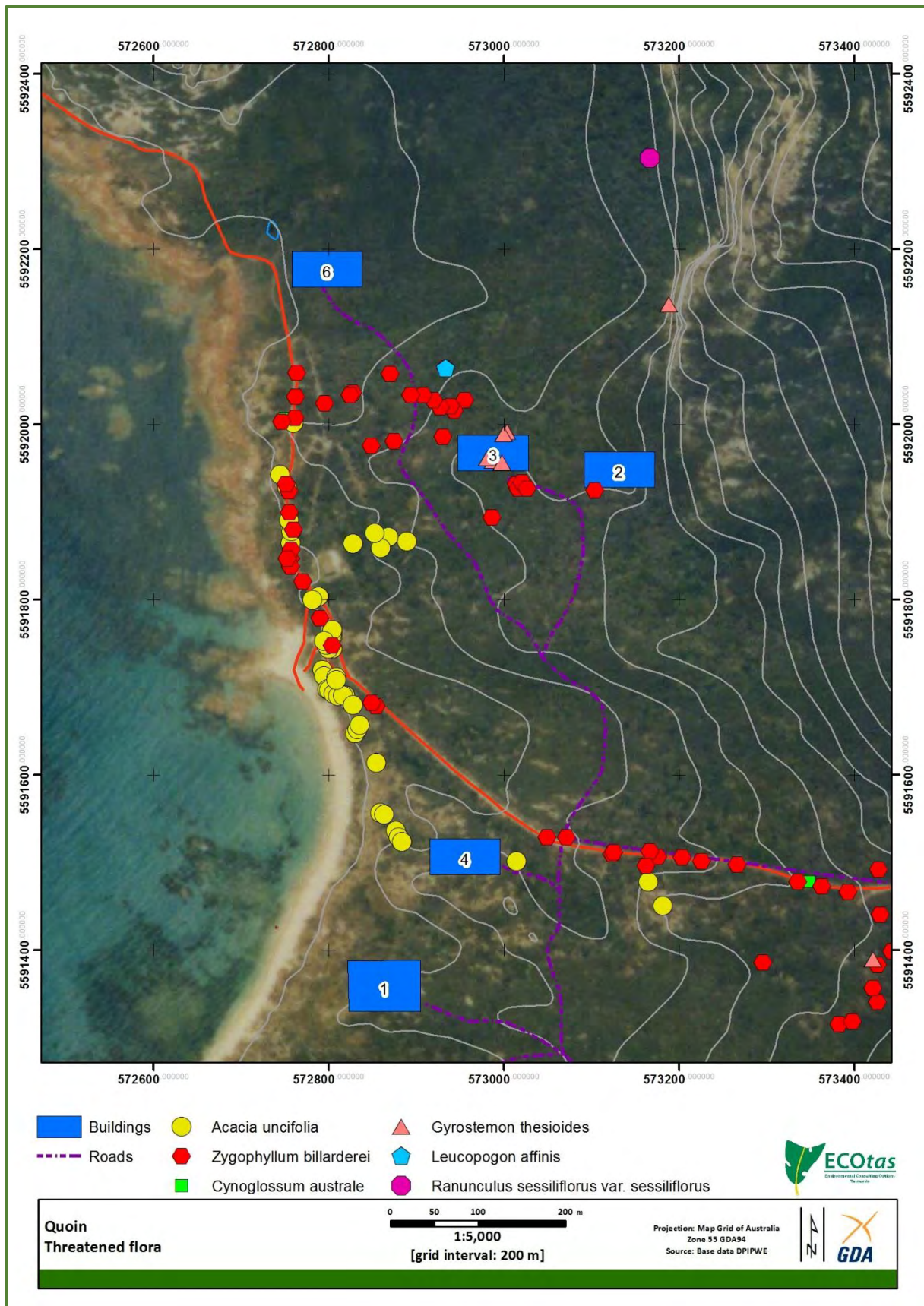


Figure 8f. Detailed distribution of threatened flora

detect the species (the absence of formal records from the assessment area, given the relatively high popularity of the Killiecrankie Beach walk, the walk to Stackys Bight and the informal use of the Quoin Road, is surprising).

Within the assessment area *Acacia uncifolia* occurred in two distinct habitats with two growth forms. The majority of individuals are located on the top of the first dune rise, just above Killiecrankie Beach or the rocky shore further north: this form tended to be compact and low, in line with the windswept shrubbery it occurs in. A fewer number of individuals occurred in the back dunes area, usually on dune rises but occasionally in dune swales: this form tended to be much more open and taller, with one specimen around 10 m tall, reflecting the lower degree of influence of the strong westerly winds.

Acacia uncifolia is known to re-sprout from rhizomes (underground stems) and germinate after fire from soil-stored seed (Lynch 1993). It is likely that many of the individuals along the extension to Quoin Road represent such "suckering" plants but that the taller specimens in the dune hinterlands represent "stand-alone" plants. The non-suckering individuals are likely to be more sensitive to disturbance, although it is noted that the more mature individuals were of poor health. Most species of *Acacia* are not particularly long-lived so focusing management on individuals may not be prudent in the long-term. It is likely that there is much soil-stored seed beneath these older individuals (seed of *Acacia* species can survive decades to centuries) such that localised disturbance may cause a flush of seedlings. Lynch (1993) noted that although disturbance is beneficial for this species, studies indicate that longer fire intervals and moderate to high temperatures are probably required to enable regeneration from seed. Such a fire event is unlikely to occur at the present site due to deliberate actions.

There is not an accurate estimate of the total population of *Acacia uncifolia* on the Furneaux islands so ascertaining the proportion of the population that may be affected by the project is difficult. It may be a more sensible approach to consider whether the species can be maintained across the extent of the assessment area. If this is the case, it means that the overall extent of the species will not be affected and that the area of occupancy and total number of mature individuals only marginally reduced (in the short-term, recognising that the species may re-sprout following disturbance). It is suggested that some of the larger individuals in the dune system be avoided if practical, although it is noted that some of these are close to their natural final senescence so if unavoidable, their loss is not considered critical to the maintenance of the species in the assessment area.

I am comfortable that the species is of relatively low conservation significance within the assessment area (because of the widespread distribution on the Flinders Island and locally dense populations) such that its presence should not significantly constrain project design. That said, **where practical it is recommended that project elements "work around" identified individuals and patches** but the loss of a small number of individuals is considered acceptable because other sites in close proximity to the assessment area will be retained undisturbed. If there is an opportunity to utilise the species in ornamental plantings using locally collected seed (if present), this would appropriately offset any particular loss of individuals.

- *Cynoglossum australe* ("coast houndstongue")

In Tasmania, *Cynoglossum australe* is widespread, well-reserved, sometimes extremely locally common and a "disturbance-ophile". For these reasons, the Scientific Advisory Committee (SAC) established under the Tasmanian *Threatened Species Protection Act 1995* recently recommended that the species be removed from schedules of the Act. At the time of writing, the relevant State minister has not made a decision but there is little doubt this will confirm the recommendation by SAC. Until this decision is formalised, however, the species will need to be considered as "threatened" and treated accordingly (at least with respect to the technical requirements for a permit to disturb the species).

Prior to the present surveys, the species was reported known from the assessment area, the record apparently falling on the track to Killiecrankie Beach, which coincides with when the recorder also added their name to the record book at the summit of Mount Killiecrankie (A.M. Buchanan, 19 Nov. 2009, 573406mE 5591451mN \pm 25 m). My recent surveys has revealed the species to be widespread across the Quoin property occupying large swathes of pasture (where it can be the dominant herb, acting as a weed, its seeds with bristly velcro-like hooks obviously readily transferred by wombats, wallabies and sheep), verges and middle of sandy tracks (e.g. main track to Killiecrankie Beach) and in canopy gaps in the dense *Leptospermum laevigatum*-dominated dune swales and rises (mainly on the base of the swale but occasionally in gaps on slopes and dune rises).

Avoiding the species as part of works will be impractical and is not warranted based on the recommended conservation status (i.e. delist), the widespread and "weedy" occurrences on the property and the obvious response to high levels of disturbance. It is recommended that the status of the species be checked prior to any permit application (which will be required for other species) and the species only included in the application if it is still listed. Estimating how many individuals and the extent of these individuals will be disturbed (usually a requirement of the permit application) is not practical not considered warranted (likely to be in the order of 100s to low 1000s from a property-wide population of perhaps 100s of 1000s if not millions). No special prescriptions should be applied for this species.

- *Gyrostemon thesioides* ("wheel broomfruit")

Within the assessment area, the species was detected at several sites, most from areas of naturally created (presumed storm windthrow) canopy gaps amongst otherwise dense *Leptospermum laevigatum* coastal scrub or shrubby *Eucalyptus globulus* forest. It was nowhere abundant, with just seven individuals from three sites recorded.

The records from the assessment area do not represent a range extension nor significant range infilling with the species known from Palana, The Dock (just north of the assessment area) and several other sites on Flinders Island. The species is represented by numerous collections from mainland Tasmania and the Furneaux Group, the latter making a significant contribution to the reservation status of the species (Harris et al. 2001). While the species is a perennial low shrub, it is often geographically and temporally transient, "popping up" after major disturbance such as wire and then "disappearing" between disturbance events. Within the assessment area, it is probably following this pattern, at present occupying a mere fraction of what it could, simply awaiting an opportunity to pioneer disturbed ground (another species, "native tobacco" (*Apalochlamys spectabilis*) is also present within the assessment area at similar sites and has a similar pattern of "boom and bust" – this very weedy appearing "messy" almost-woody mega-herb may be a good indicator of potential habitat for *Gyrostemon thesioides*).

Based on the current project design and the location of the species, one site supporting the species will be affected (villa site 3). The notesheet for the species indicates that "a re-assessment of the species' current status of 'rare' on the TSP Act may be warranted given the discovery of extensive populations in formal reserves since its original listing in 1995". Information provided in this report can be used to inform a permit application because it is recommended that provided some sites within the assessment area are avoided and the sites outside the assessment area are left undisturbed (e.g. the one right below the near-vertical granite cliffs), special prescriptions need not be applied to the other sites as there will be a local source to take advantage of newly disturbed sites i.e. it is a reasonable assumption that the species will benefit from the project.

- *Leucopogon affinis* ("lance beardheath")

[This species was formerly known as *Leucopogon lanceolatus* var. *lanceolatus* and is still shown in some databases as this].

Within Tasmania, *Leucopogon affinis* is restricted to the Bass Strait islands with only unconfirmed records from the coastal zone and hinterlands of the north coast of mainland Tasmania. Separating *Leucopogon affinis* from the widespread, common and non-threatened *Leucopogon parviflorus* can be difficult and in part relies on mature fruit. "Good" *Leucopogon affinis* is easily identified from leaf arrangement, morphology, colour, and overall growth habit but in places the species appears to grade into *Leucopogon parviflorus*. Within and adjacent to the assessment area, virtually all tall shrubby *Leucopogon* specimens were clearly *Leucopogon parviflorus* but several individuals were not easily placed in this taxon.

Specimens putatively identified as *Leucopogon affinis* were located on the banks above Killiecrankie Creek, in tall *Leptospermum laevigatum* scrub north of Quoin Road and below the steep cliffs of Mount Killiecrankie (this site well outside the assessment area but not GPSed because it was on later placed in this species from collected specimens). Some specimens from the former two sites have been lodged with the Tasmanian Herbarium for future reference.

The records from the assessment area do not represent range extension with records from across Flinders Island. Given the localised occurrence of the species within the assessment area (based on current surveys), local-level management is suggested such as minor shifting of project elements to protect the species. In this context, it needs to be recognised that the species is tolerant of high levels of disturbance and it will persist on the edges of paddocks and the like such that formal buffers between individuals and a project element (e.g. cluster of buildings, access track, etc.) is not considered warranted. I am comfortable that the species is of relatively low conservation significance (because of the widespread distribution on the Bass Strait islands and high likelihood of many more sites than indicated by database records) that complex management is not warranted. If a particular site cannot be protected within the context of the project, loss of a small number of individuals is considered acceptable because other sites in close proximity to the assessment area will be retained undisturbed. That said, if there is an opportunity to utilise the species in ornamental plantings using locally collected seed (if present), this would appropriately offset any particular loss of individuals.

- *Ranunculus sessiliflorus* var. *sessiliflorus* ("rockplate buttercup")

Within the assessment area, the species was detected at just one site, where it occurred on a granite boulder amongst open *Eucalyptus globulus* forest. The patch was c. 40 x 40 cm and comprised perhaps 10-20 mature individuals and c. 100 seedlings amongst the mass of mature leaves.

The record from the assessment area represents a minor range infilling within Tasmania with the nearest records on Flinders Island being behind Marshall Bay and the eastern end of Five Mile (Jim) Road (there are only five other records from the island, mainly the central and southern areas, and one record from Inner Sister Island). The species is otherwise quite widespread on mainland Tasmania, and occurs in numerous reserves. The Scientific Advisory Committee (SAC) established under the Tasmanian *Threatened Species Protection Act 1995* recently recommended that the species be removed from schedules of the Act. At the time of writing, the relevant State minister has not made a decision but there is little doubt this will confirm the recommendation by SAC. Until **this decision is formalised, however, the species will need to be considered as "threatened"** and treated accordingly (at least with respect to the technical requirements for a permit to disturb the species).

Based on the current project design and the location of the species, it is highly unlikely the site will be affected. It is recommended that the status of the species be checked prior to any permit application (which will be required for other species) and the species only included in the application if it is still listed. Unlike a species such as *Cynoglossum australe* (see above), which is widespread and "weedy" within and close to the assessment area (and will manifestly benefit from the level of disturbance anticipated), *Ranunculus sessiliflorus* is highly localised. Even if the species is delisted and does not need to be formally considered, it is recommended that rock outcrops be avoided

wherever practical to maximise the opportunity for localised species to be maintained. Rock outcrops often support vascular plants (including ferns), non-vascular plants (bryophytes such as mosses and liverworts) and lichens not represented in even immediately adjacent vegetation, with the exposed rock substrate providing a local niche. This is the case for the assessment area with some of the species indicated in Appendix B only being recorded from the base of the near-vertical granite cliffs.

- *Stuckenia pectinata* (“fennel pondweed”)

This species is a wholly aquatic perennial herb and was detected from the small dam nestled amongst the dunes in the southern end of the assessment area. No estimate was made of population abundance (long-stemmed aquatic herb that forms tangled masses in the water column virtually impossible to separate and count) or extent (effectively the whole dam could potentially be occupied but likely only a small area would be at any one time).

For the record, the small dam also supported a native charophyte (aquatic freshwater macro-alga), which was not collected because the material was infertile (needs to be fertile to be identified by a specialist) – there are no threatened species of charophyte in Tasmania so the future collection and identification is for academic interest only (I have been collecting charophytes for a specialist colleague who is preparing the *Flora of Australia* treatment so filling in the gaps from poorly-collected areas, such as the Furneaux Group, is important).

The record from the assessment area represents a range extension within Tasmania with the nearest records on Flinders Island being Fergusons Lagoon behind Foochow Beach (east coast) and Nalinga Creek on Lady Barron Road south of Whitemark. The species is otherwise quite widespread on mainland Tasmania, albeit represented by only about 20 confirmed populations. The species is probably much more widespread than indicated by database records and herbarium collections because aquatic species tend to be under-collected and recorded in surveys.

It is my understanding that the small dam will remain unaffected by the project (it is assumed that a farm dam will supply the irrigation needs of the project). If this is the case, a permit to disturb the species will not be required. If works will affect the dam, the management of the species will need to be re-considered. The dam also provides a locally significant water source, the only one I detected amongst the dunes, which is important for a variety of fauna species (most notably frogs and birds).

- *Zygophyllum billardierei* (coast twinleaf)

Within Tasmania, *Zygophyllum billardierei* is restricted to the eastern Bass Strait islands, where it is relatively widespread (mainly on the western coastlines). It mainly occurs along the coastal fringe but is also present in dune hinterlands and further inland, where it occurs on calcareous sands in forest, wetland and heath communities. The records from the assessment area represent a minor range infilling with the species known from Killiecrankie to the south, and The Dock and Palana to the north.

Within the assessment area, the species was scattered to locally very dense, mainly occurring in disturbed sites such as the fringe of Quoin Road (where it forms dense swards on the ground and extends metres up shrubs) and amongst canopy gaps in tall long-unburnt dune scrub (where it was usually ground-hugging at various densities). That the species persists in the absence of disturbance is evidenced by the fact that it occurs in the unburnt *Leptospermum laevigatum* scrub, although in this habitat it tends to be in low abundance. However, the species is predominantly a disturbance-ophile, manifestly benefited by canopy opening (e.g. along Quoin Road).

Estimating the abundance and even the extent of the species that may be affected by the project is difficult because of the species' **growth habit**. It mainly occurs in the northern half of the assessment area where extensive patches will remain unaffected by the works. Elsewhere, whether

the species is disturbed or protected is considered moot as on-site evidence suggests it will be one of the primary re-colonisers of open areas meaning that the species is almost certain to become more extensive and abundant (e.g. along track verges, around buildings and on the edges of golf course elements).

Avoiding the species as part of works will be impractical and is not warranted based on the **widespread and “weedy” occurrences on the property and the obvious response to high levels of disturbance**. Estimating how many individuals and the extent of these individuals will be disturbed (usually a requirement of the permit application) is not practical not considered warranted (likely to be in the order of 100s to low 1000s from a property-wide population of perhaps 100s of 1000s if not millions). No special prescriptions should be applied for this species.

- *Isopogon ceratophyllus* (“horny conebush”)

In Tasmania, *Isopogon ceratophyllus* is restricted to the eastern Bass Strait islands (putatively extinct from King Island), where it is relatively widespread and sometimes locally common in heathlands and heathy woodlands. Within the assessment area there is a single record (S. Harris, 11 Dec. 1984, 572862mE 5592412mN ± 100 m). While I do not doubt the veracity of the identification of the species, the fact that the record has clearly been converted from the AGD66 to the GDA94 datum (or from a dot on a 1:100,000 map to a seemingly more precise point) because in 1984 field botanists were not carrying GPS units (so the metre-level easting/northing values are an artefact of data manipulation), I do doubt the 100 m precision assigned to the record. That the species was collected from somewhere in the area is highly likely. However, my forays into this now very dense granite-based heathland/scrub failed to detect the species.

While the precise location of the record is not known and there is no supporting herbarium specimen (not surprising for such a spinous and woody plant that is hard to press and does not require vouchers to confirm the identity), which often provide some information on extent and abundance (and often a more precise location), it is highly likely it came from the windswept heathy scrub on granite. This area will not be affected by the project so a permit to take an unknown number of specimens will not need to be considered, unless an area of potential habitat will be affected and further surveys detect an individual. Given the density of the vegetation, undertaking targeted surveys will be difficult and unlikely to reliably confirm the presence/absence of the species (the site was probably much more open in the mid 1980s when the species was detected). It may be more prudent to undertake localised surveys during or post-construction when some areas become more accessible but only if areas of potential habitat are affected (not likely at this stage of planning). The species is also highly distinctive and information could also be provided to surveyors at the time of marking out locations of project elements in this part of the assessment area: any reported sites could then be avoided by immediate flagging and minor element re-design.

- *Phyllangium distylis* (“tiny mitrewort”)

This is one of a suite of species of tiny annual herbs that flower ephemerally in response to suitable seasonal conditions with **detection an almost serendipitous affair (“right place, right time”)**. The record from the assessment area (J.S. Whinray, 20 Nov. 1966, 572612mE 5592283 mN ± 100 m) is reliable and is supported by a herbarium specimen. The precision of 100 m is somewhat erroneous because the easting/northing indicates a datum transformation of an originally probably somewhat imprecise position. The record coincides with one for *Stylidium beaugleholei* (“fan triggerplant”), another annual herb, collected on the same date but allocated a precision of 500 m, perhaps a better reflection of records from 1966 collected without GPS and only relying on older 1:100,000 topographic maps.

In Tasmania, *Phyllangium distylis* occurs near the coast in the north and northeast, with outlying populations on King Island, Cape Barren and Flinders islands, and the Midlands. The species may be locally abundant in its preferred habitat, which includes sandy humic heaths and open

shrublands, muddy soaks and the margins of ephemeral wetlands. The historic record from the assessment area represents the northernmost extent of the species in Tasmania.

Potential habitat for the species within and adjacent to the assessment area is extremely limited, being restricted to the skeletal soils between the residence on the separate title and the track to Stackys Bight. The open areas amongst windswept heathland on granite are probably the most likely locations, with the sandier calcareous soils appearing somewhat unsuitable (based on my experience with the species in the Midlands and on King Island). The species is likely to occupy seepages between and below massive granite exposures and sections of the walking track to Stackys Bight **are possibly ideal (slightly "better" soils that are ephemerally muddy)**.

This discussion is equally applicable to *Stylidium beaugleholei*, a species that often co-occurs with species of *Phyllangium*, and several other such annual ephemeral herbs. Candidates include *Stylidium despectum*, *Stylidium perpusillum*, *Phyllangium divergens*, *Myriophyllum integrifolium*, *Triglochin minutissimum* and *Calandrinia granulifera*, all of which are listed threatened species. Other species of such herbs may be present and have local biogeographic significance.

Unfortunately, my March surveys were well outside the peak flowering time of all of these species. However, the nominal points of the records of *Phyllangium distylis* and *Stylidium beaugleholei* are outside any areas to be affected by the project. Predicting the flowering period in any one year is difficult because it is affected by preceding seasonal conditions and disturbance events so the best guide is the collection date of local records, which would mean a mid-November survey. A spring-based survey is recommended for the area in and around villa site 6 (northernmost site) because this is in an area close to/within the heathland on granite discussed above.

- *Phylloglossum drummondii* ("pygmy clubmoss")

There is a record of this species from the Quoin property, with the database record falling on the paddocks in the southeastern part of the property. The record (J.S. Whinray, 31 Aug. 1966, 574212mE 5390183mN ± 400 m) is unlikely to actually be from the property because the **supporting herbarium voucher is labelled "c. 18 km N of Killiecrankie Road c. 1.6 km from Emita - Palana Road"**, which is more suggestive of a roadside verge/adjacent poorly-drained paddock than a record collected from a foray well west of Palana Road. The precision is somewhat erroneous because the easting/northing indicates a datum transformation of an originally imprecise position.

Irrespective of this, there is no suitable habitat for the species within the actual assessment area so no further consideration is warranted.

- *Stylidium beaugleholei* ("fan triggerplant")

See discussion under *Phyllangium distylis*.

The taxonomy of annually-flowering *Stylidium* species has received recent attention (e.g. Wege 2011) and we now have a much better understanding of identifying these tiny annual herbs. Recent surveys in the Midlands, northeast and on King Island has also clarified the range of habitats occupied by these species. There are two other species of annual *Stylidium* (*S. despectum* and *S. perpusillum*), which are also known from the Furneaux Group so could also be present.

