

## **APPENDIX 5**

### ***CTENOTUS ORA* POTENTIAL IMPACT ASSESSMENT REPORT**

**(Source: Ecoscape (Australia) Pty Ltd, 2012b)**

Armstrong Reserve, Dunsborough  
*Ctenotus ora* Potential Impact Assessment

Ray Village Aged Services (Inc.) trading as CapeCare



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**Armstrong Reserve, Dunsborough, *Ctenotus ora* Potential Impact Assessment**

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## summary

*Ctenotus ora*, the 'Coastal Plains Skink', is a recently described species of medium sized skink with a restricted range in the south-west of Western Australia, most of which has been cleared for agriculture and urban development. It cannot reliably be distinguished from the more widespread *C. labillardieri* except by DNA sequences, but the two species appear to have disjunct distributions.

*C. ora* is considered to be of high conservation significance (recently listed as Priority 1 by the Western Australian Department of Environment and Conservation). It is thought to be dependent on sandy substrates, appears to have low population density where it occurs, and populations are fragmented both by the discontinuous distribution of sandy soils, and of remnant vegetation providing suitable habitat. Any clearing of suitable habitat within the range of this species could have at least temporary and potentially significant impacts on local populations, because of the low population density and prior fragmentation of habitat by urban and agricultural development.

Review of locality records of museum specimens and survey reports indicates that additional populations of '*Ctenotus labillardieri*' occur outside and between the known ranges of either species, and potentially represent *C. ora*. The identity of populations on and adjacent to the Whicher Scarp (northern margin of Blackwood Plateau) may be important in assessment of impact, because this area represents a large area of contiguous woodland habitat where the resident species (whichever that is) is likely to be secure.

The identity of the *Ctenotus* species at Armstrong Reserve, Dunsborough, has yet to be confirmed genetically but it is likely to be *C. ora*. Maps are constructed indicating the estimated distribution of suitable habitat within Armstrong Reserve, Dunsborough, based on vegetation structure (as related to known capture sites, and behavioural and ecological data on other *Ctenotus* species), and at local up to regional scales based on the distribution of sandy soil types and existing remnant vegetation. These maps indicate that the Dunsborough population is likely to extend to several contiguous blocks of bushland as well as Armstrong Reserve, but may be effectively isolated from larger areas of occupied habitat to the east and west. The proposed development area does not break any existing linkages that might be important to an existing population of *C. ora*.

# 1.0 introduction

Ray Village Aged Services (Inc.) trading as Capecare is a not-for-profit community organisation which delivers aged care services to the south-west region of Western Australia. Capecare has identified Armstrong Reserve, Dunsborough, as a possible site for the development of an aged care facility. The proposal is currently subject to a Public Environmental Review (EPA Assessment No. 1808).

Subsequent to a meeting at the OEPA on 26/09/2012 regarding the identification of a *Ctenotus* sp. skink trapped, photographed and released at Armstrong Reserve during the Level 2 Fauna Survey in 2011 (Ecoscape 2012), Hans Jacob (OEPA) provided the following questions and points for consideration by the proponent Capecare:

- What is the distribution of the *C. ora*'s preferred habitat within Armstrong Reserve, in the Dunsborough area and on the Swan Coastal Plain (using existing information about habitat distribution)? This is to place the loss of *C. ora* habitat in an appropriate context.
- What are the likely indirect impacts of the development on the species and can the threats and pressures from the development be managed and contained to the development footprint?
- Are there opportunities to include ongoing management measures for the species in the management plan for the reserve? For example, the placement of logs (especially Banksias) and other woody debris from the area of the development into the habitat proposed to be retained. Fire management which takes into account the protection of specialised microhabitat requirements of *C. ora*.

In order to address these questions, Ecoscape conducted a desktop assessment and a targeted habitat survey for the newly recognised species of conservation concern, *Ctenotus ora* Kay & Keogh, 2012. An additional individual of the *Ctenotus* species (presumed to be *C. ora*, but yet to be confirmed by genetic tests) was also obtained in Armstrong Reserve and accessioned to the Western Australian Museum in November 2012.



## 2.0 Summary of data on target species

### ***Ctenotus ora* Kay & Keogh, 2012 (Coastal Plains Skink)**

#### **Conservation status**

DEC Priority 1 (not announced, but listed as such on licence issued 1 November 2012)

#### **Taxonomic status and relationships**

The genus *Ctenotus* is a highly diverse clade (ie all descendants of a single common ancestor) of medium-sized, mostly robust and strong-limbed skinks (Scincidae, Lygosominae, *Sphenomorphus* Group). It contains at least 98 species distributed throughout mainland Australia (except the south-east corner) and southern New Guinea, the common ancestor of which diverged from their nearest relative *Lerista* (an almost equally diverse genus, most of whose species are elongate burrowers with reduced limbs) approximately 20 million years ago (Greer 1989; Rabosky *et al.* 2007).

The *Ctenotus labillardieri* species group (Storr 1974; Storr 1975) has been defined in a way that does not imply all members are genealogically closely related, but includes one or more of the most 'basal' genetic branches within the genus (Rabosky *et al.* 2007). All members of this species group are restricted to near-coastal southern Western Australia (Ehmann 1992; Kay & Keogh 2012; Storr 1974; Wilson & Swan 2010), and some have very restricted or fragmented distributions, e.g. *C. lanceolini* (Lancelin Island Skink, listed under the *EPBC Act 1999* and Schedule 1 of the *WC Act 1950*), *C. delli* (Darling Range Heath Ctenotus, DEC P4), and *C. gemmula* (Jewelled South-west Ctenotus, isolated Swan Coastal Plain population DEC P3).

*Ctenotus ora* is the first new member of this species group to have been described since 1975. It is morphologically very similar to some individuals of *C. labillardieri*, but shown by analysis of mitochondrial and nuclear DNA sequences to be more closely related to *C. lanceolini*, while all populations of *C. labillardieri* share more recent common ancestry with each other (Kay & Keogh 2012). *Ctenotus labillardieri*, *C. ora*, *C. lanceolini*, *C. gemmula*, and probably *C. delli* form a closely related 'core' group; the relationships of *C. delli* are uncertain, as no tissue sample has been available for DNA comparison (Kay & Keogh 2012). *Ctenotus youngsoni* and *C. catenifer* have been considered members of the same species group (Storr 1974; Storr 1975) but are somewhat more distantly related to the core group (Kay & Keogh 2012), and the Shark Bay species *C. youngsoni* belongs to a separate genetic lineage with northern/arid-zone species *C. rubicundus*, *C. strauchii*, and *C. pantherinus* (Rabosky *et al.* 2007). *Ctenotus catenifer* has not been included in phylogenetic studies other than Kay & Keogh (2012), so its affinities are less clear but can be excluded from the *C. labillardieri* core group.

#### **Diagnosis of *C. ora***

The critical section of the taxonomic description (Kay & Keogh 2012) reads:

**Diagnosis.** *Ctenotus ora* is distinguished from sister taxon *C. lanceolini* by its smaller size, generally darker colouration and lack of vertebral stripes (see Ford 1969). It is distinguishable from *C. gemmula*, *C. delli* and *C. catenifer* by a continuous white dorsolateral line, and from *C. youngsoni* by its smaller size and sharper dorsal patterning (Figure 5). *C. ora* can be distinguished from *C. labillardieri* by its smooth copper-brown dorsum and absence of white specks above the dorsolateral line.

However, *C. labillardieri* also often has a ‘smooth’ dorsum without lighter or darker spots (typical of northern parts of the range; Storr *et al.* 1999), so that not all individuals can be distinguished by these characters. A principal components analysis of ‘continuous’ characters of external morphology indicates some separation of *C. ora* from other species in the second component, summarising shape and meristics, but there is extensive overlap in ranges of both continuous and categorical variables (Kay & Keogh 2012). Thus, there is currently no way to distinguish the two species based on intrinsic morphological features, but only by reference to molecular or locality data. This in no way invalidates or questions the separate specific status of *C. ora*, but points to the practical difficulty of identification when dealing with animals in the field as well as written records, photographs, or preserved specimens.