- *Eucalyptus globulus* ("blue gum")

Tasmania has two subspecies of *Eucalyptus globulus* (de Salas & Baker 2014): subsp. *globulus* ("tasmanian blue gum") and subsp. *pseudoglobulus* ("gippsland blue gum"), the latter sometimes recognised as a species in its own right (e.g. Nicolle 2006).

E. globulus subsp. *pseudoglobulus* is differentiated from subsp. *globulus* because it has fruit in umbels of three (not one). Within and adjacent to the assessment area, on the gentle to steeper

slopes on granite-derived soils below the cliffs of Mount Killiecrankie, *Eucalyptus globulus* was dominant (mapped as a eucalypt forest mapping unit) or sparse. All material had fruit in 3s, characteristic of subsp. *pseudoglobulus*. DPIPWE's *Natural Values Atlas* (DPIWPE 2015a) still maintains records of *E. globulus* on northern Flinders Island (e.g. around Palana) as subsp. *pseudoglobulus*, despite the supporting notesheet on the species (TSS 2003) stating that "Rodondo Island is the only known location for this species in Tasmania" and "records of this species from the north of Flinders Island are considered to have closer affinities to Tasmanian *Eucalyptus globulus* subsp. *globulus*, even though they tend to be multiple fruited".

Nicolle (2006) states that "outlying populations [of *E. pseudoglobulus*] occur...on Rodondo Island [an island just south of the tip of Wilsons Promontory but administered by Tasmania]" and that "populations found elsewhere have here been included in other species (...Flinders Island – *E. globulus*)". Nicolle (2006) further notes that "intergrades (populations displaying intermediate characteristics) between *E. globulus* and *E. pseudoglobulus* occur where their distributions overlap in Gippsland and also possibly on northern Flinders Island". This approach is well-established in Tasmania (e.g. Williams & Potts 1996).

Research supports the separation of the Rodondo Island population (which has much smaller fruit in 3s and is clearly different to the Flinders Island material – B. Potts pers. comm.) with the inclusion of the northern Flinders Island material in subsp. *globulus* (e.g. Jordan et al. 1993; Yeoh 2011; Jones et al. 2012).

The practical outcome of this discussion is that the "blue gum" identified from within and adjacent to the assessment area is classified as *Eucalyptus globulus* subsp. *globulus*, a species not listed as threatened at a State or Commonwealth level. The implication is that the "taking" of individuals of this tree species does not require special legal consideration on its own. However, from a genetic perspective, retention of this part of the population of the *Eucalyptus globulus* species-complex is considered important. TSS (2003) states that "the plants from the Furneaux Group represent an important part of the evolutionary processes that have occurred within the *globulus* complex". This does not mean that loss of a small number of individuals is of great concern because the local population is abundant and extends into areas that will remain undisturbed. At a broader scale, in places "blue gum" forms a forest in its own right, which is itself classified as threatened under Schedule 3A of the Tasmanian *Nature Conservation Act 2002*. "Blue gum", irrespective of its genetic placement, is also an important foraging resource for the endangered swift parrot (*Lathamus discolor*). These two issues are considered under **RESULTS Vegetation types** Vegetation types recorded as part of the present study, **RESULTS Fauna species** Priority fauna species known from the assessment area (or potentially present), and **DISCUSSION Legislative and policy implications**.

Analysis of records of priority flora from vicinity of assessment area

Table F1 (Appendix F, see also Figure 7) provides a listing of priority flora from within the assessment area, and from 500 m and 5000 m of the assessment area (nominal buffer widths usually used to discuss the potential of a particular assessment area to support various species listed in databases), with comments on whether potential habitat is present for the species, and possible reasons why a species was not recorded. Some species not listed on databases but considered by the author to have potential to occur in the survey area are also discussed.

Note that the field assessment was not restricted to the species listed in Table F1 but considered any threatened flora with the potential to be present. While the database analysis utilises a nominal buffer of 5000 m, the author's own experience of the vegetation and flora of Tasmania's near-coastal vegetation (especially the northeast), combined with database interrogation, meant that the specific potential for numerous other species previously recorded from the wider area were taken into account.

Flora species of biogeographic or other conservation interest

The assessment area supports a number of species that, while not formally listed as threatened on State or Commonwealth legislation so will not require formal conservation management, have some local conservation significance.

The “basin” formed by the “amphitheatre” of Mount Killiecrankie and “K2” is essentially “old-growth” wind-pruned coastal scrub by virtue of the time since the last fire. While the swamp forest parts would not meet formal criteria for “old-growth” (because they are continually recycling themselves – there is some excellent ecological information on this process available), the fringes of slightly better-drained terrain support a suite of species that in themselves are not unexpected but are of a stature rarely encountered. For example, I encountered specimens of *Olearia viscosa* (viscid daisybush) that were at least 4 m tall and broad and had stems up to 15 cm diameter – elsewhere in Tasmania, finger-thin stems are the usual form for this forest shrub. *Alyxia buxifolia* (seabox) is also achieving a stature of phenomenal proportion – descriptions of the species (e.g. Curtis 1967; Jeanes 1999) suggest that it rarely exceeds 2.5 m in height and is usually much less due to wind-pruning. Within the assessment area, the species is attaining heights of close to 5 m and is an important food source for the locally dense population of black currawongs (*Strepera fuliginosa*) and forest ravens (*Corvus tasmanicus*), and presumably a suite of other vertebrates. *Pomaderris apetala* subsp. *maritima* (coast dogwood) is also usually a low shrub (e.g. Walsh & Coates 1997) but in parts of the assessment area it is locally dominant and forms stands c. 4-8 m tall.

The genetic significance of the *Eucalyptus globulus* in this part of the assessment area has been previously discussed (see **RESULTS Plant species** Priority flora species known from the assessment area). Amongst the stands of mixed *Eucalyptus globulus*-*E. nitida*-*Melaleuca ericifolia*, there are locally dense to sporadic occurrences of *Callitris rhomboidea* (“oyster bay pine”, or on the islands “cape barren pine”). Their stature suggests a long period without fire: this species is capable of regenerating continuously without major disturbance, or phasically after fire or other major devegetating events (Harris & Kirkpatrick 1991a) such that some disturbance is acceptable. In addition, the floristic composition of the blue gum-pine forest is not outlined in descriptions under the TASVEG classification (Kitchener & Harris 2013) nor specifically in descriptions of forests dominated by *Callitris* (e.g. Harris & Kirkpatrick 1991b), lending some additional significance to these stands. This does not mean that the sites should not be disturbed, rather that where practical the stands of blue gum-pine are retained.

Also of biogeographic interest is almost the northern most collections of two fern species from Tasmania (Garrett 1996), namely *Hypolepis glandulifera* (“downy groundfern”) from the *Melaleuca ericifolia* swamp forest just in from the coast track and *Pellaea falcata* (“sickle fern”), locally common in scrub opening between the coast track and the granite cliffs.

While none of these species require formal special management in their own right, designing the project to maintain the integrity of as much of the existing vegetation as possible is recommended. The main concern is the potentially higher risk of fire (simply because there will be more people around) entering the long-undisturbed vegetation. Whether a longer period without fire or some deliberate intervention is desirable or warranted is a philosophical ecological debate that is unrelated to the project. **In my opinion, maintaining the “old-growth” areas is desirable because** ample sites suitable for colonisation by opportunistic pioneer species forming new stands of young forest, woodland and scrub will be created such that maintaining a high floristic diversity is achievable without intervention.

Fauna species

General observations (fauna)

Appendix C provides an annotated list of vertebrate species recorded from the assessment area, based on the present assessments, which includes 39 species comprising 6 mammal, 27 bird, 2 amphibian and 4 reptile species. Undoubtedly further surveys will continue to increase this list (especially birds), but it is unlikely that further species with a high priority for conservation management will be detected.

An disused drey (nest) of a ringtail possum was detected from the northern part of the study area (Figure 9).

Priority fauna species known from the assessment area (or potentially present)

Two fauna species listed as threatened on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* were detected from the fringe of the assessment area (Killiecrankie Beach) or are known from a database record from the same area; as follows (Figure 7):

- *Thinornis cucullatus* ("hooded plover"); and
- *Vombatus ursinus* subsp. *ursinus* ("Flinders Island wombat").

Marginal potential habitat is present for an additional two species listed on this Act, as follows:

- *Lathamus discolor* ("swift parrot"); and
- *Litoria raniformis* ("green and golden frog") – refer to Appendix G, where the potential for this species is discussed.

No fauna species listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* were detected from the assessment area. The assessment area is within the predicted/known range of several species, and supports potential habitat of these species, as follows:

- *Lathamus discolor* ("swift parrot"); and
 - *Litoria raniformis* ("green and golden frog").
-
- *Thinornis cucullatus* subsp. *cucullatus* (hooded plover)

Killiecrankie Beach is a known site for the hooded plover (E.J. Woehler; 3 Jan. 2006; 572585mE 5591052mN; E.J. Woehler; 8 Nov. 2004; 567462mE 5588472mN) and the species was detected during the course of the present surveys. Whether the species utilises the beach for breeding is not known because much of the beach is wave-washed to the front of vertical dunes (potentially some limited parts of the southern and northern end of the beach in more sheltered, less wave-washed location arte suitable).

On the surface, it appears obvious that a project in the hinter-dunes would not directly affect the beach environment, However, there is the potential that the project would lead to an increase in a threatening process (e.g. people, vehicles, dogs entering Killiecrankie Beach and disturbing nesting birds). The project design does not include any element that would appear to result in more vehicles entering Killiecrankie Beach (most currently access from Killiecrankie township to the south, which is not controllable as part of the project). The project design does not include any element that would appear to result in more dogs entering Killiecrankie Beach (because any visitors staying on site would not bring dogs to the facility). There is an obvious opportunity for more people to visit

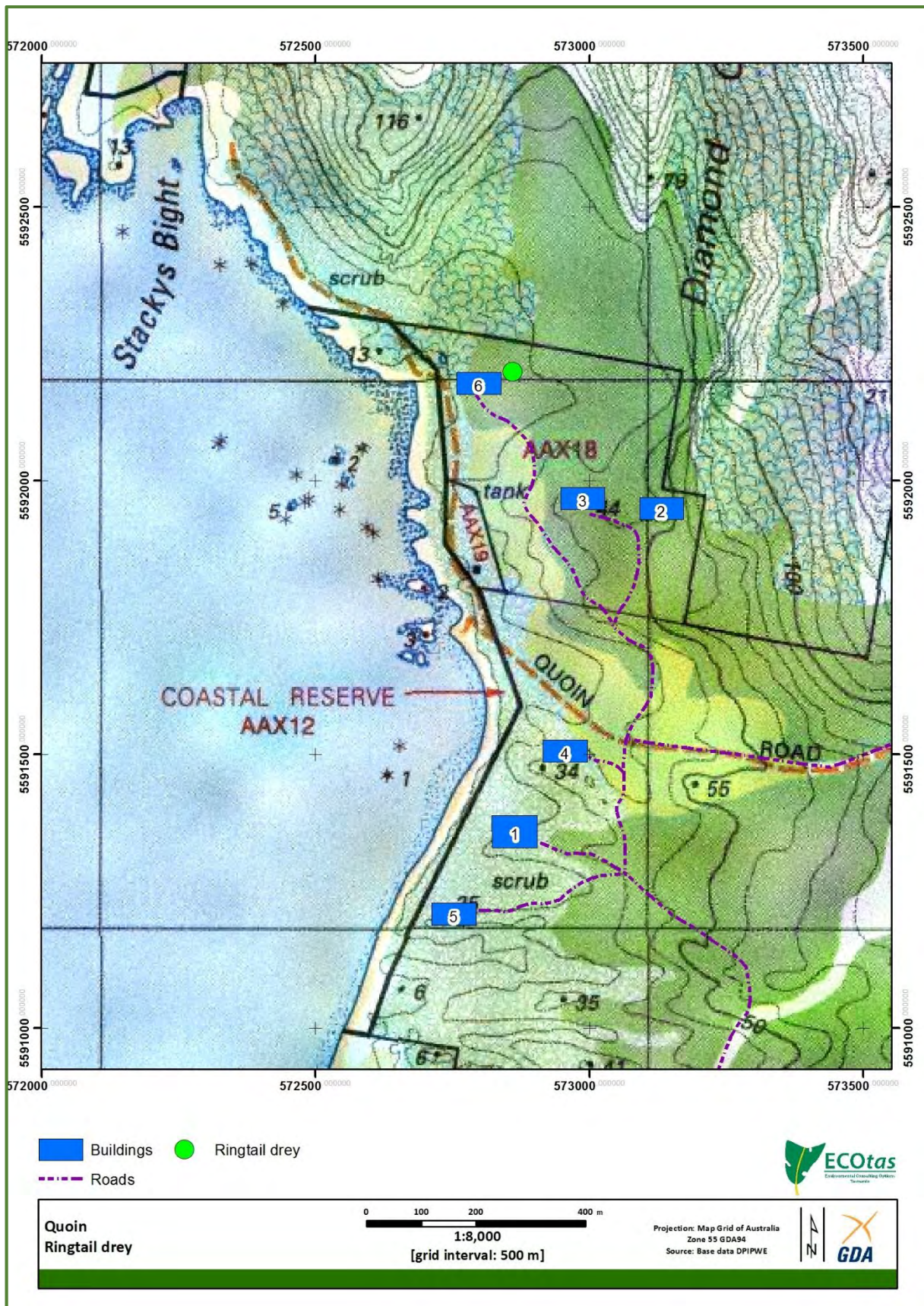


Figure 9. Location of disused ringtail drey

the beach because it is accessible from the accommodation. It is difficult to ascertain the degree to which this may disturb nesting hooded plovers because it is not known to what level beach visitors may increase and which section of beach they visit (most likely the northern section).

On the available evidence it is difficult to justify that the proposed project would result in a significant impact on the hooded plover (see **DISCUSSION Legislative and policy implications** for a more detailed discussion on this issue). There are some actions that could be implemented that may reduce the degree of potential impact on the hooded plover from possible increased visitor numbers. These include the standard DPIPWE signs about shore-nesting birds being installed at all obvious each entrances, advising visitors to stay on the hard sand rather than soft sand used for nesting. In addition, surveys during the breeding season could be undertaken and when a breeding site is identified it can be temporarily fenced off (this is undertaken on many popular beaches around the Australian coastline). Surveys could be conducted during the breeding season for the first three years after the completion of works and that fencing be erected around any identified nest sites concomitant with monitoring to ascertain the success of nesting. It may also be prudent to collect information from visitors as to the level of visitation to Killiecrankie Beach (and perhaps the section of beach visited) to inform further development of monitoring and nest management. I have not suggested a funding source for undertaking surveys and fencing and suggest this be a discussion point as part of the development of the project.

- ***Vombatus ursinus* subsp. *ursinus*** (Flinders Island wombat)

The Flinders Island wombat is listed as Vulnerable on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* but not considered threatened by State authorities. The subspecies was once present on most Bass Strait island but is now restricted to Flinders Island, where its population appears stable (in the mid 1000s). The main threats to the species are sarcoptic mange, roadkill and apparently vegetation clearing. The species is locally common across the Quoin property, seeming to be most prevalent on the edges of sandy dune swales close to paddocks, with virtually no burrows observed amongst the taller dense dune scrub.

The specific areas proposed for construction that will involve shifting of soil (and therefore disturbance to burrows) were assessed and no burrows were identified. That all burrows will be avoided by works (including buildings, upgrades to tracks, etc.) is difficult to ascertain site assessment indicated that this is the case at present. At a local scale, the species is likely to be benefited by the project through creation of forest/non-forest margins, which it seems to prefer for burrowing, and through provision of additional grazing ground. In my opinion, the project will not have a significant impact on this species (see **DISCUSSION Legislative and policy implications** for a more detailed discussion on this issue).

- ***Lathamus discolor*** (swift parrot)

This species is not listed in DPIPWE's *Natural Values Atlas* database (DPIPWE 2015a), the Forest Practices Authority's *Biodiversity Values Database* (FPA 2015) or the Department of Environment's *Protected Matters Search Tool* report (CofA 2015) but the species is known to utilise the Furneaux Group as part of its migration route and there are now known nest sites on Flinders Island, the latter from the Costers Gully area in the south of the island, where breeding behaviour was observed in two pairs (NCHD 2012). On this basis, a conservative approach is taken here and the species is considered.

Potential habitat for the swift parrot is described as comprising both potential foraging habitat and potential breeding habitat, with potential foraging habitat described as "*Eucalyptus globulus* or *Eucalyptus ovata* trees that are old enough to flower" and potential breeding habitat as "eucalypt forests that contain hollow-bearing trees" (FPA 2015).

Potential breeding habitat is absent from the disturbance footprint of the project and its immediate surrounds because of the lack of hollow-bearing trees. Even nearby eucalypt-dominated forests are essentially devoid of hollow-bearing trees with areas dominated by *Eucalyptus nitida* unlikely to ever support such trees (low mallee-form forest in back of amphitheatre/basin) and those dominated by *Eucalyptus globulus* mainly of regrowth to mature form but most are sprawling and low rather than tall with well-formed hollows (such specimens restricted to areas near the granite cliffs and well outside the project area).

Potential foraging habitat is also limited and occurs in the form of individuals of *Eucalyptus globulus* scattered through the gentle terrain behind the coast to locally dominant in forest below the granite cliffs.

While the assessment area may be of relatively low importance (from a Statewide perspective) as potential foraging habitat for the swift parrot (highly unlikely to be used for breeding given its geographic position and stature of trees), minimising loss of such habitat should be a key management objective. This can be achieved by:

- minimising the felling of *Eucalyptus globulus*.

Where removal of blue gums is unavoidable, a mitigation strategy is recommended to offset the loss of individuals (with the intent of achieving a long-term net gain of individuals of blue gum and hence potential foraging habitat), as follows:

- keep a record of the number of *Eucalyptus globulus* felled;
- for every individual of *Eucalyptus globulus* felled, re-plant five (5) times as many elsewhere within the general vicinity of the assessment area;
- locally sourced seed (to maintain genetic characteristics) should be used;
- the precise position of the plantings is not critical – some example sites include: (1) ornamental plantings around new buildings or existing farm buildings; (2) a possible grove/line of plantings along the access road to the main facility (even from as far back as the gate on Palana Road) and internal access tracks; and/or (3) supplementary plantings in and around existing stands of eucalypt forest (or other forest types) on the property;
- seedlings will need to be protected from browsing until well-established (i.e. greater than the height of the average wallaby);
- maintain a record of the sites where plantings occur and their success;
- if survival rates drop below a set threshold, supplement plant further individuals (possibly selecting sites where a greater success rate has been achieved) – the 5:1 offset ratio is suggested because of the possible loss of individuals so setting the threshold at 3:1 will still result in a net gain outcome.

Analysis of records of priority fauna from vicinity of assessment area

Table G1 (Appendix G) provides a listing of priority fauna from within the assessment area, and from 500 m and 5000 m of the assessment area (nominal buffer widths usually used to discuss the potential of a particular assessment area to support various species listed in databases), with comments on whether potential habitat is present for the species, and possible reasons why a species was not recorded.

Other ecological values

Weed species

Most of the study title is remarkably free from exotic plant species, and only one species classified as a “declared weed” within the meaning of the Tasmanian *Weed Management Act 1999* was detected from the project footprint, as follows (Figure 10):

- *Lycium ferocissimum* (“african boxthorn”) –also classified as a “Weed of National Significance” (WoNS).

An additional species classified as a “declared weed” is present on the broader property (but currently under active management by the owners and not within areas likely to be affected by the project), as follows:

- *Echium plantagineum* (“patersons curse”).

An additional species considered as an “environmental weed” is present along the majority of Killiecrankie Beach and extending into the dunes, as follows:

- *Euphorbia paralias* (“sea spurge”).

Further information the species within the assessment area is provided below. Information sheets on each of these species is also provided as attachments to the report for further information.

- *Lycium ferocissimum* (“african boxthorn”)

Boxthorn was highly localised to a locally dense patch comprising several mature individuals on the eastern verge of Quoin Road just before the coastline (see Appendix E for locality information and Appendix D for annotated images).

The species is widespread on the Furneaux islands and considered locally problematic. The virtual absence of the species from the assessment area means that maintaining this status becomes a high management priority. On-site discussions have already meant that eradication of the only identified patch will take place in the near future. Some follow-up may be needed to maintain the weed-free status.

- *Euphorbia paralias* (“sea spurge”)

This species is not formally classified as a declared weed but is widely regarded as one of the more problematic species in Tasmania, present along most coasts. There is an active volunteer program of removal for some Tasmanian coasts (e.g. see wildcaretas.org.au/branches/wildcare-sprats/).

Within and near the assessment area, the species is locally dense to sporadic along the dune front of Killiecrankie Beach and extends into some slightly more inland areas, rarely more than 10-20 m from the dune edge but locally dense in and around one major sand blow (see Appendix E for locality information and Appendix D for annotated images).

Virtually all occurrences of *Euphorbia paralias* from the assessment area are within the Crown reserve and, to the best of my knowledge, has not been subject to active control. Experience from wilderness areas of the west coast of Tasmania has shown that eradication (or at least near-eradication) is a realistic long-term goal, but the term long-term is highlighted. Removal and eventual eradication requires a dedicated team of volunteers and administrative support (e.g. NRM group, local government, Parks & Wildlife Service, etc.) and needs to take account of local site conditions (e.g. risk of erosion) and other values of local significance (e.g. shore-nesting birds, sensitive geomorphological features).

The project has a very low potential to spread sea spurge to new parts of the dune system (both on private property and Crown reserve) because it is not present in areas likely to be disturbed. However, all on-site actions should be undertaken to minimise this risk. Creation of temporary (or longer-term) patches of bare ground (e.g. sandy access tracks, cleared vegetation around villa clusters) are ideally suited to rapid colonisation by sea spurge. However, the species is distinctive and easily treated such that ongoing monitoring and treatment will practically and feasibly maintain the weed-free status.

There may be opportunities for the project to make a significant contribution to the removal of sea spurge from parts of the Crown reserve along Killiecrankie Beach as part of an offset/mitigation strategy. This would need to be carefully considered in terms of the role of different parties and the dedication/administration of resources.

At a broader level, maintaining the virtual weed-free status of the project area is considered a very high management priority. The key to achieving this will be strict machinery and vehicle hygiene protocols and maintaining work sites (especially the access roads) free from weeds.

It is recommended that a weed and hygiene management plan be developed as part of any project proposal for the site. This plan should include, as a minimum:

- machinery and vehicle hygiene protocols in accordance with Rudman et al. (2004), Rudman (2005) and Allan & Gartenstein (2010);
- provisions for the removal of *Lycium ferocissimum* (african boxthorn), which is highly localised and practically removed with on-site farm vehicles and machinery;
- provisions to monitor and control *Euphorbia paralias* (sea spurge) within and adjacent to the project area, with the long-term objective being the maintenance of the project area as weed-free;
- consideration of a broader multi-party resource-managed program of control of *Euphorbia paralias* (sea spurge) from along Killiecrankie Beach and adjacent dunes within the Crown reserve;
- provisions for attending to other weeds that may establish post-works (e.g. a 5-year weed monitoring and control plan); and
- an indication of plant species that should not be utilised in ornamental plantings (i.e. those that have the potential to become weedy).

Rootrot pathogen, *Phytophthora cinnamomi*

Phytophthora cinnamomi (PC) is widespread in lowland areas of Tasmania, across all land tenures. However, disease will not develop when soils are too cold or too dry. For these reasons, PC is not a threat to susceptible plant species that grow at altitudes higher than about 700 metres or where annual rainfall is less than about 600 mm (e.g. Midlands and Derwent Valley). Furthermore, disease is unlikely to develop beneath a dense canopy of vegetation because shading cools the soils to below the optimum temperature for the pathogen. A continuous canopy of vegetation taller than about 2 metres is sufficient to suppress disease. Hence PC is not considered a threat to susceptible plant species growing in wet sclerophyll forests, rainforests (except disturbed rainforests on infertile soils) and scrub e.g. teatree scrub (Rudman 2005; FPA 2009).

The assessment area supports extensive areas of vegetation recognised as not or only marginally susceptible to the pathogen, although there are some moderately to highly susceptible plant species present (e.g. members of the Proteaceae, Fabaceae and Ericaceae families). Field assessment did not detect any obvious evidence of the pathogen (e.g. "wavefront" of poor health understorey, dead or dying individual plants) and it appears the site is presently free of the pathogen. It is usual to undertake soil sampling for later laboratory analysis for the pathogen only when there is field evidence of the disease.

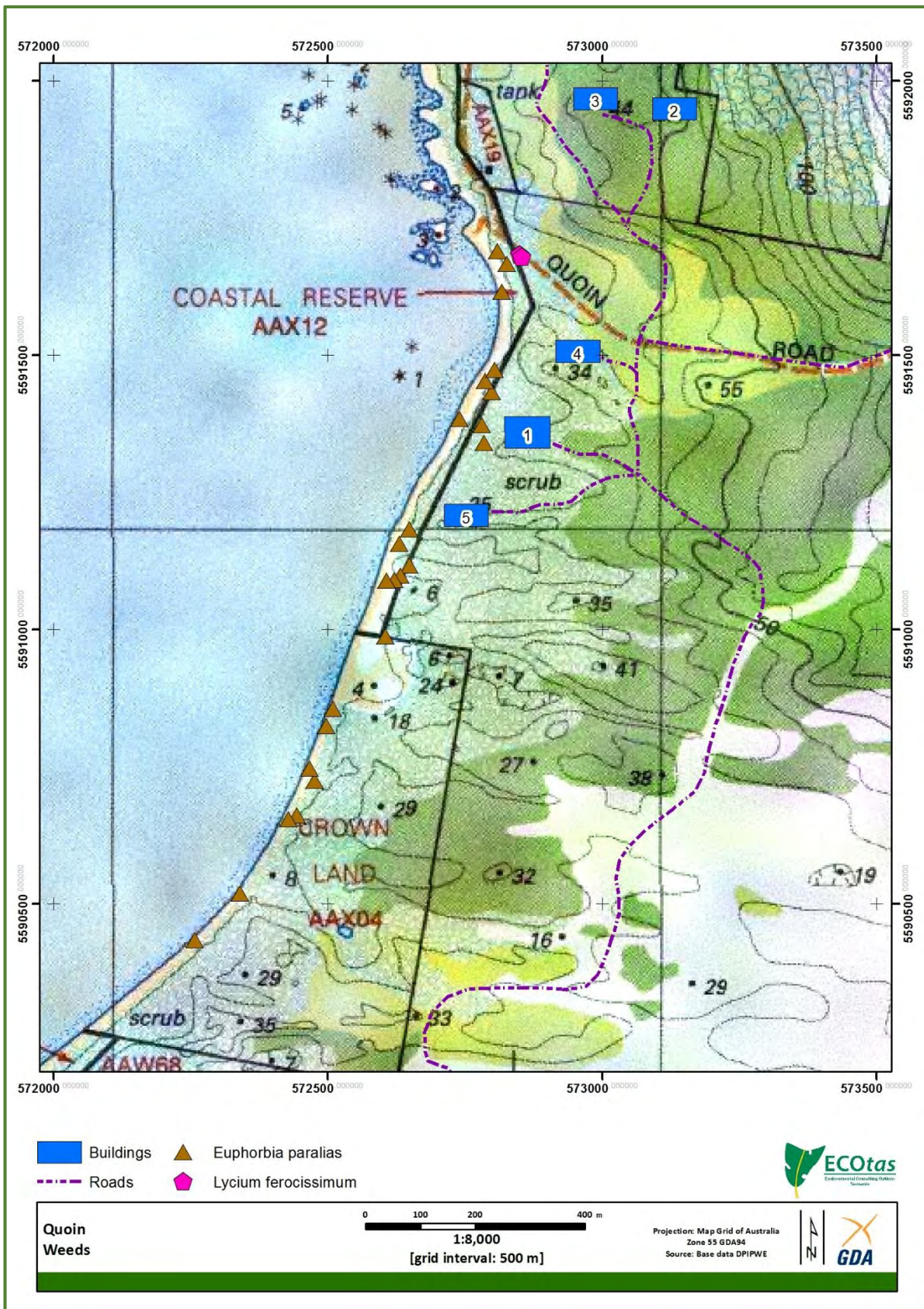


Figure 9. Distribution of weeds from within and near the project area

Maintaining the apparent disease-free status of the site is considered an important management priority. As with the management of weeds, the key to achieving this will be strict machinery and vehicle hygiene protocols, which can be incorporated into a project-level weed and hygiene management plan.

Myrtle wilt

Myrtle wilt, caused by a wind-borne fungus (*Chalara australis*), occurs naturally in rainforest where myrtle beech (*Nothofagus cunninghamii*) is present. The fungus enters wounds in the tree, usually caused by damage from wood-boring insects, wind damage and forest clearing. The incidence of myrtle wilt often increases forest clearing events such as windthrow and wildfire.

Nothofagus cunninghamii is absent from the assessment area.

Myrtle rust

Myrtle rust is a disease limited to plants in the Myrtaceae family. This plant disease is a member of the guava rust complex caused by *Puccinia psidii*, a known significant pathogen of Myrtaceae plants outside Australia. Infestations are currently limited to NSW, Victoria, Queensland and Tasmania (DPIPWE 2015d).

No evidence of myrtle rust was noted. Adherence to the strict biosecurity guidelines issued by DPIPWE should be applied to the project: this relates mainly to the species used in ornamental plantings (suggest these are restricted to locally indigenous species, ideally from site-collected propagules).

Chytrid fungus and other freshwater pathogens

Native freshwater species and habitat are under threat from freshwater pests and pathogens including *Phytophthora cinnamomi* (root rot), *Batrachochytrium dendrobatidis* (Chytrid frog disease), *Mucor amphibiorum* (platypus Mucor disease) and the freshwater algal pest *Didymosphenia geminata* (Didymo) (Allan & Gartenstein 2010). Freshwater pests and pathogens are spread to new areas when contaminated water, mud, gravel, soil and plant material or infected animals are moved between sites. Contaminated materials and animals are commonly transported on boots, equipment, vehicles tyres and during road construction and maintenance activities. Once a pest pathogen is present in a water system it is usually impossible to eradicate. The manual *Keeping it Clean – A Tasmanian Field Hygiene Manual to Prevent the Spread of Freshwater Pests and Pathogens* (Allan & Gartenstein 2010) provides information on how to prevent the spread of freshwater pests and pathogens in Tasmanian waterways wetlands, swamps and boggy areas.

The assessment area only supports one small dam nestled amongst the dunes, where two species of common frog were detected by call. Golf courses require a lot of water but it is understood the main source will be a large farm dam located close to the homestead. Unless there are proposals to shift water from one catchment to another, no special management actions are needed to because water (whether contaminated or not with the pathogen) will be managed in-catchment meaning the risk of introducing or spreading the disease is negated.

Additional "Matters of National Environmental Significance"

The EPBCA *Protected Matters Area* report (CofA 2015) provides listing of Matters of National Environmental Significance (MNES) that are known to be, maybe or likely to be present within the report area, or be affected by activities within the report area (i.e. "downstream" impacts).

Listed Threatened Ecological Communities

CofA (2015) indicates that "Giant Kelp Marine Forests of South East Australia" (listed as an Endangered community) may occur within the area. No part of the project will affect the marine littoral zone so this MNES is not considered further.

CofA (2015) indicates that "Subtropical and Temperate Coastal Saltmarsh" (listed as a Vulnerable community) is likely to occur within the area. No part of the project or surrounds is currently mapped as any form of "saltmarsh" vegetation type (DPIPWE 2015a for TASVEG 3.0 coverage – see also Figure 6), and field assessment did not identify any such vegetation (see Table 1). No areas of this community will be impacted so this MNES is not considered further.

Places on the Register of the National Estate (RNE)

CofA (2015) indicates that the report area may affect the following natural RNE places: "Mount Killiecrankie Geoh heritage Area" (TAS Indicative Place) and "Mount Boyes – Wingaroo Heaths" (TAS Registered).

Information provided at <http://www.environment.gov.au> [accessed 1 April 2015] indicates that the Mount Killiecrankie Geoh heritage Area is a nominal c. 50 ha area located 3 km north-northeast of Killiecrankie. Information provided indicates that the site is registered because of the following reasons:

"Mount Killiecrankie Geoh heritage area is important for contemporary refugia. It contains communities that are strongly associated with climatic and topographic factors that confer a degree of protection from endangering processes such as fire and disease. These refugia have two important roles: they provide locations for the conservation of species and communities and they provide sources for population expansion if limiting conditions prevail (Criterion A.2).

Mount Killiecrankie Geoh heritage area is important for its geoh heritage values. That is, it contains features or processes which demonstrate the principal characteristics of the regional geodiversity (geology, landforms, soils), or which are unusual or outstanding aspects of it".

I have insufficient information (and it is not my area of expertise) to assess the potential impacts of the proposed project on this RNE place.

I note that DPIPWE's Tasmanian Geoconservation Database, accessed through TheList and included in the *Natural Values Atlas* report for the assessment area (DPIPWE 2015a), indicates additional geoconservation values present within and close to the assessment area, which relate, at least in part, to the RNE place, including:

- Site 2262 Killiecrankie Topaz ("Diamond") Locality;
- Site 2300 Mt Killiecrankie Cliff (outstanding example of a granite cliff) – this does not refer to the vertical cliff-face on the immediate west side of Mount Killiecrankie but cliffs further to the northwest;

- Site 2268 Mt Killiecrankie Granite Pluton; and
- Site 2283 Stackys Bight Arches.

Again, it is not my area of expertise to provide comment on these values. However, the link between physical features and ecological values is noted. In this case, the primary concern relates to the possible increase in fire risk to the vegetation nestled at the base of the massive granite cliffs and in the "basin" of the "amphitheatre" created by the bare cliffs of Mount Killiecrankie, Diamond Gully and "K2" (the peak to the west of Mount Killiecrankie). This is fire-sensitive vegetation because of the presence of now long unburnt sparse eucalypt forest co-dominated by *Callitris rhomboidea* (oyster bay pine). It is noted that part of Diamond Gully is close to the proposed extent of the project but it is assumed because of its configuration (steep, wide, flood-prone) that it will remain unaffected by the project.

Information provided at <http://www.environment.gov.au> [accessed 1 April 2015] indicates that the Mount Boyes – Wingaroo Heaths has its western extent on the eastern side of Palana Road i.e. not within the Quoin property. This RNE is not considered further.

CofA (2015) indicates that the report area may affect the following indigenous RNE place: "Old Mans Head South Middens" (TAS Interim List). It is beyond the scope of the present ecological report to consider non-ecological values except to note that in my experience, I did not observe features within the area I assessed that I recognised as middens.

Conservation of Freshwater Ecosystem Values (CFEV)

DPIPWE's *Conservation of Freshwater Ecosystem Values* (CFEV) database indicates three ecosystem values within the broader assessment area:

- Killiecrankie Creek (River Section 349493);
- Killiecrankie Wetland (Wetland 22318); and
- Killiecrankie Karst (Karst 124).

While the management of some aspects of freshwater ecosystem values is outside my area of expertise, I am prepared to comment on the ecological aspects of the identified features and whether the project will have a deleterious impact on these. The project will not affect Killiecrankie Creek as there are no project elements adjacent to it. The project will not impact on the wetland area (specifically identified for its "short paperbark swamp" values, which have been recognised and highlighted elsewhere in this report). The ecological values of the Killiecrankie Karst are limited but include a mosaic of dune grasslands and scrubs and various threatened flora species but no specific areas of vegetation types such as "heathland on calcareous substrates" (and the specific suite of threatened flora species that are associated with that vegetation type). Limited outcrops of calcarenite are present but will not be affected by any of the project elements.

DISCUSSION

Summary of key findings

Threatened flora

- No plant species listed as threatened on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* were detected, or are known from database records, from the assessment area. The assessment area does not support significant potential habitat of EPBCA-listed species such that further surveys are not warranted.
- Seven plant species listed as threatened, all as "rare" (Schedule 5), on the Tasmanian *Threatened Species Protection Act 1995* were detected from the assessment area, as follows:
 - *Acacia uncifolia* ("coast wirilda");
 - *Cynoglossum australe* ("coast houndstongue");
 - *Gyrostemon thesioides* ("broom wheelfruit");
 - *Leucopogon affinis* ("lanceleaf beardheath");
 - *Ranunculus sessiliflorus* var. *sessiliflorus* ("rockplate buttercup");
 - *Stuckenia pectinata* ("fennel pondweed"); and
 - *Zygophyllum billardierei* ("coast twinleaf").
- Of these species, only sites supporting *Cynoglossum australe*, *Acacia uncifolia* and *Zygophyllum billardierei* may be affected by the proposed works, with all other species located at sites away from areas likely to be disturbed.
- No special management is recommended for *Cynoglossum australe*, which has been recommended for removals from the Act (this may need to be checked closer to the time of a formal permit application).
- Where practical, avoiding mature plants of *Acacia uncifolia* is recommended but where this is not feasible, the local population that will remain unaffected is suggested as adequate to allow removal of a small number of individuals from other sites while still retaining the viability of the local population.
- It is likely to be impractical to avoid disturbance to *Zygophyllum billardierei* but this disturbance-loving species will not require special management prescriptions to maintain its local viability (likely to be benefited by any disturbance).
- Four additional species listed as threatened (all also rare except *Isopogon ceratophyllus*, which is listed as vulnerable) on the Tasmanian *Threatened Species Protection Act 1995* are known from database records from the vicinity of the assessment area (i.e. within a distance to be considered as part of the assessment area), as follows:
 - *Isopogon ceratophyllus* ("horny conebrush");
 - *Phyllangium distylis* ("tiny mitrewort");
 - *Phylloglossum drummondii* ("pygmy clubmoss"); and
 - *Stylidium beaugleholei* ("fan triggerplant").

Threatened fauna

- Two fauna species listed as threatened on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* were detected from the fringe of the assessment area (Killiecrankie Beach) or are known from a database record from the same area; as follows:
 - *Thinornis cucullatus* (“hooded plover”); and
 - *Vombatus ursinus* subsp. *ursinus* (“Flinders Island wombat”).
- Marginal potential habitat is present for an additional two species listed on this Act, as follows:
 - *Lathamus discolor* (“swift parrot”); and
 - *Litoria raniformis* (“green and golden frog”).
- No fauna species listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* were detected from the assessment area. The assessment area is within the predicted/known range of several species, and supports potential habitat of these species, as follows:
 - *Lathamus discolor* (“swift parrot”); and
 - *Litoria raniformis* (“green and golden frog”).
- Recommendations are provided in relation to the management of potential habitat of the swift parrot (minimise loss of *Eucalyptus globulus*).
- The Flinders Island wombat is unlikely to be deleteriously affected by the proposal – some discussion on the management of this species is provided.
- Some suggestions on the management of the minimising increased disturbance to the hooded plover along Killiecrankie Beach are provided for consideration.
- No special management actions are recommended in relation to the green and golden frog (unlikely to be present based on distribution).

Vegetation types

- The assessment area supports ten TASVEG mapping units:
 - *Eucalyptus viminalis* – *Eucalyptus globulus* coastal forest and woodland (DVC);
 - *Eucalyptus nitida* Furneaux forest (DNF);
 - *Allocasuarina verticillata* forest (NAV);
 - *Melaleuca ericifolia* swamp forest (NME);
 - coastal heathland (SCH);
 - coastal scrub on alkaline sands (SCA);
 - *Melaleuca squarrosa* scrub (SMR);
 - coastal grass and herbfield (GHC);
 - agricultural land (FAG); and
 - weed infestation (FWU).
- DVC and NME are classified as threatened under Schedule 3A of the Tasmanian *Nature Conservation Act 2002*. DVC is unlikely to be affected by the project (may occur close to one of the villa sites). NME will be affected by an access route and its extent will need to be further mapped.

- SCA will be the main vegetation type affected by the project. There are no legislative or policy constraints on clearing and/or modification of this vegetation community.

Weeds

- One species classified as a “declared weed” within the meaning of the Tasmanian *Weed Management Act 1999* was detected from within the assessment area: *Lycium ferocissimum* (african boxthorn) was localised to a dense clump on the southern side of the sandy track to the beach.
- One additional “environmental weed: was detected: *Euphorbia paralias* (sea spurge) is locally frequent along Killiecrankie Beach
- Recommendations are provided in relation to management of weeds, primarily to maximise the chance of the site remaining free from declared weed species.

Plant disease

- No evidence of plant disease (*Phytophthora cinnamomi*, rootrot fungus; myrtle wilt; myrtle rust) was detected.
- Some management recommendations are made to minimise the risk of introducing plant pathogens, especially rootrot fungus (mainly machinery hygiene protocols).

Animal disease (chytrid)

- The assessment area is not known to support the frog chytrid pathogen.
- Some management recommendations are made to minimise the risk of introducing the pathogen.

Summary of key ecological impacts for each project element

For each project element (see Master Plan at Figure 1), and summarised in the list below, I have examined the ecological findings and indicated the key ecological findings related to that project element.

1. Main facility/wellness
2. Villa site – 5 x villa
3. Villa site – 2 x villa
4. Villa site – 8 x villa
5. Villa site – 4 x villa
6. Villa site – 5 x villa
7. Maintenance shed
8. Manager’s House site #1
9. Manager’s House site #2
10. Owner’s house site #1
11. Ex owner’s house site
12. Ex bunk house (refurb)
13. Storage shed
14. Proposed roads in.

Table 2 indicates the key findings against each element. The main concern is that some of the project elements have not been subject to a element-level ecological survey (because their location has changed since the initial surveys), although the risk of detecting ecological values that would further or differently constrain the project is very low. The project elements (buildings) are unlikely to have a significant impact on ecological values of high conservation concern. One villa site may affect some individuals of *Gyrostemon thesioides*, although this is not considered a significant constraint (may be possible to work around or manage under permit conditions), and some other populations of threatened flora (e.g.t. *Cynoglossum australe*, *Zygophyllum billardierei*)

will be affected but these species are locally common disturbance-loving plants that will not be deleteriously affected.

The access routes will have the greatest impact on ecological values including threatened flora and various vegetation types. The specific routes have not been surveyed as yet (except in broad terms) such that the extent of each vegetation type to be affected (especially the mosaic of swamp forest vegetation types in and around the basin/ amphitheatre) is not known.

Table 2. Key ecological issues related to each site

Project element	Vegetation types	Threatened flora
Main facility/wellness	"coastal grass and herbfield" (GHC) – not threatened "coastal scrub on alkaline sands" (SCA) – not threatened	None detected (not subject to targeted element-level survey but broader survey targeted all grassier more open areas of dune)
Villa site – 5 x villa (site 2)	"coastal scrub on alkaline sands" (SCA) – not threatened [the site is close to an area supporting <i>Eucalyptus globulus</i> , which would be classified as " <i>Eucalyptus viminalis</i> - <i>Eucalyptus globulus</i> coastal forest and woodland" (DVC), a threatened vegetation type – the extent of encroachment into DVC may need to be determined by follow-up survey]	<i>Zygophyllum billardierei</i> is located close to the site – see comments on this species in section above (i.e. should not be considered a constraint)
Villa site – 2 x villa (site 3)	"coastal scrub on alkaline sands" (SCA) – not threatened	<i>Zygophyllum billardierei</i> is located close to the site – see comments on this species in section above (i.e. should not be considered a constraint) <i>Gyrostemon thesioides</i> is located within and immediately adjacent to the site – see comments on this species in section above (i.e. should not be considered a constraint, although avoiding if practical is suggested)
Villa site – 8 x villa (site 4)	"coastal scrub on alkaline sands" (SCA) – not threatened	<i>Acacia uncifolia</i> is located close to the site – avoid if practical
Villa site – 4 x villa (site 5)	"coastal grass and herbfield" (GHC) – not threatened	None detected (not subject to targeted element-level survey but broader survey targeted all grassier more open areas of dune)
Villa site – 5 x villa (site 6)	"coastal heathland" (SCH) – not threatened	None detected (not subject to targeted element-level survey)
Maintenance shed	"coastal scrub on alkaline sands" (SCA) – not threatened	<i>Cynoglossum australe</i> throughout paddocks and in

Project element	Vegetation types	Threatened flora
		and around proposed house site – see comments on this species in section above (i.e. should not be considered a constraint)
Manager's House site #1	"coastal scrub on alkaline sands" (SCA) – not threatened	Not specifically surveyed
Manager's House site #2	"coastal scrub on alkaline sands" (SCA) – not threatened	Not specifically surveyed
Owner's house site #1	" <i>Allocasuarina verticillata</i> forest" (NAV) – not threatened	<i>Cynoglossum australe</i> throughout paddocks and in and around proposed house site – see comments on this species in section above (i.e. should not be considered a constraint)
Ex owner's house site	"agricultural land" (FAG – not threatened	None detected (throughout the paddock areas between Palana Road and Killiecrankie Beach, <i>Cynoglossum australe</i> is common, although not specifically recorded from around the house site)
Ex bunk house (refurb)	"agricultural land" (FAG – not threatened	As above
Storage shed	"agricultural land" (FAG – not threatened	As above
Proposed roads in	<p>"<i>Allocasuarina verticillata</i>" forest (NAV) – small areas, mainly upgrade</p> <p>"<i>Melaleuca ericifolia</i> swamp forest" (NME) – through basin - amphitheatre (precise area of this threatened vegetation type to be affected unknown as I would need to walk the surveyed line and map vegetation changes</p> <p>"coastal heathland" (SCH) – possible small areas near villa site</p> <p>"coastal scrub on alkaline sands" (SCA) – extensive areas, majority of project area</p> <p>"<i>Melaleuca squarrosa</i>" scrub (SMR) – as above for NME (but note that SMR is not threatened)</p> <p>"agricultural land" (FAG) – extensive areas</p>	<p><i>Cynoglossum australe</i> – extensive along existing tracks, fenceline and in pasture</p> <p><i>Zygophyllum billardierei</i> – extensive along Quoin Road, scattered throughout northern part of project area</p> <p><i>Acacia uncifolia</i> – possible occurrence close to Quoin Road and one of southern villa sites (may be possible to avoid)</p>

Legislative and policy implications

Some commentary is provided below with respect to the key threatened species, vegetation management and other relevant legislation. Note that there may be other relevant policy instruments in addition to those discussed.