#### **Known distribution and recorded habitat**

Based on only five specimens identified as *Ctenotus ora*, the species is apparently restricted to the southern Swan Coastal Plain and Cape Naturaliste area, as far north as Pinjarra and south as far as Yallingup (Kay & Keogh 2012). There has been growing awareness among a few zoologists of the distinctiveness and patchy distribution of coastal plain ‘*C. labillardieri*’, as mentioned in some previous reports and reviews (Bamford *et al.* 2010; Bush *et al.* 1995; How *et al.* 2009; Wilson & Swan 2010) but apparently no individuals have been recognised as distinct from *C. labillardieri* at the time of collection. It is thought to occur in very low densities across its range, in contrast to neighbouring *C. labillardieri* populations, which may occur in high densities associated with granite outcrops in the Darling Range (Bush *et al.* 1995; Kay & Keogh 2012; Orange 2005).

The common name suggested by Kay & Keogh may be misleading, as two of the five specimens are from the Cape Naturaliste area, west of the Dunsborough Fault and not actually on the coastal plain (the type locality is approximately 100 m above sea level). The alternative of ‘**Geographe Bay Skink**’ can be suggested.

This species seems to have a preference for sandy substrates with low vegetation (including heath) in open *Eucalyptus/Corymbia* woodland over *Banksia* (Kay & Keogh 2012). Individuals have been found sheltering under *Banksia* logs on white sand, and trapped in eucalypt woodland with *Banksia* or Peppermint mid-storey, or heath (Bamford *et al.* 2010; DEC 2012). Photographs of suitable *Ctenotus* habitat at the approximate collecting locations of the holotype and one paratype specimen are given in **Figure 6** and **Figure 7 (Appendix 2)**.

### Likely additional records within known range

The genetic study of Kay and Keogh (2012) did not demonstrate any sympatry or overlap between *C. ora* and *C. labillardieri*, and was thus consistent with complete separation in geographic range and habitat (**Figure 1**). This suggests that any specimens previously identified as *C. labillardieri* (or *C. delli*, in one case) recorded from the southern Swan coastal plain and Cape Naturaliste area are likely to belong to *C. ora*. By assuming this to be the case, a number of additional WAM specimens and fauna survey records can be attributed to the new species. It should be noted that there are considerable areas in the south-west bioregion where one or more *Ctenotus* species are likely to occur (or have occurred historically) but are not represented by available records (**Figure 2**), so that any attempt to draw a realistic distribution map depends on interpolation and extrapolation. For example, there are very few records on the Blackwood Plateau, so that potential contact or separation of *C. ora* and *C. labillardieri* in this area has not been documented.

Specimen and fauna survey data that may pertain to *C. ora* are given in **Table 1** (Appendix and mapped in **Figure 3**, including all specimens reported in *NatureMap* (DEC 2012) as *C. labillardieri* or *C. delli* but occurring within or adjacent to the geographic range of *C. ora*. These include four additional WAM specimens from the Cape Naturaliste area and three (poorly localised) from east of Lake Clifton, and fauna survey records (without vouchers) from Bunbury, Kemerton Industrial Park, and Point Grey. Two records from Smiths Beach, just south of the Yallingup paratype locality (ATA Environmental 2007), are not included in the *NatureMap* database.

Two specimens provisionally identified as *C. ora* have been recorded in Armstrong Reserve, Dunsborough; details are given in **Section 3**.

### Possible range extensions, north and south

Beyond the coastal strip from Pinjarra to Yallingup, there are two areas in which populations reported as *Ctenotus labillardieri* occur on the Swan Coastal Plain, but were neither sampled genetically nor included in the morphological study of Kay & Keogh (2012), and hence lie outside the range of both *C. labillardieri* and *C. ora* shown in **Figure 1**. Summaries of these records are also included in **Table 1** and mapped in **Figure 3**. They are not assumed here to represent *C. ora*, but also should not be assumed to be *C. labillardieri* without either molecular evidence or discovery of morphological diagnostic criteria applicable to individuals.

There are records of eight WAM specimens identified as *C. labillardieri* from the Perth area below the Darling Scarp, from Herne Hill to Gosnells, and west as far as Kewdale. None of these specimens was collected after 1986; the existence of a Perth population would certainly have been known to museum zoologists, but has not been mentioned in local or State-level field guides (Bush *et al.* 1995;Storr *et al.* 1999), suggesting it has been assumed to be extinct. Identity of these lizards might be determined in future by applying ‘ancient DNA’ methods to museum specimens (not guaranteed to work, eg Schander & Halanych 2003) or from fresh specimens if a population does persist in

remnant bushland within this range (eg around Perth Airport). Because the closest relative of *C. ora*, *C. lancelini*, occurs north of Perth, their common ancestor presumably had a continuous distribution along the coastal plain and there is no reason to rule out recent presence of *C. ora* in the Perth area.

Populations identified as *C. labillardieri* have also been recorded from several locations along the Whicher Scarp, in the north-east between Gwindinup and Capel River (Bamford & Bamford 2000; Bancroft & Bamford 2008), and south-east of Busselton (Harewood 2012). The Whicher Scarp diverges from the Darling Scarp near Wokalup and forms a parabolic curve (northern margin of Blackwood Plateau) approaching the coast at Dunsborough. Vegetation and faunal communities on the scarp have features of both the Southern Jarrah Forest and Swan Coastal Plain Bioregions. The landscape is undulating with lateritic soils high in the landscape, but extensive sandy and sandy loam soils in valleys. The vegetation is broadly Jarrah/Marri woodland typical of the Southern Jarrah Forest, but there are coastal plain elements in some areas where sands are deep (Bancroft & Bamford 2008; Keighery *et al.* 2008). The western part of the scarp has been largely cleared, and the remaining forest has been subject to logging, but the few trapping surveys carried out in the area have found '*C. labillardieri*' to be relatively abundant. Without genetic evidence, there is no basis for assuming that these populations are actually *C. labillardieri* rather than *C. ora*.

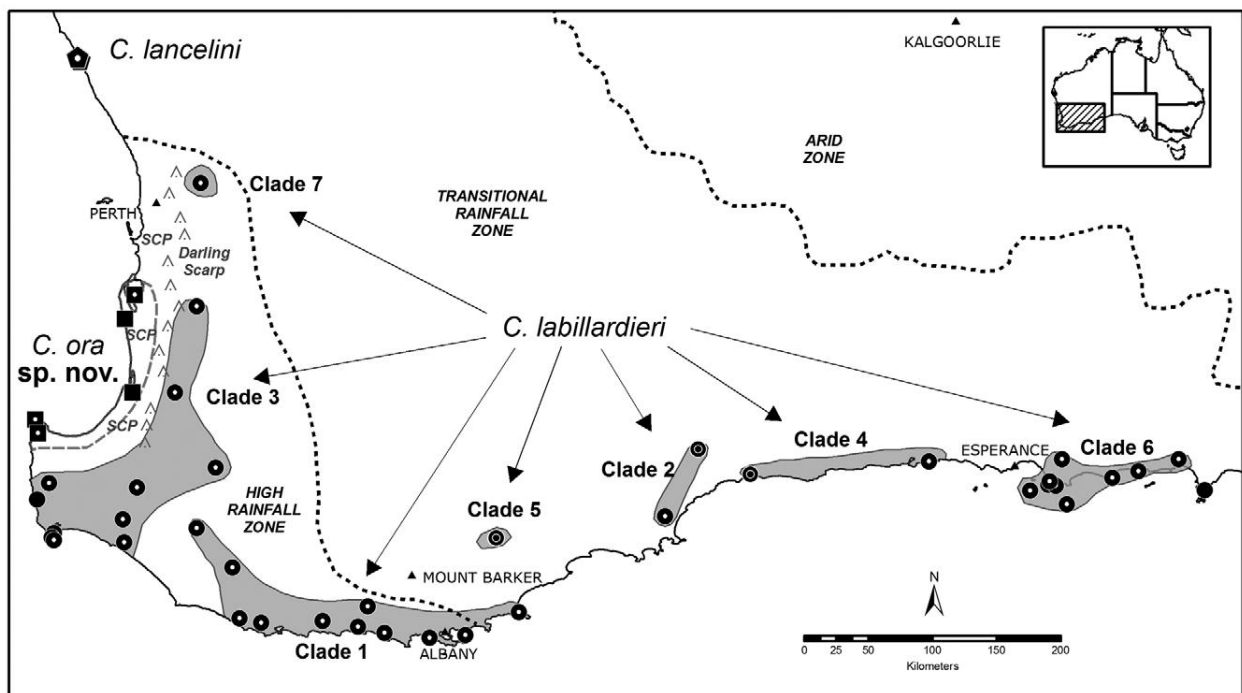


Figure 1. Distribution of *Ctenotus ora*, *C. lancelini*, and seven distinct clades comprising *C. labillardieri* (figure 1 of Kay & Keogh 2012)