Tasmanian *Threatened Species Protection Act 1995*

Seven plant species listed as threatened on the Tasmanian *Threatened Species Protection Act 1995* were detected within or adjacent to the assessment area. An additional three species listed on the Act are known from within or adjacent to the assessment area based on database records/herbarium collections.

Threatened flora on this Act are managed under Section 51, where a permit is required to knowingly “take” (which includes kill, injure, catch, damage, destroy and collect), keep, trade in or process any specimen of a listed species. Where threatened flora are likely to be disturbed, it is usual to apply for a permit under Section 51 of the Act on the required proforma to the Policy & Conservation Advice Branch (PCAB, DPIPWE). This should only be submitted when a specific action is known such that details can be provided of the degree of anticipated impact on the species. Note that even activities that may benefit (or not materially impact on) a species can still require a permit (e.g. fuel reduction burning across a known site).

At this stage of project planning it is difficult to accurately determine the anticipated impact on the species of threatened flora present. Some follow-up surveys have been recommended to ascertain the potential impact on some species that were not detectable at the time of initial assessment. However, the present report does provide sufficient information to consult with PCAB (DPIPWE) to determine their approach to management of threatened flora present (or potentially present) within and adjacent to the assessment area. Under each of the species (see **RESULTS Plant species Priority flora species known from the assessment area**) considerable detail is provided that indicates the likely impact on the species. In my opinion, despite the relatively high number of threatened flora species present that will (or may) be affected by the project, their presence should not be **considered a “fatal flaw”**. **Some sites and species should be avoided** by design (some of these following targeted timed surveys if potential habitat will be affected) because of their localised occurrences and potential for the project elements to locally eliminate such species (e.g. annual herbs near the coastline, *Leucopogon affinis* that is highly localised). Other sites and species will be avoided (e.g. *Stuckenia pectinata* in small dam). The balance of species are disturbance-philic and site evidence suggests will respond positively to site works.

The present document should provide sufficient details to complete the permit proforma (e.g. extent of population, number of individuals) either in its current form or as an updated document following timed targeted surveys.

Potential habitat of threatened fauna is more complex to manage under Section 51 of the Act **because unless works would result in the “taking” of a specimen, a permit under the Act is not technically possible**. However, it is usual for development proposals involving the disturbance of potential habitat of threatened species listed on the Act to be referred to DPIPWE for advice. In the **absence of being in a position to issue a permit under Section 51 of the Act, DPIPWE’s Policy & Conservation Advice Branch (PCAB) may make recommendations to a development proponent in regard to managing habitat of threatened species and/or may endorse or comment on proposed offset/mitigation strategies**.

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

No flora species listed on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* were detected from within the assessment area. There is no significant potential habitat for flora species listed on the Act within the subject title.

The project may impact on fauna species listed on the Act, either directly or through disturbance of potential habitat. The Commonwealth Department of the Environment provides a *Significant Impact Guidelines* policy statement (CofA 2013) to determine if referral to the department is required. Under **RESULTS Fauna species** Priority fauna species known from the assessment area (or potentially present) four species were identified that may require consideration under the Act. Of these, the potential impact on *Litoria raniformis* (green and golden frog) was considered negligible as the species is unlikely to be present, and even if present, potential habitat would not be deleteriously affected – this species is not considered to require further consideration.

The potential impact on *Lathamus discolor* (swift parrot) under the Act is more difficult to ascertain because the potential presence of the species within the assessment area is not even identified on **formal database systems, including the Department of the Environment’s Protected Matters Search Tool** report (CofA 2015) or **DPIPWE’s Natural Values Atlas** report (DPIPWE 2015a). I have taken a conservative approach to the consideration of this species and indicated that potential habitat may be present (in the form of individuals of *Eucalyptus globulus*) and that there should be some mitigation strategy implemented to offset the loss of individuals of this tree species. While mitigation does not negate the need for a referral under the Act (unless it can be demonstrated that such mitigation is effective), in this case given that the suggested mitigation is very much a “just in case” strategy, **formal referral under the Act is not considered warranted.**

Avoiding an impact on *Vombatus ursinus* subsp. *ursinus* (Flinders Island wombat) will be impractical. Vegetation clearing is identified as a threat to the species, but only in general terms and more of a historical nature (CofA 2008, 2010). Table 2 lists the significant impact criteria for Vulnerable species and assesses the project against each of these, concluding that the project will not result in a significant impact on the species such that a referral under the Act is not warranted.

Table 2. Assessment against Significant Impact Criteria for Vulnerable species under the *Significant Impact Guidelines 1.1: Vombatus ursinus* subsp. *ursinus*

Criterion	Species
	<i>Vombatus ursinus</i> subsp. <i>ursinus</i>
lead to a long-term decrease in the size of an important population of a species	There is a very low likelihood of the action resulting in a long-term decrease on the size of the population of the species. In fact, at a local scale, the species is likely to be benefited by the project through creation of forest/non-forest margins, which it seems to prefer for burrowing, and through provision of additional grazing ground. Other risks associated with the project such as incidence of roadkill are considered very low (only internal low-speed roads/tracks will be present such that the risk of roadkill is very low). CRITERION NOT MET
reduce the area of occupancy of an important population	The area of occupancy of the species will be unaffected at a local or whole-of-population scale (except at a highly localised temporal scale during works). At a local scale, the species is likely to be benefited by the project through creation of forest/non-forest margins, which it seems to prefer for burrowing, and through provision of additional grazing ground. For the record, in my opinion this criterion is missing the logical critical phrase “to the extent that the species is likely to decline”, which is included in the criterion on availability or quality of habitat. CRITERION NOT MET
fragment an existing important population into two or more populations	The works will not further fragment the population at any scale – the species is distributed throughout the works area and is capable of crossing large expanses of

Criterion	Species
	disturbed ground such that the final project installation will not impact on the species. CRITERION NOT MET
adversely affect habitat critical to the survival of a species	Technically, critical habitat for <i>Vombatus ursinus</i> subsp. <i>ursinus</i> is not defined on the Register of Critical Habitat under the EPBCA. More conservatively, there is no doubt that the assessment area supports the species but it is not considered "critical" because such habitat is widespread on the broader property (and indeed across the whole island) and the apparently preferred habitat is mainly outside the actual assessment area. CRITERION NOT MET
disrupt the breeding cycle of an important population	At a highly temporal scale (e.g. during works) and highly localised spatial scale (e.g. individual burrows), the works may result in the disruption of the breeding cycle of a small number of individuals but not of an important population (in this case, the "important population" comprises the whole of the island, and as such, the disturbance to a miniscule part of the total population would not be significant). CRITERION NOT MET
modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	At a local scale, potential habitat may be disturbed but it does not follow that the availability or quality of habitat will be decreased to such an extent that the species is likely to decline – it is more likely that the works will benefit the species through creation of forest/non-forest margins, which it seems to prefer for burrowing, and through provision of additional grazing ground. CRITERION NOT MET
result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	There is no indication that the works would result in the establishment of invasive species harmful to the wombat. CRITERION NOT MET
introduce disease that may cause the species to decline	There is no indication that the works would result in current sarcoptic mange prevalence becoming worse as outbreaks of the disease appear to be more closely linked to seasonal conditions rather than localised habitat disturbance. CRITERION NOT MET
interfere substantially with the recovery of the species	This specific part of the species' range and/or population has not been identified as critical to the recovery of the species in an endorsed Recovery Plan. It is likely that the project will locally benefit the species through creation of forest/non-forest margins, which it seems to prefer for burrowing, and through provision of additional grazing ground. CRITERION NOT MET

The assessment area (or its immediate surrounds i.e. Killiecrankie Beach) supports *Thinornis cucullatus* (hooded plover), listed as Vulnerable under the Act (CofA 2014). On the surface, it appears obvious that a project in the dunes would not directly affect the beach environment and therefore would not trigger the significant impact guideline thresholds (see criteria in Table 2 above). However, the *Guidelines* also indicate that potential "downstream" impacts need to be considered, where "downstream" is interpreted as "adjacent" or "because of" (e.g. in this case, if the project would lead to an increase in a threatening process (e.g. people, vehicles, dogs) to Killiecrankie Beach). The project design does not include any element that would appear to result in more vehicles entering Killiecrankie Beach (most currently access from Killiecrankie township to the south, which is not controllable as part of the project). The project design does not include any element that would appear to result in more dogs entering Killiecrankie Beach (because any visitors staying on site would not bring dogs to the facility). There is an obvious opportunity for more people to visit the beach because it is accessible from the accommodation and golf course. It is difficult to ascertain the degree to which this may disturb nesting hooded plovers because it is not known to what level beach visitors may increase and which section of beach they visit (most likely the northern section). It is assumed that the species does use the beach for breeding, although large

sections of it are wholly wave-washed at high tide creating vertical dune fronts, suggesting that only some sections may be suitable for nesting.

The *Guidelines* provide advice on when a significant impact may be likely:

"To be 'likely', it is not necessary for a significant impact to have a greater than 50% chance of happening; it is sufficient if a significant impact on the environment is a real or not remote chance or possibility.

If there is scientific uncertainty about the impacts of your action and potential impacts are serious or irreversible, the precautionary principle is applicable. Accordingly, a lack of scientific certainty about the potential impacts of an action will not itself justify a decision that the action is not likely to have a significant impact on the environment".

On the available evidence it is difficult to justify that the proposed project would result in a significant impact on the hooded plover. There are some actions that could be implemented that may reduce the degree of potential impact on the hooded plover from possible increased visitor numbers. These include the standard DPIPW signs about shore-nesting birds being installed at all obvious each entrances, advising visitors to stay on the hard sand rather than soft sand used for nesting. In addition, surveys during the breeding season could be undertaken and when a breeding site is identified it can be temporarily fenced off (this is undertaken on many popular beaches around the Australian coastline). I have not suggested a funding source for undertaking surveys and fencing but note that Killiecrankie Beach is Crown land and that the project is proposed to be on part Crown land, suggesting an obvious collaboration.

The *Guidelines* also state:

"However you should not conclude that a significant impact is not likely to occur because of management or mitigation measures unless the effectiveness of those measures is well-established (for example through demonstrated application, studies or surveys) and there is a high degree of certainty about the avoidance of impacts or the extent to which impacts will be reduced".

In my opinion, a formal referral to the Commonwealth Department of the Environment under the *Significant Impact Guidelines* (CofA 2013) is not warranted at this stage because while there is some uncertainty as to the degree of potential impact on the hooded plover, it is very difficult to establish that such a threat would be realised. I do suggest that surveys be conducted during the breeding season for the first three years after the completion of works and that fencing be erected around any identified nest sites concomitant with monitoring to ascertain the success of nesting. It may also be prudent to collect information from visitors as to the level of visitation to Killiecrankie Beach (and perhaps the section of beach visited) to inform further development of monitoring and nest management.

On the basis of the above discussion, a formal referral to Commonwealth Department of the Environment under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* is not considered warranted. Note that the decision to refer is made by the person taking the action (i.e. the project proponent) but that other agencies (e.g. Council, DPIPW) or consultation sometimes reveal facts that influence the decision to refer.

Tasmanian *Nature Conservation Act 2002*

Schedule 3A of the Act lists vegetation types classified as threatened within Tasmania. The project will not include clearing of such vegetation types (all outside the project footprint). The intent of the listing on the Act is to prevent clearing of these vegetation types or to ensure that any such clearing is considered appropriately under the relevant planning system. The administrative control

on such clearing is through the Tasmanian forest practices system or under the local planning scheme. Further details are provided under the *Forest Practices Act 1985* (see below).

Tasmanian *Wildlife (General) Regulations 2010*

The assessment of the subject title indicated the presence of species listed on schedules of the Regulations (i.e. "specially protected wildlife", "protected wildlife", "partly protected wildlife" – see Appendix C), and also "products" (e.g. nests, dens, etc.) of these species were detected from within areas likely to be disturbed.

Avoiding disturbance to "dreys" (nests) of the ringtail possum (*Pseudocheirus peregrinus*) and burrows of the wombat (*Vombatus ursinus* subsp. *ursinus*) is likely to be impractical, although the single drey detected is outside the project footprint, and no wombat burrows were actually detected from the disturbance footprint.

A permit is likely to be required under the Regulations if it can be demonstrated that products of protected wildlife will be physically disturbed. The Policy & Conservation Advice Branch (PCAB, DPIPWE) also consider permit applications under these Regulations, in addition to the permits related to fauna and flora listed as threatened under the Tasmanian *Threatened Species Protection Act 1995* (neither the ringtail possum or the wombat are listed as threatened on this Act). Whether a separate permit application is required should be discussed with PCAB as part of the threatened flora permit application process. In my opinion, the extensive population of wombats on the broader property and the virtual restriction of burrows to the paddock/scrub interface (i.e. not within the dune scrub where buildings and golf course elements will be installed) means that disturbance to the species will be minimal and restrictions should not be applied. It is likely that individuals of ringtail possums will abandon dreys (nests) at the time of disturbance and be able to construct a new drey in areas of retained similar vegetation, such that disturbance to the species will be minimal and restrictions should not be applied.

Tasmanian *Weed Management Act 1999*

One species classified as a "declared weed" within the meaning of the *Tasmanian Weed Management Act 1999* was detected from within the assessment area: *Lycium ferocissimum* (african boxthorn) was localised to a dense clump on the southern side of the sandy track to the beach.

This species is subject to a Statutory Weed Management Plan under the *Weed Management Act 1999* (see information on weed section of DPIPWE's web site). The assessment area falls within the Flinders municipality, which for the management of the species is classified as a "Zone B" municipality (widespread infestations).

In relation to "Zone B" species, "containment", within the meaning of the *Weed Management Act 1999*, is the most appropriate management objective for municipalities who have problematic infestations but no plan and/or resources to undertake control actions at a level required for eradication. The management outcome for these municipalities is ongoing prevention of the spread of declared weeds from existing infestations to areas free or in the process of becoming free of these weeds.

The extent of weeds is not such that a complex and/or formal weed management plan is considered warranted in the short-term to deal with the current infestations of declared weeds. However, at a broader level, maintaining the virtual weed-free status of the assessment area is considered a very high management priority. The key to achieving this will be strict machinery and vehicle hygiene protocols and maintaining work sites (especially the access roads) free from weeds.

It is recommended that a weed and hygiene management plan be developed as part of any project proposal for the site. This plan should include, as a minimum:

- machinery and vehicle hygiene protocols in accordance with Rudman et al. (2004), Rudman (2005) and Allan & Gartenstein (2010);
- provisions for the removal of *Lycium ferocissimum* (african boxthorn), which is highly localised and practically removed with on-site farm vehicles and machinery;
- provisions to monitor and control *Euphorbia paralias* (sea spurge) within and adjacent to the project area, with the long-term objective being the maintenance of the project area as weed-free;
- consideration of a broader multi-party resource-managed program of control of *Euphorbia paralias* (sea spurge) from along Killiecrankie Beach and adjacent dunes within the Crown reserve;
- provisions for attending to other weeds that may establish post-works (e.g. a 5-year weed monitoring and control plan); and
- an indication of plant species that should not be utilised in ornamental plantings (i.e. those that have the potential to become weedy).

Tasmanian *Forest Practices Act 1985* and associated regulations

A Forest Practices Plan (FPP) is required for most “clearing” activities in areas of forest and woodland (and for some activities within threatened non-forest native vegetation). However, changes to the Act (25 November 2009), as stated below, indicate additional circumstances in which an FPP is not required.

Whether an FPP is needed or not is an important consideration because if one is needed it adds another layer of planning assessment and approval to the project. I have sought advice from officers of the Forest Practices Authority (T. Leaman & A. la Sala pers. comm. 9 May 2015) and the information below summarises the policy position in relation to the *Forest Practices Act 1985*.

4. Circumstances in which forest practices plan, &c., not required

- (j) the harvesting of timber or the clearing of trees on any land, or the clearance and conversion of a threatened native vegetation community on any land, for the purpose of enabling –
 - (i) the construction of a building within the meaning of the *Land Use Planning and Approvals Act 1993* or of a group of such buildings; or
 - (ii) the carrying out of any associated development;if the construction of the buildings or carrying out of the associated development is authorised by a permit issued under that Act.

Clause 4.(j)(i) of the Regulations means that an FPP is not required for any of the buildings associated with the project provided that a permit is issued under the relevant planning scheme. The key issue in interpreting whether an FPP is required for other non-building elements of the project is indicated below in the definition of “associated development”.

3. Interpretation

associated development means development that is related to the construction or use of a building, or to the construction or use of a group of buildings, and includes the development of –

- (a) water, sewerage, gas, electrical, telecommunications and other services to be provided to the building or group of buildings; and
- (b) roads, footpaths and cycle paths; and

- (c) firebreaks; and
- (d) recreational facilities, including but not limited to parks and sportsgrounds; and
- (e) facilities to enable the commercial use of the building or group of buildings.

This interpretation clearly identifies that all elements related to the project such as roads, tracks, **paths, water tanks, services and the like are all included in the concept of "associated development"** and therefore do not require an FPP.

On this basis, provided that a permit is issued under the relevant planning scheme, an FPP will not be required, irrespective of the extent of clearing. This level of detail has been provided to inform the decision-making process such that all parties (e.g. Council, Crown, etc.) are aware that this additional level of approval is not required.

Tasmanian *Land Use Planning and Approvals Act 1993 (Flinders Council Planning Scheme 1994)*

As stated above, various matters of environmental significance will need to be considered under the Act and **Scheme**. The discussion below may need to be re-considered if the project is applied for under the incoming **Scheme**, in which case the Biodiversity Code will need to be specifically addressed.

The discussion below is restricted to ecological issues only – all other matters relevant to the **Scheme** will need to be considered in other reports. The entire assessment area is subject to various "Special Area" overlays including "Visually Sensitive", "Ecologically Sensitive" and "Shoreline Waterway" overlays. The treatment of areas subject to these overlays is covered, in the main, by Part 7 Special Area Provisions of the **Scheme**.

Extracts of Part 7 of the **Scheme** are copied below (reformatted only to suit this report), with comments from the author in square brackets indicating the application of the conditions to the proposed development relative to the identified ecological values.

PART 7 SPECIAL AREA PROVISIONS

7.1 Introduction

A Special Area delineated on the Plan is land of special interest, value or sensitivity. Within Special Areas the provisions of the Scheme may be varied, added to or substituted, to ensure that use or development is appropriate to and compatible with its qualities and values.

7.2 Visually Sensitive Areas

[This applies to the majority of private titles not subject to the "Shoreline Waterbody" overlay, which extends about 100 m back from the coastline and along Killiecrankie Creek, or the "Ecologically Sensitive" overlay, which applies to the Crown reserve area beyond the "Shoreline Waterbody" strip. In the main, this is a visual amenity issues but the section refers to "natural vegetation" so is discussed below].

7.2.1 These areas have been identified in recognition of their contribution to the landscape character and scenic values of the Planning Area. Important elements in their selection are:

- (a) visual prominence when seen from public roads, foreshores and coastal waters;

[No comments].

(b) undisturbed landforms and natural vegetation;
 [The assessment area subject to this overlay can be considered to **comprise "undisturbed landforms and natural vegetation"**].

(c) minimal visible evidence of human activity in the form of buildings, structures or works.

[No comments].

7.2.2 The objectives of the Visually Significant Areas are:

(a) to retain the natural appearance of each Area;

[No comments].

(b) to minimise the visual impact of Use or Development;

[No comments].

(c) to retain and restore where possible the natural vegetation cover.

[This has relevance because the project will result in the loss of some areas of native vegetation cover, although substantial areas will be retained].

7.2.3 Notwithstanding any other provision in this Scheme, within the Visually Sensitive Areas any application for Use or Development (other than those prohibited within the Zone) shall be considered as a discretionary Use or Development in accordance with Clause 3.5.

[No comments].

7.2.4 In considering an application for Use or development within the Visually Sensitive areas and whether to impose conditions Council shall consider the following matters:

(a) the objectives listed in Clause 7.2.2

[No comments].

(b) the siting, orientation, setbacks, bulk, form, height, scale and external finishes of buildings and structures

[No comments].

(c) the visual impact of buildings, clearing, excavation, access, construction, fences, firebreaks or the deposition of fill;

[No comments].

(d) the adequacy of proposed landscaping and whether any special works or practices are required to protect the scenic values of the site;

[No comments].

(e) whether development is proposed to be located on skylines or ridgelines.

[No comments].

7.3 Ecologically Sensitive Areas

[This applies to the majority of the Crown reserves associated with the Killiecrankie Nature Recreation Area, excluding the coastal strips that is subject to the **"Shoreline Waterbody" overlay**].

- 7.3.1 These areas have been identified as important for the maintenance of natural processes, for the conservation of rare, endangered or threatened species, as refuges for migratory bird species or as reservoirs of biodiversity.

[The present report clearly identifies that the northern part of the assessment area **subject to this overlay could be considered "important for the maintenance of natural processes", although the degree to which these will be deleteriously impacted by the proposal will clearly be influenced by the final design of the project and any environmental offsets/mitigation developed and applied. Several "threatened" flora species (to use a more generic term than that in 7.3.1.) are present, and there is some potential habitat for threatened fauna species. Again, the degree of deleterious impact is dependent on the project design and the offset/mitigation strategy but some species are likely to manifestly benefit from disturbance, while others will warrant site-specific management. The assessment area has not been identified as a "refuge for migratory bird species" or a "reservoir of biodiversity"].**

- 7.3.2 The objectives of the Ecologically Significant Areas are:

- (a) to promote the maintenance of ecological processes and genetic diversity;

[In my opinion, it is possible to find a balance between development and **"maintenance of ecological processes and genetic diversity": whether this meets the intent of the term "promote" is open to interpretation. The development is highly unlikely to result in the loss of genetic diversity because within the assessment area, the suite of vegetation types and floristic diversity would be maintained. There may be some minor disruption of "ecological processes" at a temporary scale (e.g. during construction) and a geographic scale (e.g. areas of cleared vegetation) but probably not to the extent that such processes will be deleteriously affected (i.e. not maintained" in the longer term)].**

- (b) to protect and enhance ecosystems, habitats and biological communities which enable the survival of indigenous flora and fauna and assist to maintain biodiversity;

[See discussion above because the issues are similar. Clearing of native **vegetation is unlikely to meet the intent of the phrase "protect and enhance"].**

- (c) to identify and protect habitats which support threatened, rare or endangered species;

[Such habitats of been identified (areas of threatened native vegetation, populations of threatened flora and areas of potential habitat for **threatened fauna). In my opinion, the term "protect" is very tight and in practice is better considered as "appropriately manage". For example, some threatened flora species present (e.g. *Zygophyllum billardierei*) will manifestly benefit from high levels of disturbance. The management of known and sites and potential habitat of threatened species in the context of the project is practical within the intent of this clause].**

- (d) to ensure that planning decisions incorporate consideration of the ecological impacts of Use or Development;

[The purpose of the present report is to inform land use decisions and project design to ensure that the identified ecological values are appropriately considered at all levels of planning and approval].

- (e) to encourage land management practices, based on expert advice, that will sustain the natural and ecological values of the land.

[In my opinion, finding a balance between development and sustaining the natural and ecological values of the land is feasible but will require a well-considered offset/mitigation strategy and close consultation with the reserve manager].

- 7.3.3 Notwithstanding any other provision in this Scheme, within the Ecologically Sensitive Areas any application for Use or Development (other than those prohibited in the zone) shall be considered as a discretionary Use or Development in accordance with Clause 3.5.

[No comments].

- 7.3.4 In considering an application for Use and Development within the Ecologically Sensitive areas and whether to impose conditions Council shall consider the following matters:

- (a) the objectives listed in Clause 7.3.2;

[No comments].

- (b) the effect of the proposed Use on the natural values of the land;

[The project will impact on the natural values of the land, with the extent dictated by the final project design and the nature of any offsets or mitigation].

- (c) the siting of buildings, structures, works and effluent disposal systems in relation to natural vegetation, watercourses and wetlands;

[The project is unlikely to impact on watercourses or wetlands. The impact on natural vegetation is discussed under other clauses].

- (d) the likely ecological impact of the building, clearing, excavation, drainage works, access construction, vehicular traffic, fences, firebreaks or the deposition of fill;

[The project would be designed to minimise the ecological "footprint"].

- (e) the adequacy of proposed management and whether any special works or practices are required to protect the ecological values of the site;

[This will depend on the final project design and the nature of any offsets or mitigation].

- (f) whether access to particular sites should be restricted on a seasonal or more frequent basis in order to conserve the reproductive potential of species;

[Not considered relevant to any particular ecological values identified from the assessment area].

- (g) the identification of natural values, including the presence of any rare, threatened or endangered species and what management requirements may be necessary; and

[The present report has clearly identified the locations of populations of threatened flora and potential habitat of threatened fauna, and identified site-specific management prescriptions to ensure the maintenance and/or enhancement of these species within the assessment area].

- (h) the need for management approaches to prevent the importation of weeds, soil diseases or toxic substances that may contaminate the land.

[The present report has clearly identified the very low levels of weed infestations from the assessment area and provided management recommendations for their control and minimising the risk of further infestations. The assessment area is unlikely to support plant or animal diseases but management recommendations are provided for minimising the risk of introducing such vectors].

7.5 Shorelines, Water Bodies and Watercourses

[This applies to a narrow coastal strip along Killiecrankie Beach and associated rocky shoreline to the north].

- 7.5.1 The shorelines, water bodies and watercourses identified in Schedule 3 shall be sustainably managed for the protection of water quality, the conservation of aquatic and shoreline habitat and the enhancement of recreational opportunities.

[There is unlikely to be a material impact on Killiecrankie Beach or rocky shoreline. Limited areas of native vegetation within close proximity to the coast may be affected, although this is unlikely to be of a scale considered "unsustainable"].

- 7.5.2 Development (other than that prohibited within the zone) which pertains to a Shoreline, Water Body or watercourse listed in Schedule 3 shall be considered as a discretionary Use or development in accordance with Clause 3.5.

[No comments].

- 7.5.3 Before considering an application pursuant to Clause 7.5.2 council may require **additional information, prepared and submitted for Council's consideration by a** suitably qualified person(s) to ensure that the proposal is adequately in terms of:

- (a) contours and levels of the natural surfaces in relation to the range of water levels likely to occur in the vicinity of the propose use or Development;

[No comment – will be supplied as part of application].

- (b) existing water quality, including seasonal variations;

[As above].

- (c) Quantities and qualities of water that are proposed to be abstracted from or discharged to the sea, a water body or a watercourse listed in Schedule 3;

[As above].

- (d) the likely impact of the proposed use or development on the quality of waters by reason of off-site effects such as erosion, siltation, salination, chemical spray drift, nutrient seepage, seed disposal or other emissions;

[As above].

- (e) The natural, ecological, cultural, recreational and aesthetic qualities of the site.

[The present report identifies the ecological values present within and adjacent to the assessment area. Specific measures to manage these

values are provided (e.g. timed targeted surveys to identify critical sites, minimising disturbance to sites supporting threatened flora, weed management actions)].

7.5.4 In considering an application for Use or Development in Shorelines, Water Bodies and Watercourses and whether to impose conditions Council shall consider the following matters:

- (a) the siting, orientation, setback, bulk, form, height, scale, materials and external finishes of buildings and structures;

[No comment – will be supplied as part of application].

- (b) The impact upon water quality, foreshore or streamside vegetation and wildlife habitat of building, clearing, excavation, effluent disposal, access construction, fences, firebreaks or the deposition of fill;

[The present report identifies the ecological values present within and adjacent to the assessment area, including foreshore vegetation and wildlife habitat. Specific measures to manage these values are provided (e.g. timed targeted surveys to identify critical sites, minimising disturbance to sites supporting threatened flora, weed management actions)].

- (c) Whether land should be acquired by Council as a condition of subdivision or otherwise, to protect the items listed in Schedule 3;

[No comments].

- (d) Whether additional fencing or any other special works or practices are required to protect the items listed in Schedule 3;

[No such additional features are suggested at this stage to manage the identified ecological values].

- (e) The design, content and location of signage and interpretative displays

[No comments].

Recommendations

The recommendations provided below are a summary of those provided in relation to each of the ecological features described in the main report. The main text of the report, and supported appendices, provide the relevant context for the recommendations.

Vegetation types

The building clusters are all located in vegetation types not classified as threatened/priority vegetation communities at a Commonwealth, State or local government level. There are no constraints to clearing (construction) and modification (fire management zones) in these vegetation types. One of the villa clusters (shown as site 2 on the Master Plan) is close to forest/woodland dominated by *Eucalyptus globulus*. My understanding is that there is no intent to disturb such forest (which would be classified as "*Eucalyptus viminalis-Eucalyptus globulus* coastal forest and woodland" (DVC), a threatened vegetation type) and that the building site is probably within tall dune scrub (non-threatened) – this may need to be confirmed by additional site assessment (because the site was not subject to an element-level site survey).

The broader assessment area supports a range of other vegetation types, including some classified as threatened under Schedule 3A of the Tasmanian *Nature Conservation Act 2002*. Only the access routes are likely to pass through threatened vegetation in the area of the basin/amphitheatre ("Melaleuca ericifolia swamp forest", NME) but the mosaic of vegetation types present means that the surveyed route of the access would need to be walked and the vegetation transitions mapped to determine the extent of each vegetation type requiring clearing.

Threatened flora

A permit under the Tasmanian *Threatened Species Protection Act 1995* will be required for disturbance to some species of threatened flora through application to the Policy Conservation & Advice Branch (PCAB, DPIPWE).

As a set of general guidelines, the following actions are recommended for species identified (or previously known from database records) from the broader project area:

- *Acacia uncifolia* ("coast wirilda"): avoid, where practical, individuals of this species, especially those greater than 3 m in height;
- *Cynoglossum australe* ("coast houndstongue"): no special management actions required;
- *Gyrostemon thesioides* ("broom wheelfruit"): avoid identified sites, where practical;
- *Leucopogon affinis* ("lanceleaf beardheath"): avoid identified sites, where practical;
- *Ranunculus sessiliflorus* var. *sessiliflorus* ("rockplate buttercup"): avoid identified site (granite outcrop close to granite cliffs), where practical;
- *Stuckenia pectinata* ("fennel pondweed"): avoid identified site (small dam in dunes), where practical;
- *Zygophyllum billardierei* ("coast twinleaf"): no special management actions required;
- *Isopogon ceratophyllus* ("horny conebrush"): known site outside project area, only conduct targeted search if potential habitat will be affected (not considered likely at this stage);
- *Phyllangium distylis* ("tiny mitrewort"): known site will not be affected, only conduct timed targeted search if potential habitat will be affected (not considered likely at this stage);
- *Phylloglossum drummondii* ("pygmy clubmoss"): known site will not be affected, no special management required; and
- *Stylidium beagleholei* ("fan triggerplant"): as above for *Phyllangium distylis*.

Threatened fauna – swift parrot (*Lathamus discolor*)

While the assessment area may be of relatively low importance (from a Statewide perspective) as potential foraging habitat for the swift parrot (highly unlikely to be used for breeding given its geographic position and stature of trees), minimising loss of such habitat should be a key management objective. This can be achieved by:

- minimising the felling of *Eucalyptus globulus*.

Where removal of blue gums is unavoidable, a mitigation strategy is recommended to offset the loss of individuals (with the intent of achieving a long-term net gain of individuals of blue gum and hence potential foraging habitat), as follows:

- keep a record of the number of *Eucalyptus globulus* felled;
- for every individual of *Eucalyptus globulus* felled, re-plant five (5) times as many elsewhere within the general vicinity of the assessment area;

- locally sourced seed (to maintain genetic characteristics) should be used;
- the precise position of the plantings is not critical – some example sites include: (1) ornamental plantings around new buildings or existing farm buildings; (2) a possible grove/line of plantings along the access road to the main facility (even from as far back as the gate on Palana Road) and internal access tracks; and/or (3) supplementary plantings in and around existing stands of eucalypt forest (or other forest types) on the property;
- seedlings will need to be protected from browsing until well-established (i.e. greater than the height of the average wallaby);
- maintain a record of the sites where plantings occur and their success;
- if survival rates drop below a set threshold, supplement plant further individuals (possibly selecting sites where a greater success rate has been achieved) – the 5: 1 offset ratio is suggested because of the possible loss of individuals so setting the threshold at 3: 1 will still result in a net gain outcome.

Management of individuals of *Eucalyptus globulus*

Maintaining the genetic representation of *Eucalyptus globulus* within and adjacent to the assessment area is considered important from a biogeographic perspective. This can be achieved by:

- minimising the felling of *Eucalyptus globulus* (the loss of a small number of individuals and/or the lopping of some limbs is considered acceptable).

Weeds and disease

It is recommended that a weed and hygiene management plan be developed as part of any project proposal for the site. This plan should include, as a minimum:

- machinery and vehicle hygiene protocols in accordance with Rudman et al. (2004), Rudman (2005) and Allan & Gartenstein (2010);
- provisions for the removal of *Lycium ferocissimum* (african boxthorn), which is highly localised and practically removed with on-site farm vehicles and machinery;
- provisions to monitor and control *Euphorbia paralias* (sea spurge) within and adjacent to the project area, with the long-term objective being the maintenance of the project area as weed-free;
- consideration of a broader multi-party resource-managed program of control of *Euphorbia paralias* (sea spurge) from along Killiecrankie Beach and adjacent dunes within the Crown reserve;
- provisions for attending to other weeds that may establish post-works (e.g. a 5-year weed monitoring and control plan); and
- an indication of plant species that should not be utilised in ornamental plantings (i.e. those that have the potential to become weedy).

Follow-up surveys

The present report is based on initial ecological surveys that aimed to cover the broad project area, and where known, specific project elements. Since the time of the survey, the position of some project elements has been altered markedly such that some sites have not been subject to an element-level ecological survey. This is not considered a “fatal flaw” to continued planning because based on the broader level assessment, these sites are considered highly unlikely to support values not considered elsewhere.

However, to inform a formal threatened flora permit application, some more detailed element-level site surveys are considered warranted to better estimate the extent of disturbance to populations of threatened flora. Note that my initial advice is that the populations of threatened flora so far identified should not constrain the project at the level of planning, rather at the micro-site level (e.g. literally shifting a proposed access by matters of metres to avoid, for example, a patch of mature *Acacia uncifolia*), because most species will either be entirely avoided or are locally abundant and will not be deleteriously affected.

To inform the development of any offset/mitigation strategy in relation to threatened vegetation types, it is recommended that the sites of project elements, especially the access routes (which were not known at the time of initial survey), be surveyed to map vegetation transitions and the extent of each vegetation type to be affected. For most elements, only non-threatened vegetation will be affected so this comment is mainly in relation to the access through the basin/amphitheatre and in areas that may support eucalypt forest/woodland.

In my opinion, the recommendation for follow-up surveys should not restrict further project planning because these could be conditioned on any planning permit. Ideally, such surveys would be undertaken in spring (e.g. late October to early December) to maximise the opportunity of detecting ephemeral herbs and spring/summer-flowering grasses. Based on the initial surveys, I do not believe that ecological values will be identified that will significantly constrain the project and that element-level surveys are best undertaken when the final design is effectively approved, as this will avoid multiple iterations and maximise the opportunity for site-level management of any key values.

Legislation and policy

No formal referral to the relevant Commonwealth government agency under the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* is considered warranted.

A permit under the Tasmanian *Threatened Species Protection Act 1995* will be required for disturbance to some species of threatened flora through application to the Policy Conservation & Advice Branch (PCAB, DPIPWE).

A permit under the Tasmanian *Wildlife (General) Regulations 2010* may be required if products (e.g. nests, burrows) of specially protected wildlife can be demonstrated to be physically disturbed (not identified at this stage of assessment and planning).

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APPENDIX A. Vegetation community structure and composition

The table below provides a detailed description of the main native vegetation mapping unit identified from the assessment area that will be affected by works. The lists of species provided are representative species only.

Coastal scrub on alkaline sands (TASVEG code: SCA)

SCA occupies the majority of the assessment area, although it varies in form markedly. Most of the hinter-dune rises and swales mapped as SCA support a long unburnt tall and dense canopy dominated by *Leptospermum laevigatum* (coast teatree), with occasional pockets replaced by other scrub species. The understorey of this taller facies of SCA is usually quite dense (with massive individuals of species such as *Myoporum insulare* and *Alyxia buxifolia*; or dense swathes of species such as *Leucopogon parviflorus*). As exposure to the westerly winds increases (e.g. on the dune rises directly overlooking the coast), the canopy height is reduced but the species composition is similar.



Views of SCL at approximate building cluster sites north of Quoin Road – note the open virtually non-existent understorey on the left but the grassy-herb understorey on the right

In dune swales and the lower slopes of dune rises, SCA becomes more diverse with species such as *Correa alba*, *Ozothamnus turbinatus*, *Olearia axillaris* and *Acacia uncifolia* becoming more prevalent. These areas are a true “scrub” facies of SCA, whereas the hinter-due areas are close to a “forest” facies. All areas of native vegetation to be cleared/modified support the taller facies of SCA.



Views of SCL at the approximate location of the wellness compound

The distinction between SCA and other vegetation types (especially NAV, DVC, DNF, NME and SMR) is usually quite clear, with SCA generally occurring on the calcareous sands on dune rises.

However, the distinction between SCA and GHC is somewhat more complex, reflecting a probably ever-shifting succession between grass-dominated areas with shrub-dominated areas. Some areas are distinctly dominated by grass with only

sparse shrubs, quite easily allocated to GHC. However, as shrubs become dominant, reducing the impact of natural wind erosion (which seems to maintain the density of grass cover), GHC grades into SCA. Aerial imagery is actually quite a useful indicator of the mosaic of GHC and SCA in the areas of dunes closer to the coast. Small areas of the GHC/SCA mosaic may be affected by the project, but separating the two at this stage of planning is not considered warranted.

Note that the small dam nestled in the dune swales south of Quoin Road has not been mapped separately as the TASVEG mapping unit "water, sea" (TASVEG code: OAQ) because it is very small and is best subsumed as a highly localised and minor variation of the SCA mapping unit.



Views of SCL at approximate building cluster sites south of Quoin Road

Stratum	Height (m) Cover (%)	Species (underline = dominant, parentheses = sparse or occasional)
Trees	10-120 m <5%	<u>Eucalyptus globulus</u> , (<i>E. viminalis</i>), (<i>E. globulus</i>) [areas mapped as SCL are essentially devoid of eucalypts, this layer is included to indicate the gradation into DVC in some places]
Tall shrubs	8-15 m 30-80%	<u>Leptospermum laevigatum</u> , (<i>Pomaderris apetala</i>), (<i>Allocasuarina verticillata</i>) [this layer is present on hinter-dunes only, most areas are of lower stature, as below]
Tall shrubs	6-8 m 30-80%	<u>Leptospermum laevigatum</u> , (<i>Pomaderris apetala</i>), (<i>Allocasuarina verticillata</i>), <i>Dodonaea viscosa</i> [this layer is present on hinter-dunes only, most areas are of lower stature, as below]
Medium shrubs	1-5 m 10-40%	<u>Leptospermum laevigatum</u> , <i>Leucopogon parviflorus</i> , <i>Beyeria lechenaultii</i> , <i>Correa alba</i> , <i>Myoporum insulare</i> , <i>Acacia uncifolia</i> , (<i>Exocarpos syrticola</i>), <i>Alyxia buxifolia</i> , (<i>Pimelea serpyllifolia</i>), (<i>Apalochlamys spectabilis</i>)
Low shrubs	<1 m 5-10%	<i>Rhagodia candolleana</i> , <i>Suaeda australis</i> , <i>Tetragonia implexicoma</i> , <i>Zygophyllum billardierei</i> , (<i>Gyrostemon thesioides</i>), (<i>Olearia phlogopappa</i>)
Grass	+ -40%	<i>Poa</i> spp., <i>Rytidosperma</i> spp. [most areas of SCL that will be affected by works lack a significant grass component, but some localised areas have some dense patches of native grass]
Graminoids	+	<i>Ficinia nodosa</i>
Ground ferns	<1 m variable	<i>Pteridium esculentum</i> , <i>Pellaea falcata</i> [localised to small areas only, most areas of SCA do not support ground ferns]
Herbs	variable	<i>Senecio linearifolius</i> , <i>Stackhousia spathulata</i>
Climbers	+	<i>Clematis microphylla</i>

APPENDIX B. Vascular plant species recorded from assessment area

Botanical nomenclature follows *A Census of the Vascular Plants of Tasmania* (de Salas & Baker 2014), with family placement updated to reflect the nomenclatural changes recognised in the *Flora of Tasmania Online* (Duretto 2009+); common nomenclature follows Wapstra et al. (2005+, updated online at www.dpipwe.tas.gov.au).

i = introduced/naturalised; e = endemic to Tasmania; DW – declared weed within meaning of Tasmanian *Weed Management Act 1999* (B – municipality zoning; wi = widespread infestations); EW = environmental weed as considered by the author; TSPA = status on Tasmanian *Threatened Species Protection Act 1995*

Table B1. Summary of vascular species recorded from the assessment area

STATUS	ORDER			
	DICOTYLEDONAE	MONOCOTYLEDONAE	GYMNOSPERMAE	PTERIDOPHYTA
	75	22	1	8
e	4	-	-	-
i	6	2	-	-
Sum	85	24	1	8
TOTAL	118			

DICOTYLEDONAE

AIZOACEAE

Tetragonia implexicoma bower spinach

AMARANTHACEAE

Atriplex cinerea grey saltbush
Rhagodia candolleana subsp. *candolleana* coastal saltbush
Sarcocornia quinqueflora subsp. *tasmanica* tasmanian glasswort
Suaeda australis southern seablite

APIACEAE

Xanthosia pilosa woolly crossherb

APOCYNACEAE

Alyxia buxifolia seabox

ARALIACEAE

Hydrocotyle hirta hairy pennywort

ASTERACEAE

Actites megalocarpa dune thistle
Apalochlamys spectabilis sticky firebush
Brachyscome parvula coast daisy
Cassinia aculeata subsp. *aculeata* common dollybush
i *Cirsium vulgare* spear thistle
Euchiton japonicus common cottonleaf
Helichrysum leucopsidium satin everlasting
i *Hypochaeris radicata* rough catsear
Lagenophora stipitata blue bottledaisy
Leptinella longipes coast buttons
Leucophyta brownii cushionbush
Olearia axillaris coast daisybush
Olearia glutinosa sticky daisybush
Olearia lepidophylla clubmoss daisybush
Olearia phlogopappa subsp. *insularis* island dusty daisybush
Olearia viscosa viscid daisybush
Senecio biserratus jagged fireweed
Senecio linearifolius var. *denticulatus* toothed fireweed groundsel
Senecio linearifolius var. *linearifolius* common fireweed groundsel
Senecio pinnatifolius var. *lanceolatus* lanceleaf coast groundsel

BORAGINACEAE

Cynoglossum australe coast houndstongue rare (TSPA)

	BRASSICACEAE		
i	<i>Cakile maritima</i> subsp. <i>maritima</i>	searocket	
	CASUARINACEAE		
e	<i>Allocasuarina monilifera</i>	necklace sheoak	
	<i>Allocasuarina verticillata</i>	drooping sheoak	
	CELASTRACEAE		
	<i>Stackhousia spathulata</i>	coast candles	
	CONVOLVULACEAE		
	<i>Dichondra repens</i>	kidneyweed	
	CRASSULACEAE		
	<i>Crassula tetramera</i>	wiry stonecrop	
	ERICACEAE		
	<i>Leucopogon affinis</i>	lance beardheath	rare (TSPA)
	<i>Leucopogon parviflorus</i>	coast beardheath	
	EUPHORBIACEAE		
	<i>Beyeria lechenaultii</i>	pale turpentine-bush	
i	<i>Euphorbia paralias</i>	sea spurge	EW
	FABACEAE		
	<i>Acacia longifolia</i> subsp. <i>sophorae</i>	coast wattle	
	<i>Acacia mucronata</i> subsp. <i>mucronata</i>	erect caterpillar wattle	
	<i>Acacia uncifolia</i>	coast wirilda	rare (TSPA)
	<i>Acacia verticillata</i> subsp. <i>verticillata</i>	prickly moses	
	<i>Aotus ericoides</i>	golden pea	
	<i>Goodia lotifolia</i>	smooth goldentip	
	<i>Indigofera australis</i> subsp. <i>australis</i>	native indigo	
	<i>Pultenaea daphnoides</i>	heartleaf bushpea	
	GENTIANACEAE		
i	<i>Centaurium erythraea</i>	common centaury	
	GERANIACEAE		
	<i>Geranium solanderi</i>	southern cranesbill	
	GOODENIACEAE		
	<i>Goodenia ovata</i>	hop native-primrose	
	<i>Selliera radicans</i>	shiny swampmat	
	GYROSTEMONACEAE		
	<i>Gyrostemon thesioides</i>	broom wheelfruit	rare (TSPA)
	LOBELIACEAE		
	<i>Lobelia anceps</i>	angled lobelia	
	<i>Lobelia pedunculata</i>	matted lobelia	
	MYRTACEAE		
	<i>Calytrix tetragona</i>	common fringemyrtle	
	<i>Eucalyptus globulus</i> subsp. <i>globulus</i>	tasmanian blue gum	
e	<i>Eucalyptus nitida</i>	western peppermint	
	<i>Kunzea ambigua</i>	white kunzea	
	<i>Leptospermum laevigatum</i>	coast teatree	
	<i>Leptospermum lanigerum</i>	woolly teatree	
	<i>Melaleuca ericifolia</i>	coast paperbark	
	<i>Melaleuca squarrosa</i>	scented paperbark	
	OXALIDACEAE		
	<i>Oxalis rubens</i>	coast woodsorrel	
	PHYLLANTHACEAE		
	<i>Phyllanthus gunnii</i>	shrubby spurge	
	PLANTAGINACEAE		
e	<i>Plantago bellidioides</i>	herbfield plantain	
	POLYGONACEAE		
	<i>Muehlenbeckia adpressa</i>	climbing lignum	
	PROTEACEAE		
	<i>Banksia marginata</i>	silver banksia	
e	<i>Lomatia tinctoria</i>	guitarplant	
	RANUNCULACEAE		
	<i>Clematis microphylla</i>	small-leaf clematis	
	<i>Ranunculus sessiliflorus</i> var. <i>sessiliflorus</i>	rockplate buttercup	rare (TSPA)
	RHAMNACEAE		
	<i>Pomaderris apetala</i> subsp. <i>maritima</i>	coast dogwood	