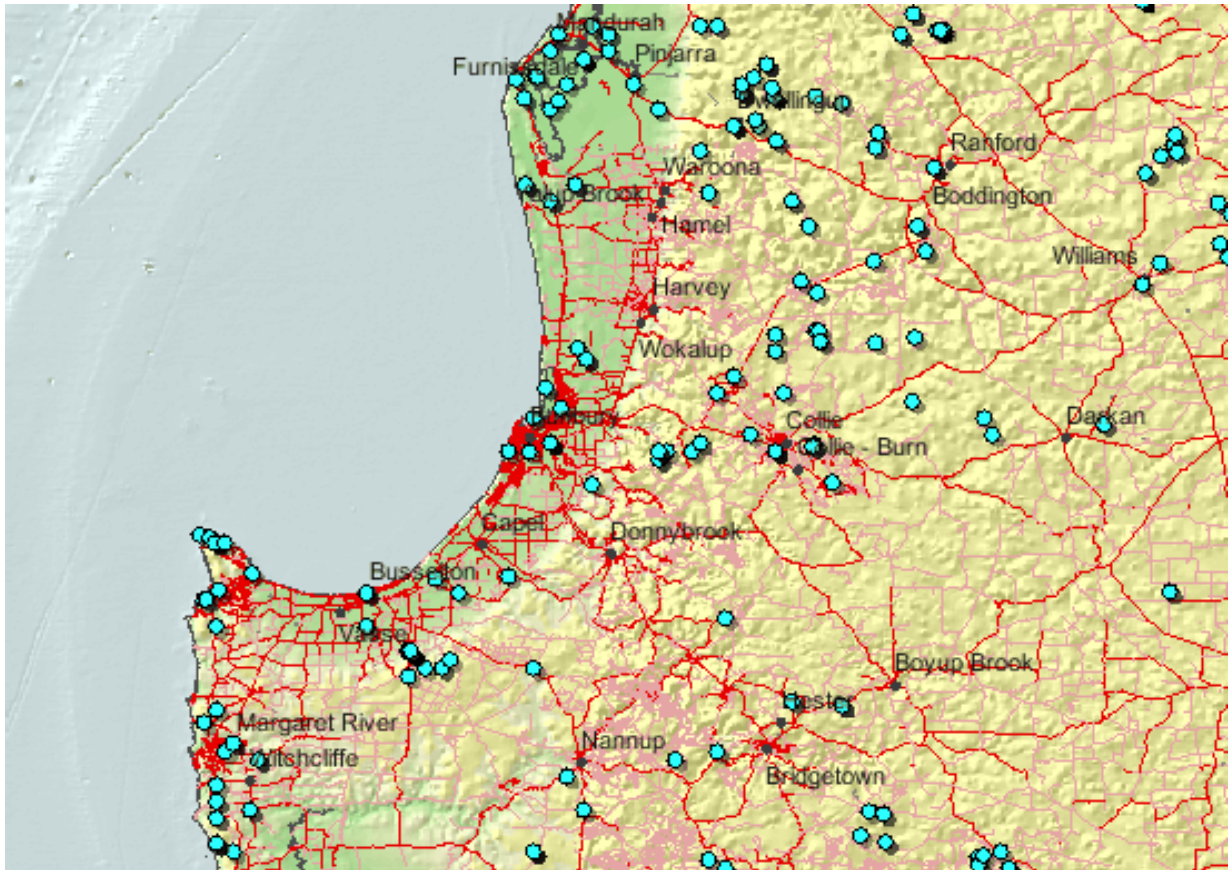


Figure 2. Southern Swan Coastal Plain and adjacent areas, showing localities for all species of *Ctenotus* recorded in NatureMap (DEC 2012)

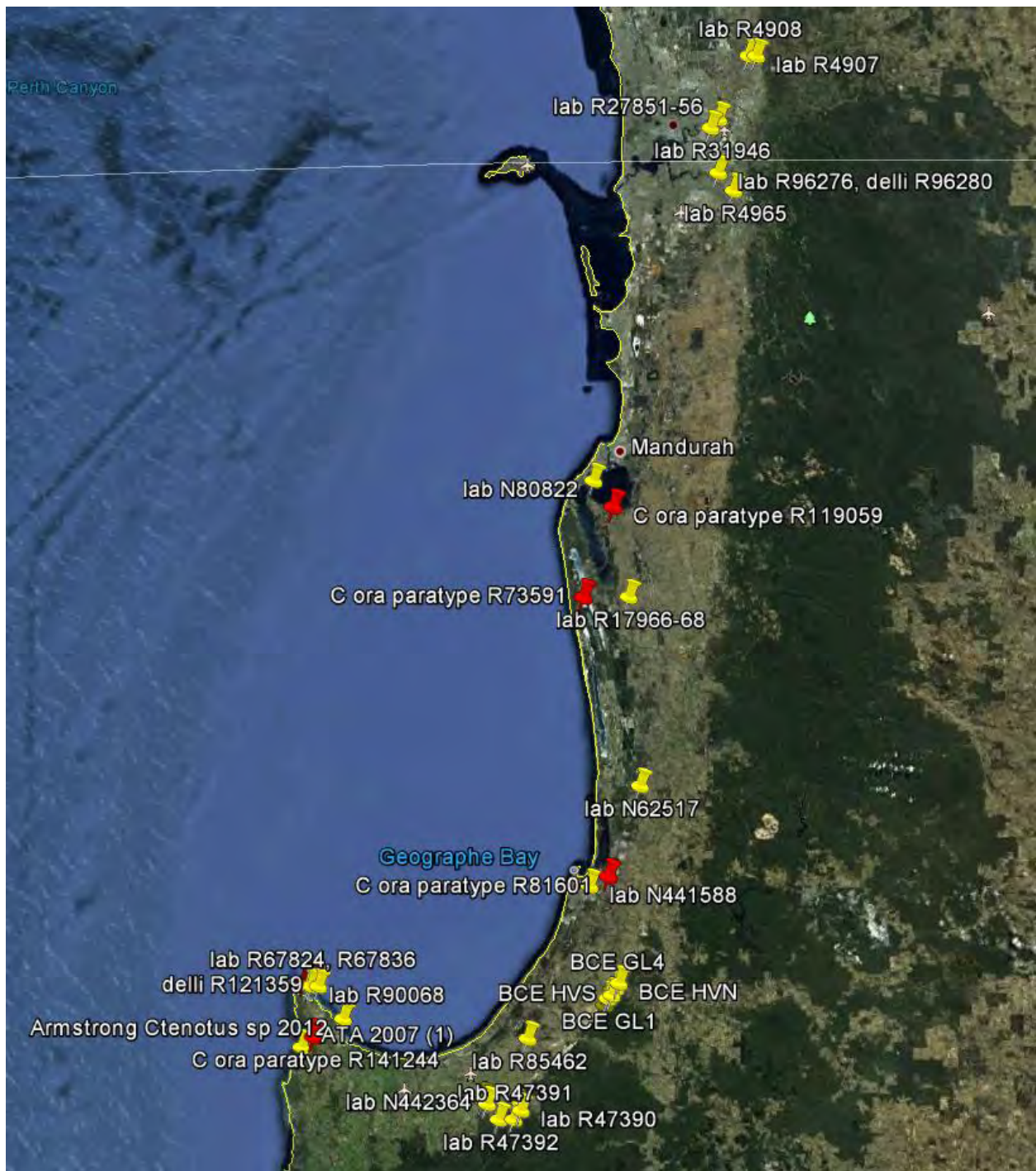


Figure 3. Localities of *Ctenotus ora* type specimens (red pins) and other records possibly of this species (yellow). Imagery: Google Earth

## 3.0 *Ctenotus* in Armstrong Reserve

A specimen trapped, photographed and released at on 16 September 2011 as part of a Level 2 fauna survey (Ecoscape 2012) (**Figure 4**) had a snout-vent length approximately 63 mm, slightly greater than reported in any of Kay & Keogh's sample of *Ctenotus ora*. It may have entered the trap on the previous day, as the trap was cleared at 11:20 am and had last been checked 24 hours earlier. During this interval, temperature at the Cape Naturaliste BoM station was between 15.3 and 18.0°C (Bureau of Meteorology 2012). The trap was located in the northern part of the reserve, in a partly grassy clearing within vegetation assessed by Ecoscape (2010) as type AfCcErBILOF (Peppermint, Marri, Flooded Gum and Banksia low woodland or open forest).

A second specimen was recently (11 November 2012) trapped in the southern part of the Reserve adjacent to the fence of the Shire works depot, in vegetation assessed by Ecoscape (2010) as type CcAfMxOF (Marri, Peppermint, and mixed species low woodland or open forest). A skink consistent with *Ctenotus* was seen fleeing to cover (sticks and leaf litter around the base of a small Peppermint) at 12:10 pm, and a funnel trap was then set at the site, with short fences along the edge of the litter pile (**Figure 8, Appendix 2**). When checked at 2:39 pm the trap contained an adult *Ctenotus* and also a *Morethia lineocellata*, both of which had heavy burdens of red mites attached around axilla and behind base of hindlimb (cover image and **Figure 5**).

The recently collected *Ctenotus* specimen will be accessioned to the Western Australian Museum collection and sampled for DNA comparison to confirm specific identity. The two Armstrong Reserve specimens differ in various details of colour and pattern. Some of these may reflect temporal variation related to season, the ecdysis cycle and/or reproductive condition, such as being generally darker and having a pale buff rather than lemon-yellow ventral surface.

Neither specimen has a plain or 'smooth' copper-brown dorsum as considered diagnostic for the species, but both have dark flecks forming two distinct longitudinal series (paravertebral lines) as in some *C. labillardieri*. This feature is also present in a specimen photographed by Brad Maryan, identified as *C. ora* and featured in electronic news stories in late October (eg ABC Science 2012). It is unlikely (in a skink) that black pattern elements would be rapidly lost in alcohol-preserved specimens, so if the Dunsborough specimens are *C. ora* the species is variable in this character.

No other captures or positive sightings of this species or any other *Ctenotus* were made during either survey, so no attempt is made here to assess their relative or absolute abundance.



Figure 4. *Ctenotus* sp. Captured and released at Armstrong Reserve in September 2011





Figure 5. *Ctenotus* sp. Captured at Armstrong Reserve in November 2012

## 4.0 Potential distribution of *Ctenotus ora*

To place the loss of *C. ora* habitat in Armstrong Reserve in an appropriate context, it is necessary to assess the extent and distribution of its habitat:

- within the Reserve, to determine what would be lost vs retained at a site where *Ctenotus* (presumed to be *C. ora*) is known to occur
- in the Dunsborough area relevant to a local population that is potentially viable in the long term, and current or past linkages to other areas of habitat in the region
- in the complete range of the species, comprising the Cape Naturaliste area and southern Swan Coastal Plain.

**Map 1** shows the estimated extent of habitat currently suitable for *Ctenotus* within Armstrong Reserve, and its intersection with the proposed development area. Trap locations are also shown, indicating sites where *Ctenotus* was recorded in either the 2011 or 2012 surveys. Areas considered unsuitable are those where either the canopy or understorey vegetation is closed, so that sunlight does not regularly reach exposed soil or leaf litter, or areas that are completely cleared. This distinction does not correspond with those used in mapping vegetation type or condition in previous surveys, but the *Melaleuca*-dominated vegetation type (MrErAfIOf in Ecoscape 2010) is generally lower-lying, wetter and thicker than other types, and correlates with closed and unsuitable habitat.

The presence of logs on the ground was examined as a potential habitat indicator during November 2012, but is not utilised in any quantitative way here. Such interpretation would have to consider numerous variables affecting the habitat value of individual logs (species, age since fall, size, insolation, wetness, surrounding vegetation etc); freshly cut sticks (potentially including dumped garden waste) may be as important a resource as massive, damp old logs. The distribution of logs was assessed by photographing as many as possible using a GPS-capable camera and plotting photo locations on a map. There do seem to be more, or more suitable logs in more open areas, but this is partly due to factors such as the progressive death of *Banksia* due to dieback, and accessibility of open habitat near roadsides for disposal of loppings.

**Maps 2-4** use a different approach to estimating extent of potential habitat, based on the recorded association of *C. ora* specimens, including those at Armstrong Reserve, with sandy soils, and with open forest or woodland vegetation (usually *Eucalyptus* and/or *Corymbia* over *Banksia* and/or *Agonis*, with open heath or sedge understorey). Because this description fits most of the vegetation that occurs on sandy soils in the region, these maps use the intersection of only two data layers, representing sandy soils and remnant native vegetation.

**Map 2** covers the Dunsborough area, showing Armstrong Reserve, Marri Reserve, and a similar-sized area of remnant vegetation on the western side of Cape Naturaliste Road, as a nearly continuous red

area at the centre. All three areas were traversed during the November 2012 survey, and considered to contain equally suitable *Ctenotus* habitat. As skinks the size of *Ctenotus* are able to cross roads (though less frequently than larger species like *Egernia kingii*, which was observed crossing Naturaliste Terrace during the survey), it is considered likely that a single population of *C. ora* currently occupies these three adjacent patches of habitat. The map shows that this area of habitat was historically continuous with the coastal Quindalup dune system (extending south-east), but narrowly separated from more patchily distributed areas of sandy soil extending south and west. Due to clearing, all three linkages are now broken, with multiple gaps of several hundred metres between remnant patches. These gaps are likely to have effectively isolated the Dunsborough *Ctenotus* population, although some individuals may be able to utilise marginal habitats and survive road crossings to move between fragments occasionally.

**Map 3** shows that the three linkages meeting at Dunsborough connect westward to large areas of suitable habitat extending from Cape Naturaliste to Yallingup (where there are two definitive and six likely records of *C. ora*), eastward to significant remnant patches of Peppermint-dominated woodland along the coast, and south-south-east along Whicher Scarp, where remnant habitat is more fragmented but contains numerous blocks of similar size to that at Dunsborough.

**Map 4** zooms out to the complete distribution range of *C. ora* (but excluding the Perth area) and indicates that large and nearly continuous areas of remnant potential habitat, with scattered records known or likely to represent *C. ora*, exist in coastal areas between Busselton and Mandurah. As shown in **Figure 2 (Section 2 above)**, records of *Ctenotus* throughout this area are unevenly distributed and contain large gaps; consequently, they are unlikely to fully or accurately represent the actual distribution of any species, so that the poor knowledge of *C. ora*'s distribution at this scale is not exceptional.

These maps show that the complex and fragmented geometry of (presumed) potential habitat for *C. ora* is not only due to historic clearing, but also to the patchy distribution of suitable soil types in a geologically complex bioregion. They also show that there are extensive areas of protected habitat where the species is known to occur and likely to be more or less continually distributed (Cape Naturaliste to Yallingup, Bunbury to Dawesville), and another large area where the identity of *C. labillardieri* species-group populations has yet to be determined (Whicher Scarp).

The proposed development area of Armstrong Reserve does not break any linkages within existing or potential habitat at either a local or regional scale, and represents a very small proportion of the area known or likely to be occupied by *Ctenotus ora*.