ROSACEAE			
	<i>Acaena novae-zelandiae</i>	common buzzy	
	<i>Acaena pallida</i>	dune buzzy	
RUBIACEAE			
	<i>Galium australe</i>	tangled bedstraw	
RUTACEAE			
	<i>Boronia anemonifolia</i> subsp. <i>variabilis</i>	stinky boronia	
	<i>Correa alba</i> var. <i>alba</i>	white correa	
	<i>Correa reflexa</i> var. <i>nummulariifolia</i>	roundleaf correa	
SANTALACEAE			
	<i>Exocarpos syrticola</i>	coast native-cherry	
SAPINDACEAE			
	<i>Dodonaea viscosa</i> subsp. <i>spatulata</i>	broadleaf hopbush	
SCROPHULARIACEAE			
	<i>Myoporum insulare</i>	common boobialla	
SOLANACEAE			
i	<i>Lycium ferocissimum</i>	african boxthorn	DW (wi)
	<i>Solanum vescum</i>	gunyang	
THYMELAEACEAE			
	<i>Pimelea serpyllifolia</i> subsp. <i>serpyllifolia</i>	thyme riceflower	
URTICACEAE			
	<i>Urtica incisa</i>	scrub nettle	
ZYGOPHYLLACEAE			
	<i>Zygophyllum billardierei</i>	coast twinleaf	rare (TSPA)
GYMNOSPERMAE			
CUPRESSACEAE			
	<i>Callitris rhomboidea</i>	oyster bay pine	
MONOCOTYLEDONAE			
ARACEAE			
	<i>Lemna disperma</i>	common duckweed	
CENTROLEPIDACEAE			
	<i>Centrolepis strigosa</i> subsp. <i>strigosa</i>	hairy bristlewort	
CYMODOCEACEAE			
	<i>Amphibolis antarctica</i>	sea nymph	
CYPERACEAE			
	<i>Eleocharis sphacelata</i>	tall spikesedge	
	<i>Ficinia nodosa</i>	knobby clubsedge	
	<i>Gahnia grandis</i>	cutting grass	
	<i>Isolepis inundata</i>	swamp clubsedge	
	<i>Isolepis platycarpa</i>	flatfruit clubsedge	
	<i>Lepidosperma elatius</i>	tall swordsedg	
	<i>Lepidosperma filiforme</i>	common rapiersedge	
ORCHIDACEAE			
	<i>Dockrillia striolata</i> subsp. <i>striolata</i>	streaked rock-orchid	
POACEAE			
i	<i>Aira caryophyllea</i> subsp. <i>caryophyllea</i>	silvery hairgrass	
i	<i>Ammophila arenaria</i> subsp. <i>arenaria</i>	marram grass	
	<i>Austrofestuca littoralis</i>	coast fescue	
	<i>Austrostipa flavescens</i>	yellow speargrass	
	<i>Austrostipa stipoides</i>	coast speargrass	
	<i>Poa labillardierei</i> var. <i>labillardierei</i>	silver tussockgrass	
	<i>Poa poiformis</i> var. <i>poiformis</i>	coastal tussockgrass	
	<i>Rytidosperma caespitosum</i>	common wallabygrass	
	<i>Rytidosperma geniculatum</i>	kneed wallabygrass	
	<i>Rytidosperma penicillatum</i>	slender wallabygrass	
	<i>Rytidosperma setaceum</i>	bristly wallabygrass	
	<i>Spinifex sericeus</i>	beach spinifex	
POTAMOGETONACEAE			
	<i>Stuckenia pectinata</i>	fennel pondweed	rare (TSPA)
PTERIDOPHYTA			
ADIANTACEAE			
	<i>Pellaea falcata</i>	sickle fern	

ASPLENIACEAE*Asplenium flabellifolium*

necklace fern

BLECHNACEAE*Blechnum nudum*

fishbone waterfern

DENNSTAEDTIACEAE*Histiopteris incisa*

batswing fern

Hypolepis glandulifera

downy groundfern

Pteridium esculentum

bracken

GLEICHENIACEAE*Gleichenia microphylla*

scrambling corallfern

PTERIDACEAE*Pteris tremula*

tender brake

APPENDIX C. Vertebrate fauna recorded from assessment area

The following table lists the vertebrate fauna recorded from the assessment area, based on opportunistic sightings only. No nocturnal or crepuscular surveys were undertaken, and logs, rocks and other habitat features were not deliberately disturbed. Note that the list below can be used to build up a more complete picture of the range of species utilising the area.

Vertebrate nomenclature follows the following texts for the different groups:

Birds: Christidis, L. & Boles, W.E. (2008). *Systematics and Taxonomy of Australian Birds*. CSIRO Publishing, Collingwood, with nomenclature updated to the interim working list provided by BirdLife Australia.

Reptiles: Hutchinson, M., Swain, R. & Driessen, M. (2001). *Snakes and Lizards of Tasmania*. Fauna of Tasmania Handbook No. 9. University of Tasmania and Department of Primary Industries, Water & Environment, Hobart, with nomenclature updated to recent scincid taxonomy, as included in *A Complete Guide to Reptiles of Australia* (Wilson, S. & Swan, G. 2013).

Amphibians: Littlejohn, M. (2003). *Frogs of Tasmania*. Fauna of Tasmania Handbook No. 6 (2nd edition). University of Tasmania, Hobart.

Status: € = introduced/naturalised; e = endemic to Tasmania (at infrataxon level)

record type: s = live sighting; a = audible (call of frog or bird); c = carcass/bones/skull; n = nest/drey; sc = scat; d = diggings or other signs

Table C1. Summary of vertebrate species recorded from the assessment area

STATUS	ORDER			
	MAMMALS	BIRDS	AMPHIBIANS	REPTILES
	4	22	2	4
e	2	5	-	-
i	-	-	-	-
Sum	6	27	2	4
TOTAL	39			

Table C2. Vertebrate fauna recorded from assessment area

Record	Status	Scientific name	Common name	Comments
MAMMALS				
TACHYGLOSSIDAE (echidna family)				
s, d		<i>Tachyglossus aculeatus setosus</i>	Short-beaked echidna	Diggings infrequent; several sightings in pasture adjacent to dune scrub
MACROPOIDAE (kangaroo & wallaby family)				
s, sc		<i>Macropus rufogriseus</i>	Red-necked wallaby	Several sighted; scats numerous; several skulls and miscellaneous bones
s, sc	e	<i>Thylogale billardierii</i>	Tasmanian pademelon	As above
PHALANGERIDAE (possum family)				
s, sc		<i>Trichosurus vulpecula</i>	Common brushtail possum	One seen in dense scrub; scats on logs, rocks and tracks; several skulls and miscellaneous bones

Record	Status	Scientific name	Common name	Comments
PSEUDOCHEIRIDAE (ringtail possums)				
d		<i>Pseudocheirus peregrinus</i>	Common ringtail possum	One drey (nest) detected in <i>Melaleuca ericifolia</i> swamp forest in northern part of assessment area (appeared disused).
VOMBATIDAE (wombat)				
s, sc, d	e	<i>Vombatus ursinus ursinus</i>	Flinders Island wombat	Several sighted (especially on margins of paddock and dune scrub); numerous burrows (but mainly on edges of paddocks, rare amongst dune scrub); scats numerous; occasional skulls
REPTILES				
SCINCIDAE (skinks)				
s		<i>Niveoscincus metallicus</i>	Metallic skink	Several sighted in forest
s		<i>Acritoscincus duperreyi</i>	Eastern three-lined skink	One sighted near rock outcrop below base of cliffs
s		<i>Liopholis whitii</i>	Whites skink	Several sighted at edges of granite outcrops and base of cliffs
s		<i>Tiliqua nigrolutea</i>	Southern bluetongue	Adult female in northern part of assessment area
AMPHIBIANS				
HYLIDAE (tree frogs)				
a		<i>Litoria ewingii</i>	Brown tree frog	Heard at small dam in dunes
MYOBATRACHIDAE (ground frogs)				
a		<i>Crinia signifera</i>	Common froglet	Heard at small dam in dunes
BIRDS				
PHALACROCORACIDAE (cormorant family)				
s		<i>Microcarbo melanoleucos melanoleucos</i>	Australasian little pied cormorant	Perching on rocks offshore from Killiecrankie Beach near end of Quoin Road; two flew over dunes during survey
ACCIPITRIDAE (eagle, hawk and kite family)				
s		<i>Haliaeetus leucogaster</i>	White-bellied sea-eagle	One flew over dunes and Killiecrankie Beach during survey
FALCONIDAE (falcon family)				
s		<i>Falco cenchroides cenchroides</i>	Australasian nankeen kestrel	Several sighted in and around forest and woodland remnants in paddocks between homestead and main dunes
HAEMATOPODIDAE (oystercatcher family)				
s, a		<i>Haematopus longirostris</i>	Pied oystercatcher	Several along Killiecrankie Beach

Record	Status	Scientific name	Common name	Comments
s, a		<i>Haematopus fuliginosus fuliginosus</i>	Southern sooty oystercatcher	Several along Killiecrankie Beach and rocky shoreline
CHARADRIIDAE (plover and dotterel family)				
s		<i>Charadrius ruficapillus</i>	Red-capped plover	Two pairs along northern end of Killiecrankie Beach
s		<i>Thinornis cucullatus cucullatus</i>	Eastern hooded plover	One pair at southern end of Killiecrankie Beach; group of three at northern end of Killiecrankie Beach near calcarenite outcrop
s, a		<i>Vanellus miles novaehollandiae</i>	Southern masked lapwing	One noisily flushed from pasture along Quoin Road at dusk
LARIDAE (gull and tern family)				
s, a		<i>Larus pacificus pacificus</i>	East coast Pacific gull	Several seen (and heard) along Killiecrankie Beach and rocky foreshore; also flying over
s, a		<i>Chroicocephalus novaehollandiae novaehollandiae</i>	Australian silver gull	As above
COLUMBIDAE (pigeon and dove family)				
s, a		<i>Phaps chalcoptera</i>	Common bronzewing	Calls occasional in forest; one flushed from eastern end of Quoin Road
CACATUIDAE (cockatoo and corella family)				
s, a, d		<i>Calyptorhynchus funereus xanthanotus</i>	Tasmanian yellow-tailed black cockatoo	Small flocks sighted and heard throughout; evidence of "grubbing out" of teatree and paperbark stems (a pair sighted doing this); several feathers on ground
PSITTACIDAE (parrot, lorikeet and rosella family)				
s, a, d	e	<i>Platycercus caledonicus caledonicus</i>	Green rosella	Several seen and heard throughout; occasional feathers on ground
STRIGIDAE (boobook owl family)				
a		<i>Ninox novaeseelandiae leucopsis</i>	Southern boobook	Several heard at night from homestead area and during nocturnal walk along Quoin Road towards coast
MALURIDAE (fairy-wren, emu-wren and grasswren family)				
s, a		<i>Malurus cyaneus samueli</i>	Flinders Island superb fairy-wren	Numerous individuals seen and heard, especially in open areas
ACANTHIZIDAE (thornbill and gerygone family)				
s	e	<i>Sericornis humilis humilis</i>	Southern Tasmanian scrubwren	Several seen in dense dune scrub and forested areas
s, a	e	<i>Acanthiza ewingii ewingii</i>	Southern Tasmanian thornbill	Several small flocks and individuals seen and heard, mainly in forested areas
MELIPHAGIDAE (honeyeater and chat family)				
s, a	e	<i>Lichenostomus flavicollis</i>	Yellow-throated honeyeater	Several seen and heard in a range of vegetation types

Record	Status	Scientific name	Common name	Comments
s, a		<i>Phylidonyris novaehollandiae canescens</i>	Tasmanian new holland honeyeater	Small numbers amongst dune scrub
PACHYCEPHALIDAE (whistler and shrike-thrush family)				
a		<i>Pachycephala pectoralis glaucura</i>	Tasmanian golden whistler	Calls in eucalypt forest occasional
s, a		<i>Colluricincla harmonica strigata</i>	Tasmanian grey shrike-thrush	Numerous calls, sightings occasional, mainly in eucalypt forest
ARTAMIDAE (woodswallow, currawong, butcherbird and magpie family)				
s, a, sc		<i>Strepera fuliginosa parvior</i>	Flinders Island black currawong	An extremely numerous species taking advantage of over-mature berries on "old-growth" seabox (<i>Alyxia buxifolia</i>); regurgitated pellets of berries numerous
RHIPIDURIDAE (fantail family)				
s, a		<i>Rhipidura fuliginosa albiscapa</i>	Tasmanian grey fantail	Several seen and heard in a range of vegetation types
CORVIDAE (crow and raven family)				
s, a		<i>Corvus tasmanicus tasmanicus</i>	Southern forest raven	Several seen and heard
PETROICIDAE (australian robin family)				
s		<i>Petroica multicolour leggii</i>	Tasmanian scarlet robin	One adult sighted on stump adjacent to Quoin Road
s, a	e	<i>Melanodryas vittata vittata</i>	Tasmanian dusky robin	Occasional in forested areas
ZOSTEROPIIDAE (whiteye family)				
s		<i>Zosterops lateralis lateralis</i>	Tasmanian silvereeye	Occasional in forest and dune scrub

APPENDIX D. Annotated images of key ecological features of assessment area



LHS. Individual of *Acacia uncifolia* (circled) in low windswept dune scrub



RHS. As above



LHS. Individuals of *Acacia uncifolia* (arrowed) further back from beach, where the effects of the wind-pruning are less and the plants grow taller



RHS. *Acacia uncifolia* (circled) on the verge of Quoin Road – note also *Zygophyllum billardierei* in the foreground and growing through the taller shrubs (arrowed)



LHS & RHS. Tallest slightly unhealthy individual of *Acacia uncifolia* detected in back dunes (same individual from different sides)



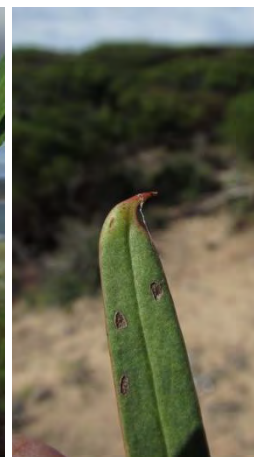
LHS. Tall healthy individual of *Acacia uncifolia* in back dunes

RHS. Naturally senescing mature *Acacia uncifolia* in back dunes with healthier younger plant in front



LHS. Quoin Road – habitat of *Zygodium billardierei* occurs on its verges, middle and in adjacent tall scrub

RHS. Verge of Quoin Road with *Leptospermum laevigatum* scrub and a ground cover of *Zygodium billardierei* (arrowed)



LHS. Flowering individual of *Acacia uncifolia* from the verge of the Quoin Road extension

CENTRE. Flowerheads of *Acacia uncifolia*

RHS. Uncinate (hooked) apex to the phyllode of *Acacia uncifolia*



LHS. Extensive mat-forming patch of *Zygophyllum billardierei* amongst *Allocasuarina verticillata* forest south of Quoin Road

RHS. *Zygophyllum billardierei* growing densely over pushed up soil on edge of Quoin Road



LHS. *Zygophyllum billardierei* and *Cynoglossum australe* on verge of Quoin Road

RHS. *Zygophyllum billardierei* on verge of extension to Quoin Road (dark green patches)



LHS. *Zygophyllum billardierei* growing around the disturbed Quoin Road and boatshed (arrowed sites indicate some of the patches)

RHS. *Zygophyllum billardierei* growing in dense swards/thickets on the edge of Quoin Road



LHS. Flower of *Zygothymus billardierei* – the species was not in flower at the time of survey (images not from site)

CENTRE. Fruit of *Zygothymus billardierei* – the species was not in fruit at the time of survey (images not from site)

RHS. Leaves of *Zygothymus billardierei* – note the characteristic “twin leaf”



LHS. Large individual of *Gyrostemon thesioides* amongst tall dune scrub

RHS. Large individual of *Gyrostemon thesioides* below granite cliffs



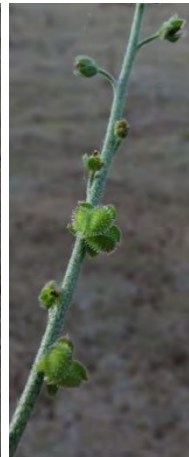
LHS. Flowers and fruit of *Gyrostemon thesioides* – the individuals in the assessment area were all infertile (images not from site)

RHS. Leaves of *Gyrostemon thesioides* (from site)



LHS. Quoin Road – these areas of rough pasture adjacent to the road support extensive populations of *Cynoglossum australe*

RHS. Habitat of *Cynoglossum australe* amongst dune swales



LHS. Basal leaves of *Cynoglossum australe*

CENTRE. Fruit of *Cynoglossum australe* (note hooked hairs that facilitate dispersal by furred animals)

RHS. Flower of *Cynoglossum australe* (very similar to introduced forget-me-nots)



LHS. Habitat of *Ranunculus sessiliflorus* amongst *Eucalyptus globulus* forest on granite slopes – patch occurs on top of rock outcrop (green patch arrowed)

RHS. Patch of *Ranunculus sessiliflorus* on top of rock outcrop



LHS. Collected specimen of *Ranunculus sessiliflorus*
RHS. Fruit (circled) of *Ranunculus sessiliflorus* showing sessile arrangement (inset)



LHS. Growth habit of *Leucopogon affinis* from northern part of assessment area
RHS. Leaves of individual shown in LHS showing leaf colour, shape and width



LHS. Growth habit of specimen of *Leucopogon affinis* from above Killiecrankie Creek
RHS. Leaf morphology of specimen of *Leucopogon affinis* from above Killiecrankie Creek



LHS & RHS. Habitat of *Stuckenia pectinata* (dense sward in water in RHS image is the species) in small dam amongst dunes



LHS. Looking across from near the end of the extension to Quoin Road to the proposed green on the rocky coastline (approximately arrowed)

RHS. Gaps amongst windswept heathland in this area are the nominal location for *Styloidium beaugleholei* and *Phyllangium distylis*



LHS & RHS. Looking east from the coastal walking track into windswept heathland on granite, nominally the location of a database record of *Isopogon ceratophyllus* (note that the gaps between the heathy scrub are also potential habitat for annual herbs such as *Styloidium beaugleholei* and *Phyllangium distylis*)



Fruit of *Eucalyptus globulus* from assessment area – note the 3-fruited umbels characteristic of subsp. *pseudoglobulus* but that the northern Flinders Island population is attributed to subsp. *globulus*



LHS. Dense patch of *Euphorbia paralias* along Killiecrankie Beach – the indicated area has been mapped as a “weed infestation” (FWU) under the TASVEG classification

RHS. *Euphorbia paralias* extending into dunes to the exclusion of most native species



LHS. *Euphorbia paralias* growing on steep eroding dune above Killiecrankie Beach

RHS. *Euphorbia paralias* colonising the fringes and base of a large sand blow



LHS. *Euphorbia paralias* along the fringe of Killiecrankie Beach
RHS. *Euphorbia paralias* (circled) scattered amongst calcarenite boulders



LHS. Dense patch of *Lycium ferocissimum* on edge of Quoin Road
RHS. Flowers and leaves of *Lycium ferocissimum*, also showing spines



LHS. Drey (nest) of ringtail possum (circled)
RHS. Hooded plover on Killiecrankie Beach

APPENDIX E. Details of threatened flora populations, weed and key fauna point locations

For details of point locations of threatened flora, weed and key fauna point locations, refer to attached .xls and .shp files and tables below (can also be supplied in .dwg format). Refer Figures xxx in main report and Appendix D for images).