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# Maps



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AUTHOR: JN  
DATE: 11-12

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PROJECT NO: 2582-10

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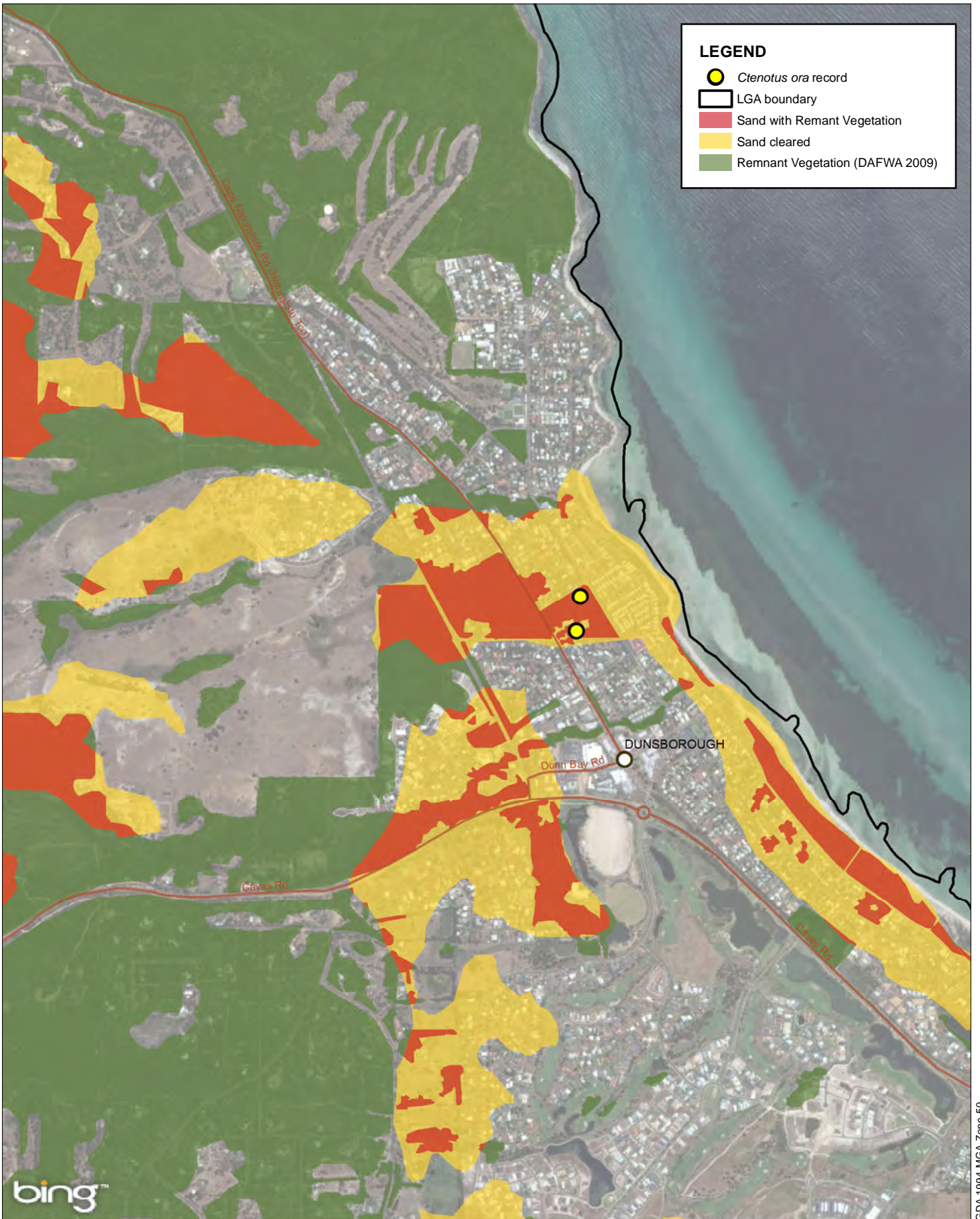


ARMSTRONG RESERVE DUNSBOROUGH *CTENOTUS ORA*  
POTENTIAL IMPACT ASSESSMENT

CLIENT: RAY VILLAGE AGED SERVICES INC.

***CTENOTUS ORA* MICRO-HABITAT**

**MAP 1**



**LEGEND**

- *Ctenotus ora* record
- ▭ LGA boundary
- Sand with Remnant Vegetation
- Sand cleared
- Remnant Vegetation (DAFWA 2009)

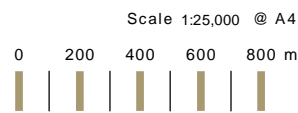
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 CTENOTUS ORA POTENTIAL IMPACT ASSESSMENT**  
 CLIENT: RAY VILLAGE AGED SERVICE INC.



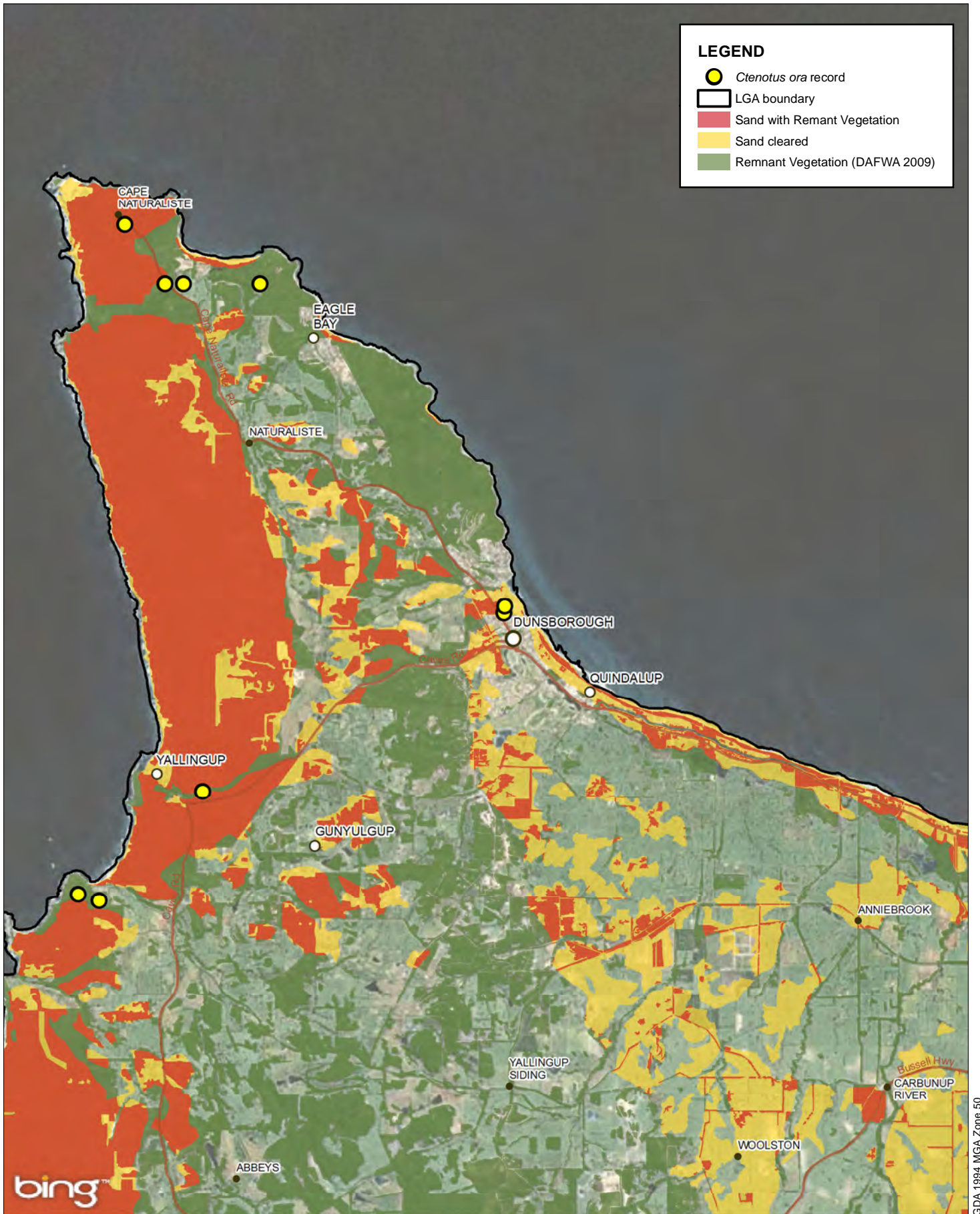
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**LOCAL LINKAGES**  
**MAP 2**

GDA 1994 MGA Zone 50





**LEGEND**

- *Ctenotus ora* record
- ▭ LGA boundary
- Sand with Remnant Vegetation
- Sand cleared
- Remnant Vegetation (DAFWA 2009)

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 CTENOTUS ORA POTENTIAL IMPACT ASSESSMENT**  
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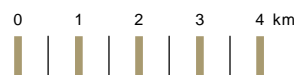
**CAPE NATURALISTE LINKAGES**



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Scale 1:125,000 @ A4

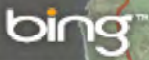
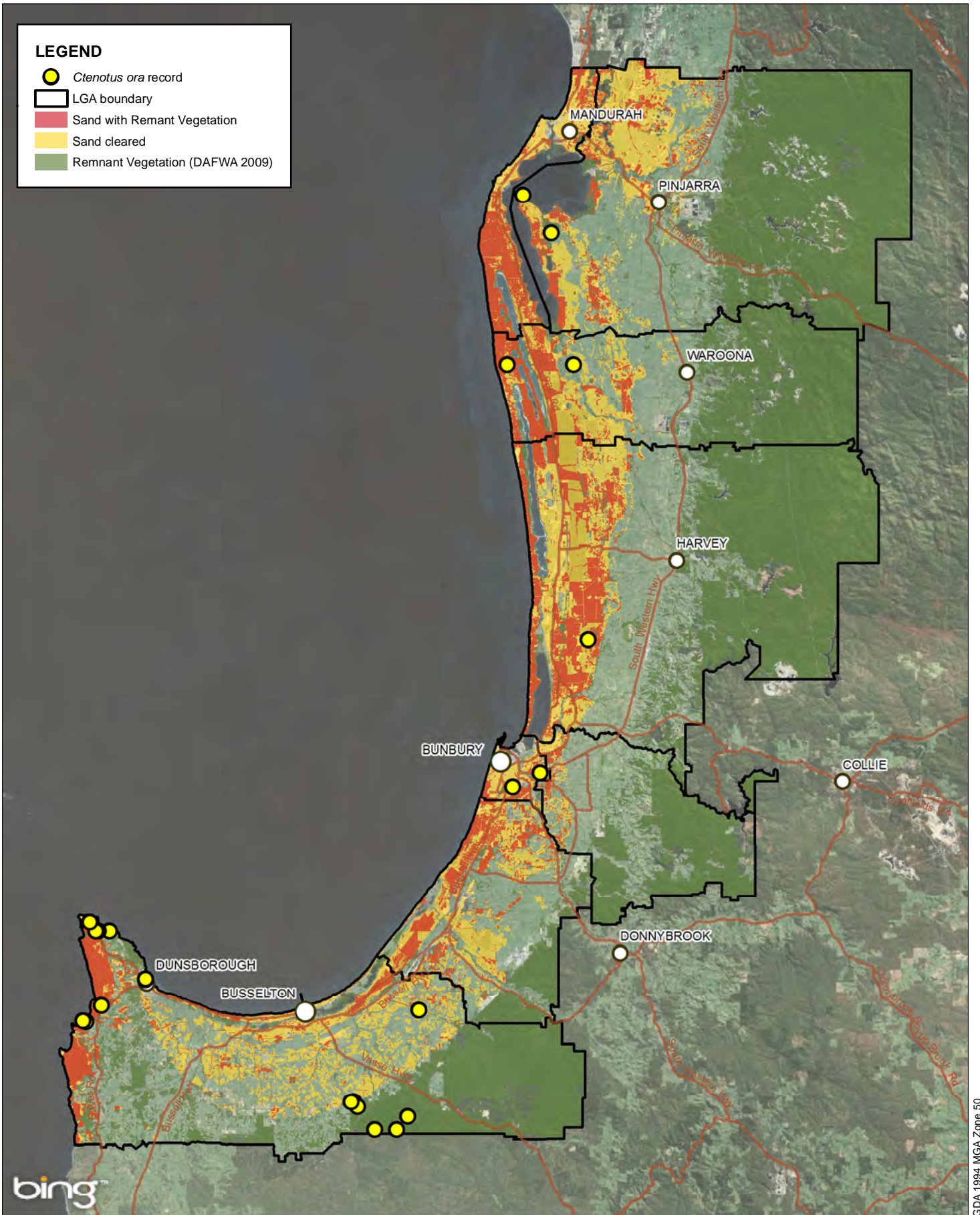


**MAP 3**

GDA 1994 MGA Zone 50

**LEGEND**

-  *Ctenotus ora* record
-  LGA boundary
-  Sand with Remnant Vegetation
-  Sand cleared
-  Remnant Vegetation (DAFWA 2009)



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AUTHOR: JN  
DATE: 11-12

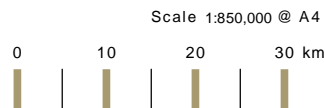
CHECKED: SB  
PROJECT NO: 2582-10

**ARMSTRONG RESERVE DUNSBOROUGH  
CTENOTUS ORA POTENTIAL IMPACT ASSESSMENT**  
CLIENT: RAY VILLAGE AGED SERVICE INC.

**SOUTHERN SCP LINKAGES**



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North Fremantle WA 6159  
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web: www.ecoscape.com.au



**MAP 4**

GDA 1994 MGA Zone 50

## appendix one: *Ctenotus* ecology and behaviour

This section is placed outside the main text because it is not based on data referring directly to *Ctenotus ora*, but is used in estimating the distribution of preferred habitat.

Greer (1989) describes typical behaviour of these lizards as follows: “*Ctenotus* are generally diurnal, sun-loving and largely terrestrial, although some species will climb in hummock grass or, occasionally, low shrubs [...] after a particularly attractive prey item. They generally run fairly hot, having average active body temperatures of 30 to 38°C [...]. When actively foraging, they move “nervously” through the habitat investigating likely hiding places for prey, occasionally pausing to look around or to bask, and dashing to cover at the slightest sign of danger.”

The records of body temperatures of active individuals in the field, and preferred temperatures in laboratory gradients, fall in the 30 to 38°C range for all tropical and arid-zone species (including the nocturnal *C. pantherinus* at 33°C; Greer 1989) but an average of 25°C was reported in *C. taeniolatus* by Heatwole (1976) in the Armidale-Tamworth area (NSW highlands). No field activity or preferred temperatures have been reported for members of the *C. labillardieri* group, but they are likely to be lower than tropical and arid species. Activity does occur at ambient temperatures below 20°C (eg at Armstrong Reserve), but lizards are able to operate at temperatures well above that of the surrounding air by basking (eg Heatwole 1976), which is facilitated by dark colours that predominate in the *C. labillardieri* group. *Ctenotus* habitats are characterised by relatively open vegetation, often including expanses of nearly bare rock or soil. While *C. labillardieri* can inhabit wet Karri forest (Bush *et al.* 1995), they would be dependent on sunlight reaching the ground through breaks in the canopy.

*Ctenotus* generally shelter in shallow burrows dug under rocks, soil crusts, or other relatively flat and exposed cover (Ehmann 1992; Greer 1989); this facilitates passive thermoregulation (thigmothermy) when the cover object is warmed by sunlight. For species preferring or requiring high body temperatures for activity, this is generally advantageous relative to burrowing under large and poorly heat-conducting items such as logs, or in sites not reached by direct sun. *Ctenotus labillardieri* and *C. ora* have both been recorded under logs (Bush *et al.* 1995; Kay & Keogh 2012), consistent with relatively low body temperatures in these species.

Some *Ctenotus* species are dietary specialists (for example on termites), but most are generalist feeders on small invertebrates obtained by a combination of sit-and-wait (ambush) and active searching, and a few species ingest some plant material (Goodyear & Pianka 2011; Read 1998; Taylor 1986). Diets have not been reported for members of the *C. labillardieri* group.