Table E1. Details of individuals of *Acacia uncifolia*

site	easting	northing	date	comments
32	572793	5591720	19/03/2015	1, dune scrub, near end of Quoin Road
33	572795	5591713	19/03/2015	1, dune scrub, near end of Quoin Road
34	572799	5591698	19/03/2015	1, dune scrub, near end of Quoin Road
35	572801	5591697	19/03/2015	1, dune scrub, near end of Quoin Road
36	572806	5591693	19/03/2015	2, dune scrub, near end of Quoin Road
37	572819	5591691	19/03/2015	1, dune scrub, near end of Quoin Road
38	572811	5591690	19/03/2015	1, dune scrub, near end of Quoin Road
39	572817	5591691	19/03/2015	1, dune scrub, near end of Quoin Road
40	572828	5591680	19/03/2015	1, dune scrub, south of end of Quoin Road
41	572831	5591648	19/03/2015	1, dune scrub, south of end of Quoin Road
42	572833	5591652	19/03/2015	1, dune scrub, south of end of Quoin Road
43	572836	5591657	19/03/2015	1, dune scrub, south of end of Quoin Road
44	572855	5591614	19/03/2015	1, dune scrub, south of end of Quoin Road
45	572859	5591557	19/03/2015	2, dune scrub
46	572864	5591555	19/03/2015	10, dune scrub
47	572877	5591537	19/03/2015	1, dune scrub
48	572880	5591529	19/03/2015	1, dune scrub
49	572884	5591524	19/03/2015	1, dune scrub
50	572809	5591712	19/03/2015	1, near end of Quoin Road
51	572809	5591709	19/03/2015	1, near end of Quoin Road
52	572805	5591758	19/03/2015	1, edge of extension to Quoin Road
53	572890	5591867	19/03/2015	1, dense dune scrub behind house
54	572869	5591872	19/03/2015	1, dense dune scrub behind house
55	572860	5591859	19/03/2015	1, dense dune scrub behind house
56	572853	5591876	19/03/2015	1, dense dune scrub behind house
57	572828	5591864	19/03/2015	1, dense dune scrub behind house
58	572757	5591865	19/03/2015	1, dense dune scrub behind house
59	572758	5591878	19/03/2015	1, edge of extension to Quoin Road
60	572755	5591891	19/03/2015	1, edge of extension to Quoin Road
61	572753	5591928	19/03/2015	1, edge of extension to Quoin Road
62	572760	5592002	19/03/2015	1, edge of extension to Quoin Road
63	572745	5591943	20/03/2015	1, edge of extension to Quoin Road
64	572789	5591804	20/03/2015	1, edge of extension to Quoin Road
65	572782	5591800	20/03/2015	1, edge of extension to Quoin Road
66	572805	5591763	20/03/2015	1, edge of extension to Quoin Road
67	572804	5591760	20/03/2015	1, edge of extension to Quoin Road
68	572805	5591766	20/03/2015	1, edge of extension to Quoin Road
69	572805	5591744	20/03/2015	2, downslope of extension to Quoin Road
70	572800	5591744	20/03/2015	3, downslope of extension to Quoin Road

site	easting	northing	date	comments
71	572798	5591749	20/03/2015	2, downslope of extension to Quoin Road
72	572795	5591753	20/03/2015	1, edge of extension to Quoin Road
73	573142	5590976	20/03/2015	1 (5 m tall), hinter-dunes
74	572858	5590429	20/03/2015	2 (tall), hinter-dunes
75	572700	5590382	20/03/2015	1, hinter-dunes
76	572727	5590323	20/03/2015	1, hinter-dunes
77	572733	5590318	20/03/2015	1, hinter-dunes
78	572738	5590317	20/03/2015	1, hinter-dunes
79	572753	5590292	20/03/2015	1, hinter-dunes
80	572680	5590225	20/03/2015	1, edge of dune/paddock
81	572963	5590184	20/03/2015	1, paddock edge
82	572501	5590100	20/03/2015	1, paddock edge
83	572480	5590090	20/03/2015	1, paddock edge
84	572389	5590075	20/03/2015	1, paddock edge
85	572389	5590070	20/03/2015	6 (in line), paddock edge
86	572119	5590144	20/03/2015	1, dune rise above Killiecrankie Creek
87	573015	5591502	21/03/2015	1, dune rise south of Quoin Road
88	573165	5591478	21/03/2015	1, dune rise south of Quoin Road
89	573182	5591451	21/03/2015	1, dune rise south of Quoin Road

Table E2. Details of individuals of *Cynoglossum australe*

site	easting	northing	date	comments
1	574638	5591715	21/03/2015	Quoin, near homestead, edge of creek remnant
2	574533	5591627	21/03/2015	Quoin, near homestead, in paddock
3	574610	5591629	21/03/2015	Quoin, near homestead, in paddock
4	574456	5591704	21/03/2015	Quoin, near homestead, edge of creek remnant
5	574058	5591562	19/03/2015	verge of Quoin Road
6	573996	5591591	19/03/2015	verge of Quoin Road
7	573731	5591567	19/03/2015	verge of Quoin Road
8	574174	5591583	20/03/2015	verge of Quoin Road
9	574103	5591559	20/03/2015	verge of Quoin Road
10	574010	5591585	20/03/2015	verge of Quoin Road
11	573928	5591590	20/03/2015	verge of Quoin Road
12	573794	5591592	20/03/2015	verge of Quoin Road
13	573738	5591578	20/03/2015	verge of Quoin Road
14	573678	5591567	20/03/2015	verge of Quoin Road
15	573619	5591543	20/03/2015	verge of Quoin Road
16	573600	5591528	20/03/2015	verge of Quoin Road
17	573563	5591510	20/03/2015	verge of Quoin Road
18	573526	5591497	20/03/2015	verge of Quoin Road
19	573497	5591485	20/03/2015	verge of Quoin Road
20	573349	5591478	20/03/2015	verge of Quoin Road
21	572751	5592007	20/03/2015	dune scrub, extension to Quoin Road
22	573055	5590685	20/03/2015	hinter-dune swale
23	573057	5590664	20/03/2015	hinter-dune swale
24	572956	5590626	20/03/2015	hinter-dune swale

site	easting	northing	date	comments
25	572841	5590626	20/03/2015	hinter-dune swale
26	572968	5590457	20/03/2015	hinter-dune swale
27	572907	5590417	20/03/2015	hinter-dune swale
28	572797	5590441	20/03/2015	hinter-dune swale
29	572541	5590431	20/03/2015	near dam in dunes
30	572727	5590258	20/03/2015	hinter-dune swale
31	572287	5590113	20/03/2015	hinter-dune swale near Killiecrankie Creek

Table E3. Details of individuals of *Gyrostemon thesioides*

site	easting	northing	date	comments
159	573189	5592137	19/03/2015	1, below cliffs of Mount Killiecrankie
160	573004	5591992	19/03/2015	1, open dune scrub north of Quoin Road
161	573000	5591989	19/03/2015	1, open dune scrub north of Quoin Road
162	572988	5591959	19/03/2015	1, open dune scrub north of Quoin Road
163	572982	5591962	19/03/2015	1, open dune scrub north of Quoin Road
164	572998	5591957	19/03/2015	1, open dune scrub north of Quoin Road
165	573422	5591390	21/03/2015	1, sheoak forest, south of Quoin Road

Table E4. Details of individuals of *Leucopogon affinis*

site	easting	northing	date	comments
156	572235	5590038	20/03/2015	1, slope on northern side of Killiecrankie Creek
158	572934	5592064	21/03/2015	4, dense dune scrub north of Quoin Road

Table E5. Details of individuals of *Ranunculus sessiliflorus* var. *sessiliflorus*

site	easting	northing	date	comments
166	573167	5592304	20/03/2015	patch, rock outcrop below Mount Killiecrankie

Table E6. Details of individuals of *Stuckenia pectinata*

site	easting	northing	date	comments
167	572551	5590463	20/03/2015	small dam in hinter-dune

Table E7. Details of individuals of *Zygophyllum billardierei*

site	easting	northing	date	comments
90	573015	5591932	19/03/2015	patch, dune scrub behind house on coast
91	573017	5591927	19/03/2015	patch, dune scrub behind house on coast
92	573021	5591934	19/03/2015	patch, dune scrub behind house on coast
93	573027	5591927	19/03/2015	patch, dune scrub behind house on coast
94	572987	5591894	19/03/2015	patch, dune scrub behind house on coast
95	572757	5591847	19/03/2015	verge of extension to Quoin Road

site	easting	northing	date	comments
96	572757	5591838	19/03/2015	verge of extension to Quoin Road
97	572762	5592008	19/03/2015	verge of extension to Quoin Road
98	573629	5591546	20/03/2015	verge of Quoin Road
99	573469	5591478	20/03/2015	verge of Quoin Road
100	573428	5591492	20/03/2015	verge of Quoin Road
101	573363	5591473	20/03/2015	verge of Quoin Road
102	573204	5591506	20/03/2015	verge of Quoin Road
103	573176	5591507	20/03/2015	verge of Quoin Road
104	573124	5591510	20/03/2015	verge of Quoin Road
105	572758	5591857	20/03/2015	extension to Quoin Road
106	572760	5591880	20/03/2015	extension to Quoin Road
107	572756	5591900	20/03/2015	extension to Quoin Road
108	572755	5591924	20/03/2015	extension to Quoin Road
109	572763	5592032	20/03/2015	extension to Quoin Road
110	572764	5592059	20/03/2015	extension to Quoin Road
111	572956	5592028	20/03/2015	dune scrub, north of Quoin Road
112	572944	5592016	20/03/2015	dune scrub, north of Quoin Road
113	572939	5592021	20/03/2015	dune scrub, north of Quoin Road
114	572928	5592020	20/03/2015	dune scrub, north of Quoin Road
115	572920	5592028	20/03/2015	dune scrub, north of Quoin Road
116	572908	5592034	20/03/2015	dune scrub, north of Quoin Road
117	572894	5592034	20/03/2015	dune scrub, north of Quoin Road
118	572871	5592058	20/03/2015	dune scrub, north of Quoin Road
119	572828	5592036	20/03/2015	dune scrub, north of Quoin Road
120	572796	5592024	20/03/2015	dune scrub, north of Quoin Road
121	572747	5592003	20/03/2015	extension to Quoin Road
122	572752	5591932	20/03/2015	extension to Quoin Road
123	572753	5591847	20/03/2015	extension to Quoin Road
124	572771	5591821	20/03/2015	extension to Quoin Road
125	572791	5591779	20/03/2015	downslope of extension to Quoin Road
126	572805	5591748	20/03/2015	extension to Quoin Road
127	572855	5591679	20/03/2015	verge of Quoin Road
128	572850	5591683	20/03/2015	verge of Quoin Road
129	573050	5591529	20/03/2015	verge of Quoin Road
130	573126	5591512	20/03/2015	verge of Quoin Road
131	573167	5591513	20/03/2015	verge of Quoin Road
132	573226	5591502	20/03/2015	verge of Quoin Road
133	573267	5591498	20/03/2015	verge of Quoin Road
134	573336	5591478	20/03/2015	verge of Quoin Road
135	573393	5591467	20/03/2015	verge of Quoin Road
136	573461	5591472	20/03/2015	verge of Quoin Road
137	573507	5591587	20/03/2015	verge of Quoin Road
138	573562	5591510	20/03/2015	verge of Quoin Road
139	573613	5591531	20/03/2015	verge of Quoin Road
140	573671	5591558	20/03/2015	verge of Quoin Road
141	572825	5592034	21/03/2015	dune scrub, north of Quoin Road
142	572849	5591976	21/03/2015	dune scrub, north of Quoin Road

site	easting	northing	date	comments
143	572875	5591981	21/03/2015	dune scrub, north of Quoin Road
144	572931	5591986	21/03/2015	dune scrub, north of Quoin Road
145	573104	5591925	21/03/2015	dune scrub, north of Quoin Road
146	572934	5592064	21/03/2015	dune scrub, north of Quoin Road
147	573163	5591497	21/03/2015	dune scrub, immediately south of Quoin Road
148	573296	5591386	21/03/2015	dune scrub, south of Quoin Road
149	573383	5591316	21/03/2015	sheoak forest, south of Quoin Road
150	573398	5591319	21/03/2015	sheoak forest, south of Quoin Road
151	573427	5591341	21/03/2015	sheoak forest, south of Quoin Road
152	573422	5591357	21/03/2015	sheoak forest, south of Quoin Road
153	573427	5591384	21/03/2015	sheoak forest, south of Quoin Road
154	573443	5591399	21/03/2015	sheoak forest, south of Quoin Road
155	573430	5591441	21/03/2015	dune scrub, immediately south of Quoin Road
157	573072	5591529	21/03/2015	verge of Quoin Road

Table E8. Point locations for weeds

easting	northing	abundance	comments
<i>Lycium ferocissimum</i> (african boxthorn)			
572850	5591683	dense patch	verge of Quoin Road near Killiecrankie Beach
572854	5591679		
<i>Euphorbia paralias</i> (sea spurge)			
524638	5591715	scattered to locally dense patches Killiecrankie Beach and dunes	
572810	5591690		
572827	5591667		
572799	5591433		
572781	5591373		
572785	5591341		
572649	5591183		
572631	5591157		
572649	5591117		
572633	5591099		
572622	5591091		
572605	5590988		
572476	5590725		
572444	5590662		
572340	5590520		
572258	5590435		
572429	5590655		
572467	5590747		
572498	5590825		
572510	5590856		
572607	5591090		
572741	5591384		

easting	northing	abundance	comments
572787	5591453		
572804	5591474		
572818	5591616		

Table E9. Point location for ringtail possum drey

easting	northing	abundance	comments
572860	5592199	1	dense swamp scrub behind north end of Killiecrankie Beach

APPENDIX F. Analysis of database records of threatened flora

Table F1 provides a listing of priority flora from within 500 m and 5000 m of the assessment area (nominal buffer widths usually used to discuss the potential of a particular assessment area to support various species listed in databases), with comments on whether potential habitat is present for the species, and possible reasons why a species was not recorded. Some species not listed on databases but considered by the author to have potential to occur in the survey area are also discussed.

Note that the field assessment was not restricted to the species listed in Table F1 but considered any threatened flora with the potential to be present. While the database analysis utilises a nominal **buffer of 5000 m**, the author's own experience of the vegetation and flora of Tasmania's near-coastal vegetation (especially the northeast), combined with database interrogation, meant that the specific potential for numerous other species previously recorded from the wider area were taken into account.

Table F1. Priority flora records from within 500 m and 5000 m of boundary of assessment area

Species listed below are listed as rare (r), vulnerable (v), endangered (e), or extinct (x) on the Tasmanian *Threatened Species Protection Act 1995* (TSPA); vulnerable (VU), endangered (EN), critically endangered (CR) or extinct (EX) on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA). Information below is sourced from the DPIPWE's *Natural Values Atlas* (DPIPWE 2015a) and other sources where indicated. Habitat descriptions are taken from TSS (2003+) and TSS (2012), except where otherwise indicated.

<i>Species</i>	<i>Status</i> TSPA EPBCA	<i>Observations</i>	<i>Comments</i>
Records within the assessment area			
<i>Cynoglossum australe</i> (coast houndstongue)	r -	1 record	<p>There is a database record (A.M. Buchanan, 19-Nov. 2009, 573406, 5591451 +/- 25 m) from the track leading to the coast.</p> <p>The species was found to be present along most of the track between the homestead and the coast, with the species extending into adjacent paddocks essentially acting as a "weed". It was also locally common throughout the back dune areas, especially along the base and edges of swales, around the small dam, and amongst canopy gaps on dune rises.</p> <p><i>Cynoglossum australe</i> has been formally recommended for removal from the TSPA by the Scientific Advisory Committee, and the decision is awaiting ministerial approval. The species is widespread, well-reserved and responds positively to disturbance.</p> <p>It is recommended that the status of the species be checked prior to application for a permit. If the species has been de-listed, no action will be required. If the species remains on the list, a permit will be needed to disturb the species but this should be issued without constrain – refer to DISCUSSION Legislative and policy implications.</p>
Records within 500 m of assessment area [and not considered in above sections]			
<i>Acacia uncifolia</i> (coast wirilda)	r -	1 record [1 additional record within 5000 m]	The species was detected within the assessment area – see RESULTS Plant species Priority flora known from the assessment area for more details.

Species	Status TSPA EPBCA	Observations	Comments
<i>Isopogon ceratophyllus</i> (horny conebush)	v -	1 record [10 additional records within 5000 m]	This species was not detected. Potential habitat is limited – see RESULTS Plant species Priority flora known from the assessment area for more detailed discussion on the database record and potential of the site to support the species.
<i>Phyllangium distylis</i> (tiny mitrewort)	r -	1 record	As above.
<i>Phylloglossum drummondii</i> (pygmy clubmoss)	r -	1 record	As above.
<i>Stylidium beaugleholei</i> (fan triggerplant)	r -	1 record [1 additional record within 5000 m]	As above.
Records within 5000 m of assessment area [and not considered in above sections]			
<i>Acrotriche cordata</i> (coast groundberry)	v -	1 record	Potential habitat (heathland on calcareous substrates) is extremely limited to occasional outcrops of calcarenite along Killiecrankie Beach, which were all thoroughly searched for this low shrub (detectable and identifiable at any time of the year). Within Tasmania, the species is restricted to Flinders Island, with typical habitat and sites being the low windswept heaths at Trousers Point (and similar sites). The assessment area does not present as highly likely habitat and the species was not detected.
<i>Drosera glanduligera</i> (scarlet sundew)	r -	1 record	Potential habitat (low nutrient, sandy or loamy soils in heathlands and woodlands) is extremely limited to occasional outcrops of calcarenite along Killiecrankie Beach and open areas amongst sandy scrub on granite and calcarenite between the private residence and the track around the coastline. The survey was undertaken well outside the peak flowering and fruiting period of this annually and ephemerally flowering diminutive herb. This is one of a suite of such species that have been recommended for timed targeted surveys in spring at selected sites (if potential habitat will be affected, which is not considered likely at this stage of planning) considered most likely to support the species – refer to DISCUSSION Recommendations for more detail.
<i>Eutaxia microphylla</i> (spiny bushpea)	r -	2 records	See under <i>Acrotriche cordata</i> – similar habitat requirements (also a perennial shrub detectable and identifiable at any time of the year).
<i>Gyrostemon thesioides</i> (broom wheelfruit)	r -	1 record	The species was detected within the assessment area – see RESULTS Plant species Priority flora known from the assessment area for more details.
<i>Hakea ulicina</i> (furze needlebush)	v -	3 records	Potential habitat (heathlands, heathy scrub and woodland) is essentially absent. Within Tasmania, the species is restricted to Flinders Island, with typical habitat and sites being dense heathlands and heathy woodlands of the inner part of the island (e.g. Wingaroo heaths). The assessment area does not present as highly likely habitat and the species was not detected (detectable and identifiable at any time of the year).

Species	Status TSPA EPBCA	Observations	Comments
<i>Leucopogon affinis</i> (lance beardheath)	r -	2 records	Listed in DPIPWE (2015a) under <i>Leucopogon lanceolatus</i> var. <i>lanceolatus</i> but the nomenclature of de Salas & Baker (2014) is recognised here. The species was detected within the assessment area – see RESULTS Plant species <u>Priority flora known from the assessment area</u> for more details.
<i>Leucopogon esquamatus</i> (swamp beardheath)	r -	12 records	See under <i>Hakea ulicina</i> – similar habitat requirements (also a perennial shrub detectable and identifiable at any time of the year).
<i>Lotus australis</i> (australian trefoil)	r -	2 records	Potential habitat (grass- or shrub-covered sandy to rocky dunes, headlands backbeaches and hinterlands) present along the majority of Killiecrankie Beach. This is an annually flowering but perennial herb, most easily detected when the pale pink flowers or distinctive radially-arranged dark brown pods are present but detectable and identifiable from vegetative material at any time (the foliage is distinctive because of its slightly fleshy, grey-green trifoliate leaves). The openings amongst the dense windswept scrub on the dunes are ideal habitat and these were searched and the species was not detected.
<i>Microtidium atratum</i> (yellow onion-orchid)	r -	1 record	Potential habitat (swamps, usually amongst dense heathland but sometimes amongst grassland) absent. The survey was undertaken outside the peak flowering period (Wapstra et al. 2012) but a follow-up timed targeted survey is not considered warranted because of the lack of potential habitat.
<i>Zygophyllum billardierei</i> (coast twinleaf)	r -	6 records	The species was detected within the assessment area – see RESULTS Plant species <u>Priority flora known from the assessment area</u> for more details.
EPBCA-listed species listed as potentially present based on Protected Matters Report (CofA 2015)			
<i>Caladenia caudata</i> (tailed spider-orchid)	v VU	Species or species' habitat likely to occur within area	This species, which is endemic to Tasmania, is known only from collections on Flinders, Cape Barren and Clarke islands (Jones et al. 1999; author check of collections held at the Tasmanian Herbarium and database records held in DPIPWE's <i>Natural Values Atlas</i> made on 1 April 2015), all of which appear to be from typical sites/habitat. For the record, the assessment area does not support potential habitat (insolated grassy to heathy woodland and heathland, often on granite, dolerite or sandstone) and presents as highly different to all known sites on mainland Tasmania and the Furneaux Group. The survey was undertaken outside the peak flowering period (Wapstra et al. 2012) but a follow-up timed targeted survey is not considered warranted because of the lack of potential habitat.
<i>Pterostylis wapstrarum</i> (fleshy greenhood)	e CR	Species or species' habitat may occur within area	The listing of this species in CofA (2015) is erroneous because the species is known only from the Midlands of Tasmania in native grasslands on broad valley floors and occasionally slopes, a habitat type absent from the assessment area. For the record, a related species, which is also listed as threatened, <i>Pterostylis ziegeleri</i> (grassland greenhood), has a greater potential to be present

Species	Status TSPA EPBCA	Observations	Comments
			<p>(because it can occur in coastal dunes and amongst grassy/shrubby rocky headlands) but that species is not known from the Furneaux Group and the assessment area does not present as similar habitat to known sites.</p> <p>The survey was undertaken outside the peak flowering period of either species (Wapstra et al. 2012) but a follow-up timed targeted survey is not considered warranted because of the lack of potential habitat.</p>
Additional species considered by the author with potential to be present but not shown in databases			
<i>Deyeuxia densa</i> (heath bentgrass)	r -	no database records	This species can occur in virtually any habitat type but was not detected.
<i>Deyeuxia minor</i> (small bentgrass)	r -	no database records	As above.
<i>Parietaria debilis</i> (shade pellitory)	r -	no database records	<p>Potential habitat (shaded sites along riparian habitats, under rocky overhangs and amongst shrub-covered dune swales, the latter the prime habitat on King Island) is present throughout much of the assessment area. This perennial low shrubby herb (detectable and identifiable at any time of the year) was not detected.</p> <p>The absence of the species from such superficially ideal habitat is somewhat surprising but it is noted that the conservation status is likely to be reviewed based on the more recently understood distribution (much more common and widespread than previously thought with islands in Bass Strait contributing significantly to this) and I would not recommend follow-up surveys.</p>
<i>Poa halmaturina</i> (dune tussockgrass)	r -	no database records	<p>There is only one database record from Flinders Island (9. Dec. 1975 – Wingaroo/Fairhaven roads area) and one from Clarke Island (29 Jan. 1994), both supported by voucher specimens held at the Tasmanian Herbarium, which is surprising because there is extensive areas of potential habitat (grass- and shrub-covered stabilised dunes, often subject to the Roaring Forties) present, especially on the west coast of the island.</p> <p>Parts of the assessment area present as superficially ideal habitat i.e. the lightly-covered dune swales and adjacent gentle to moderate slopes under <i>Leptospermum laevigatum</i>, especially in the dune “hinterlands” behind Killiecrankie Beach (these are essentially identical to sites dominated by the species on King Island’s west coast). No specimens of this small-tussocked <i>Poa</i> species were identified in the field but it is noted that the browsing intensity and time of year meant that 99% of tussocks (such as they were) lacked fertile material.</p> <p>It is difficult to discount entirely the potential presence of this species based on the surveys to date. That said, the lack of other records on the island suggests that the species is not widespread on the island and the chances of it being present are low. On this basis, I would not recommend a formal follow-up survey at a different time of year.</p>

Species	Status TSPA EPBCA	Observations	Comments
<i>Poa poiformis</i> var. <i>ramifer</i> (island purplegrass)	r -	no database records	Potential habitat (grasslands, mainly on islands) widespread through the dune system. Only var. <i>poiformis</i> was detected (widespread and common).
<i>Pomaderris oraria</i> subsp. <i>oraria</i> (bassian dogwood)	r -	no database records	Potential habitat (rocky and sandy grasslands, heaths and scrubs in near-coastal areas) widespread. This distinctive shrub was not detected.
<i>Pomaderris paniculosa</i> subsp. <i>paralia</i> (shining dogwood)	r -	no database records	As above.
<i>Pterostylis cucullata</i> subsp. <i>cucullata</i> (leafy greenhood)	e VU	no database records	<p>Until 2005, this species was not known from the Furneaux Group, within Tasmania being restricted to populations on King Island, other northwest Bass Strait islands, south of Temma and historical records from Circular Head and Low Head. In 2005 the species was found on private property around Tanners Bay. Extension surveys were undertaken in 2008, and the population is now known to be represented by just 11 individuals over 0.0004 ha.</p> <p>Parts of the assessment area present as superficially ideal habitat i.e. the lightly-covered dune swales and adjacent gentle to moderate slopes under <i>Leptospermum laevigatum</i>, especially in the southern dune "hinterlands" behind Killiecrankie Beach (these are essentially identical to sites dominated by the species on King Island's west coast).</p> <p>TSS (2010) indicate that "it is...likely that additional subpopulations occur in large areas of unsurveyed potential habitat on private property on both King and Flinders Island". In theory, potential habitat is quite widespread on Flinders Island but the lack of records of this distinctive orchid, especially given the local popularity of orchids on the island, suggests it is extremely scarce. While difficult to discount the presence of the species because the survey was conducted well outside the peak flowering period of November (Wapstra et al. 2012), the likelihood of the species being widespread and significantly constraining the project is very low.</p> <p>The species is best detected when in full flower (around mid-November) but rosette leaves can be detected earlier and fertilised scapes (that have elongated to disperse) seed can remain visible for several weeks.</p> <p>The sites selected for building clusters either do not support potential habitat or only support highly marginal habitat (in the form of localised grassy patches), such that a timed targeted survey is not considered warranted. Other parts of the assessment area (e.g. the southern dune hinterlands) were more prospective and should be the subject of targeted cautionary surveys for the species if such sites were to be disturbed (not likely at this stage).</p>
<i>Stellaria multiflora</i> (rayless starwort)	r -	no database records	This species, apparently represented by subsp. <i>nebulosa</i> on the Furneaux Group (Miller & West 2012), occurs in similar habitats to <i>Ranunculus sessiliflorus</i> (see above). It is an annual herb that most often occurs on rock plates and outcrops, a habitat type sparse throughout the majority of the assessment area. Based on the distribution of records on Flinders

Species	Status TSPA EPBCA	Observations	Comments
			Island (which are mainly on the eastern coastline in coastal dune scrub, heathlands, low alpine herbfields and open eucalypt forests, often in damp areas on sandy to rocky soils), I think the opportunity for occurring within the assessment area is low. Potential habitat, albeit limited, is unlikely to be disturbed during works such that a timed targeted survey is not considered warranted.
<i>Stenopetalum lineare</i> (narrow threadpetal)	e -	no database records	Potential habitat in Tasmania appears to be near-coastal grass-covered stabilised dunes (as at Kelvedon and Cressy beaches on the east coast, Hope/South Arm Beach near Hobart, and the Georges Bay area near St Helens) but also inland rocky sites (as at Gunners Quoin) and may be marginally present. This species was not detected (the sandy openings amongst the dense windswept coastal shrubbery were searched deliberately for this species, which is detectable and identifiable at any time of the year).