All *Ctenotus* as far as known are oviparous (egg-laying), with clutch size related to maternal body size; 2-4 eggs per clutch have been reported in *C. labillardieri*, and 2 in *C. gemmula* (Chapman & Dell 1975; Greer 1989). Sexual maturity in *Ctenotus* usually occurs in the lizard's second year (sometimes earlier), and adults live for several years on average so that they make up the majority of the population at most times (Greer 1989; Pike *et al.* 2008).

appendix two: *Ctenotus ora* habitat photos



Figure 6. Cape Naturaliste carpark, vicinity of *Ctenotus ora* holotype locality, and view to south



**Figure 7. Yallingup Brook, vicinity of *Ctenotus ora* paratype locality**



**Figure 8. Armstrong Reserve, trap site F01 (1 *Ctenotus* and 1 *Morethia*, 11 November 2012)**



**Figure 9. Armstrong Reserve, trap site F02 (vicinity of 2011 *Ctenotus* locality)**



**Figure 10. Marri Reserve, trap site F03 (no captures)**



**Figure 11. Marri Reserve, trap site F04 (5 *Morethia* and 2 *Acritoscincus*)**



## Appendix three: *Ctenotus ora/labillardieri* specimen summary

**Table 1. *Ctenotus labillardieri/ora* specimen data. Records identified by WAM registration or NatureMap ID.**

| Specimen                         | Locality   | Date       | Easting (m) | Northing (m) | Accuracy (m) | Elevation (m) | Distance to shore (km) | Notes   |
|----------------------------------|--|------------|-------------|--------------|--------------|---------------|------------------------|---|
| <b>WAM R131983</b><br>(holotype) | <b>Cape Naturaliste</b> [33°32'21"S, 115°01'13"E]                | 04/11/1997 | 316181      | 6287183      | 27           | 100           | 0.68                   | Under Banksia log in open Eucalypt woodland over Banksia on white sand                      |
| <b>R73591</b><br>(paratype)      | <b>Yalgorup National Park</b> [32°50'00"S, 115°39'00"E]          | 02/11/1980 | 373647      | 6366383      | 16100        | 6             | 1.65                   | Marri over heath on sand  |
| <b>R81601</b><br>(paratype)      | <b>Eaton</b> [33°21'00"S, 115°42'00"E]                           | 06/09/1982 | 379037      | 6309156      | 3220         | 14            | 3.5                    |   |
| <b>R119059</b><br>(paratype)     | <b>Lake Mealup</b> (15km WSW Pinjarra) [32°40'00"S, 115°43'00"E] | 09/10/1993 | 379664      | 6384938      | 1610         | 10            | 2.7                    | Under Banksia log on white sand; photo probably of this specimen in Bush et al (1995) p.119 |
| <b>R141244</b><br>(paratype)     | <b>Yallingup Brook</b> [33°38'39"S, 115°02'15"E]                 | 08/04/2000 | 318001      | 6275569      | 27           | 63            | 1.3                    |   |
| <b>R90068</b> 'lab'              | [ <b>Cape Naturaliste</b> ] 5.5 km NE [NW!] Meelup [Beach]       | 26/10/1985 | 317033      | 6285998      | 134          | 42            | 0.8                    |   |
| <b>R67824</b> 'lab'              | 1 km E Willanup Spring, <b>Cape Naturaliste</b>                  | 12/11/1979 | 317413      | 6286005      | 1610         | 31            | 0.65                   |   |
| <b>R67836</b> 'lab'              | 1 km E Willanup Spring, <b>Cape Naturaliste</b>                  | 10/11/1979 | 317413      | 6286005      | 1610         | 31            | 0.65                   |   |
| <b>R121359</b> 'delli'           | <b>Cape Naturaliste</b> [approx 33°33'00"S, 115°03'01"E]         | 24/11/1994 | ~318990     | ~6286035     | N/Av         | 48            | 0.55                   | Location approximate, DEC Priority species  |
| <b>R17966</b> 'lab'              | <b>E of Lake Clifton</b>   | 06/03/1960 | 383007      | 6366501      | 8050         | 5             | 5.6                    |   |
| <b>R17968</b> 'lab'              | <b>E of Lake Clifton</b>   | 06/03/1960 | 383007      | 6366501      | 8050         | 5             | 5.6                    |   |

| Specimen                       | Locality                    | Date       | Easting (m) | Northing (m) | Accuracy (m) | Elevation (m) | Distance to shore (km) | Notes  |
|--------------------------------|-----------------------------|------------|-------------|--------------|--------------|---------------|------------------------|--|
| R17967 'lab'                   | E of Lake Clifton           | 06/03/1960 | 383007      | 6366501      | 8050         | 5             | 5.6                    |  |
| R47392 'lab'                   | Ridge Road Busselton        | 04/10/1974 | 356520      | 6258939      | 1600         | 132           | 19.4                   |  |
| R47391 'lab'                   | Witcher Road Busselton      | 04/10/1974 | 359602      | 6258985      | 1610         | 150           | 20.6                   |  |
| R47390 'lab'                   | Hills Road Busselton        | 17/10/1974 | 361121      | 6260860      | 1610         | 167           | 19.7                   |  |
| Ecoscope 2011<br>256502        | Armstrong Reserve (trap 15) | 16/09/2011 | 324157      | 6279486      | 3            | 8             | 0.3                    | <i>Eucalyptus/Corymbia</i> over <i>Banksia</i> and <i>Agonis</i> over open heath/sedgeland on sand |
| Ecoscope 2012                  | Armstrong Reserve (F01)     | 11/11/2012 | 324147      | 6279340      | 3            | 11            | 0.4                    | <i>Eucalyptus/Corymbia</i> over <i>Banksia</i> and <i>Agonis</i> over open heath/sedgeland on sand |
| J Sansom 2012<br>'lab' 441588  | Bunbury                     | 02/05/2012 | 375173      | 6307121      | 100          | 21            | 3.9                    | SWIT Remnant bushland  |
| G Harewood<br>2009 'lab' 62517 | Kemerton Industrial Park    | 25/11/2009 | 385506      | 6327815      | 100          | 23            | 8.2                    |  |
| BCE 2009 80822                 | Point Grey                  | 03/11/2009 | 375592      | 6390273      | 100          | 2             | 0.22                   | <i>Eucalyptus rudis</i> and <i>Melaleuca</i> Dampland  |
| ATA 2007 (not in<br>NMap) x1   | Smiths Beach Locality 2     | 11-12/2005 | 315482      | 6273416      | ~200         | 37            | 0.3                    | Open coastal heath (ATA Environmental 2007)  |
| ATA 2007 (not in<br>NMap) x5   | Smiths Beach Locality 3     | 11-12/2005 | 315917      | 6273295      | ~200         | 38            | 0.3                    | Peppermint / <i>Eucalypt</i> woodland (ATA Environmental 2007)                                     |
| BCE 2000 (not in<br>NMap) x 3  | Gwindinup Locality 1        | 12/1999    | 379000      | 6284100      | ~200         |               |                        | Whicher Vegetation Complex in sandy valley   |

| Specimen                               | Locality  | Date       | Easting (m) | Northing (m) | Accuracy (m) | Elevation (m) | Distance to shore (km) | Notes   |
|--|---|------------|-------------|--------------|--------------|---------------|------------------------|---|
| <b>BCE 2000</b> (not in NMap) x 4      | <b>Gwindinup</b> Locality 4                                       | 12/1999    | 380600      | 6286150      | ~200         |               |                        | Boundary of Whicher and Cartis Vegetation Complex on sandy slope/valley |
| <b>BCE 2007</b> (not in NMap) x 2      | <b>Happy Valley North</b>   | 11/2007    | 381298      | 6287286      |              |               |                        |   |
| <b>BCE 2007</b> (not in NMap) x 2      | <b>Happy Valley South</b>   | 11/2007    | 379831      | 6284781      |              |               |                        |   |
| <b>BCE 2007</b> (not in NMap) x 4      | <b>Control North</b>  | 11/2007    | 378973      | 6283746      |              |               |                        |   |
| <b>BCE 2007</b> (not in NMap) x 13     | <b>Control South</b>  | 11/2007    | 378385      | 6282747      |              |               |                        |   |
| <b>G Harewood 2011 'lab'</b><br>442125 | <b>Yoongarillup Mineral Sands Project</b> (funnel traps) – TS1.09 | 02/12/2011 | 353747      | 6262683      | 100          |               |                        |   |
| 442114                                 | TS1.08  | 03/12/2011 | 353745      | 6262702      | 100          |               |                        |   |
| 442377                                 | TS3.06  | 03/12/2011 | 354074      | 6262137      | 100          |               |                        |   |
| 442136                                 | TS2.01  | 03/12/2011 | 353212      | 6262804      | 100          |               |                        |   |
| 442065                                 | TS1.04  | 03/12/2011 | 353721      | 6262789      | 100          |               |                        |   |
| 442632, 442633                         | TS5.09  | 04/12/2011 | 353585      | 6262598      | 100          |               |                        |   |
| 442095, 442096                         | TS1.06  | 04/12/2011 | 353734      | 6262753      | 100          |               |                        |   |
| 442482                                 | TS4.05  | 04/12/2011 | 353717      | 6262235      | 100          |               |                        |   |
| 442399, 442400                         | TS3.07  | 04/12/2011 | 354067      | 6262159      | 100          |               |                        |   |