APPENDIX G. Analysis of database records of threatened fauna

Table G1 provides a listing of priority fauna from within the assessment area, and from 500 m and 5000 m of the assessment area (nominal buffer widths usually used to discuss the potential of a particular assessment area to support various species listed in databases), with comments on whether potential habitat is present for the species, and possible reasons why a species was not recorded.

Table G1. Priority fauna records from within the assessment area, and from 500 m and 5000 m of boundary of assessment area

Species listed below are listed as rare (r), vulnerable (v), endangered (e), or extinct (x) on the Tasmanian *Threatened Species Protection Act 1995* (TSPA); vulnerable (VU), endangered (EN), critically endangered (CR) or extinct (EX) on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA). Information below is sourced from the DPIPW's *Natural Values Atlas* (DPIPWE 2015a), Bryant & Jackson (1999) and FPA (2015); marine, wholly pelagic and marine littoral species such as marine mammals, fish and offshore seabirds are excluded.

Species	Status TSPA EPBCA	Observations	Comments
Records from within assessment area [excluding marine, pelagic and littoral species – for a list of species excluded from formal habitat analysis, see note after table]			
<i>Aquila audax</i> subsp. <i>fleayi</i> (Tasmanian wedge-tailed eagle)	e EN	1 sighting record nominally placed just north of Killiecrankie Creek no known nests within 1000 m of the boundary of the assessment area	Potential breeding habitat is defined as “tall eucalypt trees in large tracts (usually more than 10 ha) of eucalypt or mixed forest” and potential foraging habitat “includes a wide variety of forested (including areas subject to native forest silviculture) and non-forest habitats” (FPA 2015). The species is likely to utilise the broader assessment area as part of a broader territory and a foraging area (as indicated by the sighting record). There are no known nests within 500 m (or 1000 m line-of-sight), usual nominal management buffers applied in production forests. The nearest known “eagle” nest (species not specified in databases) is from a creekline leading into Deep Bight, first reported in 1985 and subsequently confirmed on 24 Nov. 2004, which is on the southern side of the township of Killiecrankie so will not be affected by the project. The present survey did not detect any novel nest sites from the assessment area and there are no areas of suitable forest likely to support nest sites.
<i>Thinornis cucullatus</i> subsp. <i>cucullatus</i> (eastern hooded plover)	- VU	2 sightings from Killiecrankie Beach [E.J. Woehler; 3 Jan. 2006; 572585mE 5591052mN] and Killiecrankie [E.J. Woehler; 8 Nov. 2004; 567462mE 5588472mN]	[Shown in some databases as <i>Thinornis rubricollis</i>]. A pair of hooded plovers were observed along Killiecrankie Beach on 19 March 2015 by the author, at two separate locations (presumably the same pair). The potential impacts of the project are discussed under RESULTS Fauna species <u>Priority fauna species known from the assessment area (or potentially present)</u> .

Species	Status TSPA EPBCA	Observations	Comments
Records within 500 m of assessment area			
No additional records known from within 500 m of assessment area			
Records and potential habitat within 5000 m of assessment area			
<i>Accipiter novaehollandiae</i> (grey goshawk)	e -	no database records	<p>Potential habitat is described as "native forest with mature elements below 600 m altitude, particularly along watercourses" (FPA 2015), habitat elements present within assessment area. While the habitat present is superficially similar to swamp forest habitat in the northwest of the State (e.g. extensive flats supporting paperbark-teatree swamp forests), and there are foraging resources present (numerous small birds, nesting ringtail possums, etc.), the paucity of records of the grey goshawk on Flinders Island suggests a very low population and the species is much more likely to nest/forage in more extensive areas of wet forest/swamp forest on the island rather than this patch of windswept coastal scrub.</p> <p>There are no known nests within 500 m of the subject area and no novel nests were detected during the course of the present assessment. No individuals were sighted during assessment. It is possible that the area will be used opportunistically by the species.</p>
<i>Antipodia chaostola</i> subsp. <i>leucophaea</i> (chaostola skipper)	e EN	no database records	<p>Potential habitat is "dry forest and woodland supporting <i>Gahnia radula</i> (usually on sandstone and other sedimentary rock types) or <i>Gahnia microstachya</i> (usually on granite based substrates)" (FPA 2015). Neither of these <i>Gahnia</i> species occur in the assessment area. The listing of the species in DPIPWE (2015a) is somewhat nominal (based on the distribution of the larval host plant only) because there are no confirmed records of the skipper north of the Freycinet Peninsula.</p>
<i>Galaxiella pusilla</i> (eastern dwarf galaxiid)	v VU	no database records	<p>Potential habitat (slow-flowing waters such as swamps, lagoons, drains or backwaters of streams, often with aquatic vegetation; also in temporary waters that dry up in summer for as long as 6-7 months, especially if burrowing crayfish burrows are present, although these will usually be connected to permanent water; may also include forested swampy areas) absent.</p> <p>There are no records of the species from the northwestern part of Flinders Island, with the nearest known sites the swampy lagoonal systems of the central, eastern and southeastern part of the island (e.g. Logan Lagoon, Arthurs Creek system leading into Hogan Lagoon).</p> <p>The project will not impact on potential habitat or known sites of this species.</p>
<i>Haliaeetus leucogaster</i> (white-bellied sea-eagle)	v -	no known nests within 1000 m of the boundary of assessment area	<p>See comments under wedge-tailed eagle.</p> <p>The species is likely to forage along Killiecrankie Beach and surrounding coastline but the works will not affect this aspect of the species' ecology.</p>
<i>Limnodynastes peroni</i> (striped marsh frog)	e -	no database records	<p>Potential habitat is "natural and artificial coastal and near-coastal wetlands, lagoons, marshes, swamps and ponds</p>

Species	Status TSPA EPBCA	Observations	Comments
			<p>(including dams), with permanent freshwater and abundant marginal, emergent and submerged aquatic vegetation" (FPA 2015), habitat elements essentially absent from the assessment area.</p> <p>The small dam nestled amongst the dunes is marginally suitable. This was assessed on a warm humid day (c. 25°) virtually windstill day (20 Mar. 2015). Conditions were ideal for survey and considerable time was spent at the dam sampling aquatic plants. If present, the species may have been detectable from its distinctive call.</p> <p>There are no records of the striped marsh frog from the Furneaux islands (DPIPWE's Natural Values Atlas checked 11 May 2015) and the listing in DPIPWE (2015a) and FPA (2015) is erroneous.</p>
<i>Litoria raniformis</i> (green and golden frog)	v VU	no database records	<p>Potential habitat is "permanent and temporary waterbodies, usually with vegetation in or around them, including features such as natural lagoons, permanently or seasonally inundated swamps and wetlands, farm dams, irrigation channels, artificial water-holding sites such as old quarries, slow-flowing stretches of streams and rivers and drainage features" (FPA 2015), habitat elements essentially absent from the assessment area.</p> <p>There are scant records of the green and golden frog from Flinders Island, it being historically recorded from Stony Lagoon (1986), Red Creek area (1962), Lime Pit Road area (1989) and Costers Gully (1962), although a recent call record (2013) from the south of the island (Big River Road) indicates it is still extant (NCHD 2012). On Flinders Island, the species is considered most likely to call from late summer to early autumn (NCHD 2012), which coincides with the present survey period.</p> <p>The small dam nestled amongst the dunes is marginally suitable. This was assessed on a warm humid day (c. 25°) virtually windstill day (20 Mar. 2015). The conditions were ideal for survey and considerable time was spent at the dam sampling aquatic plants. If present, the species is likely to have been detected.</p> <p>NCHD (2012) concluded that "the relatively low number of observations and records of <i>L. raniformis</i> on Flinders Island, however, suggest that this species occurs at few sites within a relatively small area on the south of the island", which is well outside the project area, suggesting that more formal follow-up surveys are not warranted.</p>
<i>Pardalotus quadragintus</i> (forty-spotted pardalote)	e EN	no database records	<p>Potential habitat is "any forest and woodland supporting <i>Eucalyptus viminalis</i> (white gum) where the canopy cover of <i>E. viminalis</i> is greater than or equal to 10% or where <i>E. viminalis</i> occurs as a localised canopy dominant or co-dominant in patches exceeding 0.25 ha" (FPA 2015).</p> <p>The assessment area does not support any <i>Eucalyptus viminalis</i> (only <i>E. globulus</i> and <i>E. nitida</i> are present).</p>
<i>Prototroctes maraena</i> (Australian grayling)	v VU	no database records	<p>This is a species of the "middle to lower reaches of coastal rivers" (FPA 2015), a habitat type that is absent from the assessment area. It is noted that Killiecrankie Creek (immediately north of the assessment area) may be suitable habitat but this will remain unaffected by the works.</p>

Species	Status TSPA EPBCA	Observations	Comments
<i>Pseudemoia pagenstecheri</i> (tussock skink)	v -	no database records	Potential habitat is "grassland and grassy woodland (including rough pasture with paddock trees), generally with a greater than 20% cover of native grass species, especially where medium to tall tussocks are present" (FPA 2015), habitat types absent from the assessment area.
<i>Pseudomys novaehollandiae</i> (new holland mouse)	e VU	no database records	<p>Potential habitat is "heathlands (mainly dry heathlands but also where dry heathlands form a mosaic with other heathland, moorland and scrub complexes), heathy woodlands (i.e. eucalypt canopy cover 5-20%), <i>Allocasuarina</i>-dominated forests on sandy substrates (not dolerite or basalt), and vegetated sand dunes; key indicator plant species include (but are not restricted to) <i>Aotus ericoides</i>, <i>Lepidosperma concavum</i>, <i>Hypolaena fastigiata</i> and <i>Xanthorrhoea</i> spp." (FPA 2015), habitat types absent from the assessment area.</p> <p>The key indicator species are all absent, and the site is highly atypical of all known sites in Tasmania. On Flinders Island, the species has only been recorded from "classic" heathland habitat, mainly on the eastern half of the island but also near Near Lagoon. The species was last recorded on Flinders Island in 2001 (NCHD 2012).</p> <p>Given the lack of typical habitat and the very long period since fire, a specialist survey for this species is not considered warranted.</p>
<i>Theclinesthes serpentata</i> (chequered blue)	r -	1 record [J. Potter, 10 Dec. 2012, 571284mE 5590266mN]	<p>Potential habitat ("wetlands and coastal dunes" with food plants known to include "saltbushes" such as <i>Atriplex</i> spp., <i>Rhagodia candolleana</i>, <i>Chenopodium</i> spp., and <i>Sarcocornia quinqueflora</i>) is present (because the one of the main larval food plants is present i.e. <i>Rhagodia candolleana</i>).</p> <p>The database record is from 2012, recorded as part of the <i>Flinders Island Natural Values Survey 2012</i> (NCHD 2012), when the species was reported from both Killiecrankie Bay and Fotheringate Beach in coastal heathland. The listing of the species in the <i>Natural Values Atlas</i> report (i.e. as a putative threatened species) is somewhat erroneous and misleading as it should indicate that the Flinders Island records are attributable to subsp. <i>serpentata</i> not subsp. <i>lavara</i> – only the latter, highly localised to southeastern mainland Tasmania, is listed as threatened (the populations on Flinders Island, and indeed elsewhere in Tasmania, are not considered threatened).</p>
<i>Vombatus ursinus</i> subsp. <i>ursinus</i> (Flinders Island wombat)	- VU	1 record	The species was detected within the assessment area – see RESULTS Fauna species Priority fauna species known from the assessment area (or potentially present) for more details.
EPBCA-listed species listed as potentially present based on Protected Matters Report (CofA 2015) [excluding marine, pelagic and littoral species – for a list of species excluded from formal habitat analysis, see note after table]			
<i>Aquila audax</i> subsp. <i>fleayi</i> (Tasmanian wedge-tailed eagle)	e EN	Breeding likely to occur within area	See section above.

Species	Status <i>TSPA</i> <i>EPBCA</i>	Observations	Comments
<i>Apus pacificus</i> (fork-tailed swift)	Migratory Marine Species	Species or species' habitat likely to occur within area	Aerial foraging bird that rarely lands – assessment area presents marginal habitat only and any works in the area would not have a deleterious impact on the species.
<i>Ardea alba</i> (great egret)	Migratory Wetland/ Marine Species	Species or species' habitat likely to occur within area	Potential habitat (natural and artificial wetlands and swampy habitats) absent. The species may infrequently utilise farm dams (and the small dam in the dunes), which will remain undisturbed by any works.
<i>Ardea ibis</i> (cattle egret)	Migratory Wetland/ Marine Species	Species or species' habitat may occur within area	As above.
<i>Galaxiella pusilla</i> (eastern dwarf galaxiid)	v VU	Species or species' habitat likely to occur within area	See section above.
<i>Haliaeetus leucogaster</i> (white-bellied sea-eagle)	v -	Species or species' habitat known to occur within area	See section above.
<i>Litoria raniformis</i> (green and golden frog)	v VU	Species or species' habitat likely to occur within area	See section above.
<i>Pardalotus quadragintus</i> (forty-spotted pardalote)	e EN	Species or species' habitat may occur within area	See section above.
<i>Pseudomys novaehollandiae</i> (new holland mouse)	e VU	Species or species' habitat likely to occur within area	See section above.
<i>Myiagra cyanoleuca</i> (satin flycatcher)	Migratory Terrestrial Species	Species or species' habitat likely to occur within area	Potential habitat present (species utilises a wide range of habitats but tends to be most frequent in dry open tall woodlands and forests and associated sheltered slopes/gullies). The species was not detected by sight or call during the assessment, which was probably undertaken just within the species' residential period in the State. Any works in the area would only marginally impact on potential habitat, with most works outside the most likely habitat of eucalypt forests.
<i>Sterna nereis</i> subsp. <i>nereis</i> (Australian fairy tern)	- VU	Breeding likely to occur in area	This species nests on sandy shorelines but there are no known sightings or breeding records from the Killiecrankie Beach area (DPIPWE's <i>Natural Values Atlas</i> checked 11 May 2015).
<i>Thinornis cucullatus</i> subsp. <i>cucullatus</i> (hooded plover – eastern)	- VU	Species or species habitat known to occur within area	See section above.

Species	Status		Observations	Comments
	TSPA	EPBCA		
<i>Vombatus ursinus</i> subsp. <i>ursinus</i> (Flinders Island wombat)	-	VU	Breeding likely to occur in area	See section above.
Additional species considered by the author with potential to be present but not shown in databases				
<i>Ceyx azureus</i> subsp. <i>diemenensis</i> (Tasmanian azure kingfisher)	e	EN	no database records	This species is not listed in DPIPWE's <i>Natural Values Atlas</i> database (DPIPWE 2015a), the Forest Practices Authority's <i>Biodiversity Values Database</i> (FPA 2015) or the Department of Environment's <i>Protected Matters Search Tool</i> report (CofA 2015) but the species is known from several sites on Flinders Island (e.g. Patriarch River in the 1960s and 70s and Samphire River in the 1970s), and even one from Bass Pyramid (Wapstra et al. 2010). Potential habitat (tree-lined major river systems) are absent from the assessment area. Killiecrankie Creek provides ideal habitat, however, as it is slow-moving, permanent, deep and supports ample foraging resources and the "classic" over-hanging branches). The creek and surrounds will not be affected by the works but it is recommended that sightings of the species be noted for scientific interest (due to the paucity of records from Bass Strait islands).
<i>Lathamus discolor</i> (swift parrot)	e	EN	no database records	See RESULTS Fauna species <u>Priority fauna species known from the assessment area (or potentially present)</u> for more detail on this species.

TSPA-listed species listed as potentially present based on *Natural Values Atlas* (DPIPWE 2015a) but excluded from formal habitat analysis in table above

Arctocephalus tropicalis (sub-Antarctic fur-seal)

Megaptera novaeangliae (humpback whale)

EPBCA-listed species listed as potentially present based on *Protected Matters Report* (CofA 2015) but excluded from formal habitat analysis in table above

Catharacta skua (great skua)

Diomedea epomophora epomophora (southern royal albatross)

Diomedea epomophora sanfordi (northern royal albatross)

Diomedea exulans antipodensis (antipodean albatross)

Diomedea exulans exulans (tristan albatross)

Diomedea exulans gibsoni (Gibson's albatross)

Fregetta grallaria grallaria (white-bellied storm-petrel)

Halobaena caerulea (blue petrel)

Macronectes giganteus (southern giant-petrel)

Macronectes halli (northern giant-petrel)

Phoebastria fusca (sooty albatross)

Pterodroma leucoptera leucoptera (Gould's albatross)

Puffinus carneipes (fleshy-footed shearwater)

Thalassarche bulleri (Buller's albatross)

Thalassarche cauta cauta (shy albatross)

Thalassarche cauta salvini (Salvin's albatross)

Thalassarche cauta steadi (white-capped albatross)

Thalassarche chrysostoma (grey-headed albatross)

Thalassarche melanophris (black-browed albatross)

Thalassarche melanophris impavida (Campbell albatross)

Balaenoptera acutorostrata (minke whale)
Balaenoptera edeni (Bryde's whale)
Balaenoptera musculus (blue whale)
Caperea marginata (pygmy right whale)
Delphinus delphis (common dolphin)
Eubalaena australis (southern right whale)
Grampus griseus (Risso's dolphin)
Lagenorhynchus obscurus (dusky dolphin)
Megaptera novaeangliae (humpback whale)
Orcinus orca (killer whale)
Tursiops truncatus (bottlenose dolphin)
Caretta caretta (loggerhead turtle)
Chelonia mydas (green turtle)
Dermochelys coriacea (leatherback turtle)
Carcharodon carcharias (great white shark)
Lamna nasus (porbeagle)
Calidris alba (sanderling)
Calidris ferruginea (curlew sandpiper)
Gallinago hardwickii (Latham's snipe)
Heraldia nocturna (upside-down pipefish)
Hippocampus abdominalis (big-belly seahorse)
Hippocampus breviceps (short-head seahorse)
Hippocampus minotaur (bullneck seahorse)
Histiogamphelus briggsii (crested pipefish)
Histiogamphelus cristatus (rhino pipefish)
Hypselognathus rostratus (knifesnout pipefish)
Kaupus costatus (deepbody pipefish)
Kimblaeus bassensis (trawl pipefish)
Leptoichthys fistularius (brushtail pipefish)
Lissocampus caudalis (Australian smooth pipefish)
Lissocampus runa (javelin pipefish)
Maroubra perserrata (sawtooth pipefish)
Mitotichthys semistriatus (halfbanded pipefish)
Mitotichthys tuckeri (Tucker's pipefish)
Notiocampus ruber (red pipefish)
Phycodurus eques (leafy seadragon)
Phyllopteryx taeniolatus (common seadragon)
Pugnaso curtirostris (pugnose pipefish)
Solegnathus robustus (robust pipehorse)
Solegnathus spinosissimus (spiny pipehorse)
Stigmatopora argus (spotted pipefish)
Stigmatopora nigra (widebody pipefish)
Stipecampus cristatus (ringback pipefish)
Urocampus carinirostris (hairy pipefish)
Vanacampus margaritifer (mother-of-pearl pipefish)
Vanacampus phillipi (Port Phillip pipefish)
Vanacampus poecilolaemus (longsnout pipefish)
Arctocephalus forsteri (New Zealand fur-seal)
Arctocephalus pusillus (Australian fur-seal)

APPENDIX H. DPIPWE's *Natural Values Atlas* report for assessment area

Appended as pdf file.

APPENDIX I. Forest Practices Authority's *Biodiversity Values Atlas* report for assessment area

Appended as pdf file.

APPENDIX J. CofA's *Protected Matters* report for assessment area

Appended as pdf file.

APPENDIX K. DPIPWE's *Conservation of Freshwater Ecosystem Values* database report for assessment area

Appended as pdf file.

OTHER ATTACHMENTS

- .shp and/or .dwg file of point locations of threatened flora
- .xls file of point locations of threatened flora
- .shp and/or .dwg file of vegetation mapping
- .shp and/or .dwg file of weeds
- .xls file of point locations of weeds