| Specimen       | Locality | Date       | Easting (m) | Northing (m) | Accuracy (m) | Elevation (m) | Distance to shore (km) | Notes |
|----------------|----------|------------|-------------|--------------|--------------|---------------|------------------------|-------|
| 442066         | TS1.04   | 04/12/2011 | 353721      | 6262789      | 100          |               |                        |       |
| 442193         | TS2.02   | 04/12/2011 | 353210      | 6262783      | 100          | 61            | 14.6                   |       |
| 442571         | TS5.03   | 04/12/2011 | 353523      | 6262760      | 100          |               |                        |       |
| 442483         | TS4.05   | 05/12/2011 | 353717      | 6262235      | 100          |               |                        |       |
| 442364         | TS3.05   | 05/12/2011 | 354081      | 6262109      | 100          | 92            | 15.55                  |       |
| 442546         | TS5.01   | 06/12/2011 | 353516      | 6262816      | 100          | 58            | 14.7                   |       |
| 442453         | TS4.03   | 06/12/2011 | 353697      | 6262194      | 100          |               |                        |       |
| 442634         | TS5.09   | 06/12/2011 | 353585      | 6262598      | 100          |               |                        |       |
| 442572         | TS5.03   | 08/12/2011 | 353523      | 6262760      | 100          |               |                        |       |
| 442416         | TS3.08   | 09/12/2011 | 354049      | 6262168      | 100          |               |                        |       |
| 442105         | TS1.07   | 09/12/2011 | 353734      | 6262735      | 100          |               |                        |       |
| 442401         | TS3.07   | 10/12/2011 | 354067      | 6262159      | 100          |               |                        |       |
| 442032         | TS1.10   | 10/12/2011 | 353748      | 6262658      | 100          |               |                        |       |
| 442566, 442547 | TS5.01   | 10/12/2011 | 353516      | 6262816      | 100          |               |                        |       |
| 442592         | TS5.05   | 10/12/2011 | 353539      | 6262721      | 100          |               |                        |       |

## **APPENDIX 6**

### **IBSA DATA PACKAGES**

**(Source: Ecoscape (Australia) Pty Ltd and PGV  
Environmental, 2019)**



**Metadata and licensing statement**

**Index of Biodiversity Surveys for Assessments (IBSA) – data packages**

Sections 1, 2, 3 and 5 must be completed for all IBSA data packages. Section 4 is to be completed only if a licence is granted in Section 3. Prior to completing this statement, ensure you have read and understood the explanatory notes and definitions provided (pp. 3-4).

**1. Report metadata**

| Field                                |   | Value   |
|--------------------------------------|---|---|
| <b>Title</b>                         | The report's full title.  | Armstrong Reserve – 2013 Orchid Survey Results                                    |
| <b>Author</b>                        | The name of the person or group who authored the report and the electronic data files.  | PGV Environmental   |
| <b>Year</b>                          | The report's year of publication.   | 2013  |
| <b>Survey type†</b>                  | A description of the type of field survey(s) in the report.   | Targeted Survey for Caladenia viridescens   |
| <b>Proponent</b>                     | The name of the proponent the report was prepared for.  | Ray Village Aged Services   |
| <b>Proposal</b>                      | The name of the proposal, project or area the report was prepared for.  | Armstrong Reserve Aged Care Facility  |
| <b>Start date</b>                    | The commencement date of the first field survey in the report.  | 11/10/2013  |
| <b>End date</b>                      | The conclusion date of the last field survey in the report.   | 11/10/2013  |
| <b>Overall survey boundary</b>       | An attached image, spatial data file or reference to a part of the report, depicting an overall boundary enclosing the individual boundaries of all field surveys in the report.  | Refer to spatial data file: 1_SurveyDetails                                       |
| <b>List of electronic data files</b> | The name of each electronic data file accompanying the report in the IBSA data package. For files that exist in sets, e.g. shapefiles, only list a single file name for each set. | <ul style="list-style-type: none"> <li>2B_Caladenia viridescens_pt.shp</li> </ul> |

|                 |   |   |
|-----------------|---|---|
| <b>Citation</b> | The preferred citation for the report and electronic data files. This citation may be used by others in referencing the work. | PGV Environmental (2013), <i>Armstrong Reserve, Dunsborough – 2013 Orchid Survey Results</i> . Letter to Endplan Environmental, 5 November 2013 |
|-----------------|---|---|

† This should include references to both the level of survey and the type of biodiversity being surveyed. For example, 'Detailed flora and vegetation Survey', 'Targeted threatened species survey', 'Pilot subterranean fauna survey', etc.

## 2. Data quality certification

|                                     |   |
|-------------------------------------|---|
| <input checked="" type="checkbox"/> | <p>I certify that the electronic data files:</p> <ul style="list-style-type: none"> <li>• contain the complete set of data arising from the surveys described in the report, per the requirements of the Instructions – Index of Biodiversity Surveys for Assessments (IBSA) data packages document;</li> <li>• are technically and scientifically accurate, at the time of this submission and for the purpose of the environmental assessment for which they were created; and</li> <li>• are consistent with the results presented in the report.</li> </ul> |
|-------------------------------------|---|

## 3. Licence to publish the IBSA data package on the IBSA website


|                                     |  |
|-------------------------------------|--|
| <input checked="" type="checkbox"/> | I grant the State of Western Australia an irrevocable, royalty-free, non-transferable, nonexclusive licence to communicate this IBSA data package to the public via the IBSA website, for the non-commercial purposes of the State. I warrant that I have the right and authority to grant this licence and confirm that I have obtained all necessary licences and consents from all owners of intellectual property rights in the IBSA data package. |
| <input type="checkbox"/>            | I do not grant the State of Western Australia any licence to communicate the report or electronic data files to the public. I understand that this Metadata and licensing statement will be made available on the IBSA website.  |

## 4. Licence to third parties to re-use the information in the IBSA data package

|                                     |   |
|-------------------------------------|---|
| <input type="checkbox"/>            | <p>I grant third parties the ability to re-use the information in this IBSA data package under a CC Licence.</p> <p>A summary of the CC Licence is provided below, for reference. This must be read in conjunction with the full licence text, available at <a href="http://creativecommons.org/licenses/by/3.0/au/legalcode">creativecommons.org/licenses/by/3.0/au/legalcode</a>. This summary is not a substitute for the full licence text and should not be relied upon.</p> <p>The third party is free to:</p> <ul style="list-style-type: none"> <li><b>Share</b> – Copy and redistribute the material in any medium or format.</li> <li><b>Adapt</b> – Remix, transform and build upon the material for any purpose, even commercially.</li> </ul> <p>Under these terms:</p> <ul style="list-style-type: none"> <li><b>Attribution</b> – The third party must give appropriate credit, provide a link to the licence, and indicate if changes were made. The third party may do so in any reasonable manner, but not in any way that suggests that you endorse the third party or the third party's use of the material.</li> <li><b>No additional restrictions</b> – The third party may not apply legal terms or technological measures that legally restrict others from doing anything the CC Licence permits.</li> </ul> |
| <input checked="" type="checkbox"/> | I do not grant third parties any licence to re-use this information.  |

## 5. Execution

I warrant that the information provided in this Metadata and licensing statement is true and correct and that I am authorised to execute this document on behalf of the company named below.

|                 |                     |                  |   |
|-----------------|---------------------|------------------|---|
| <b>Name</b>     | Paul van der Moezel | <b>Signature</b> |  |
| <b>Position</b> | Managing Director   | <b>Date</b>      | 30.5.19   |
| <b>Company</b>  | PGV Environmental   |                  |   |



## Office use only

|                                  |  |                            |  |
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| <b>Data package receipt date</b> |  | <b>Website upload date</b> |  |
| <b>Receiving agency</b>          |  |                            |  |
| <b>Assessment type</b>           |  |                            |  |

### Explanatory notes

A Metadata and licensing statement must be completed for each IBSA data package. The statement should be completed electronically and included in the IBSA data package in PDF format.

The Metadata and licensing statement must be completed by the owner of the intellectual property rights (IP owner) in the report and electronic data files, or by a person who has obtained all necessary licences and consents from the IP owner. The IP owner will usually be the person or group named as the 'Author' in Section 1.

In practice, the person or group that conducts the field surveys, authors the report and prepares the electronic data files typically would be an environmental consultant; by doing this work the consultant would be the IP owner, and would therefore be responsible for preparing the IBSA data package and completing the Metadata and licensing statement.

In some cases however, the proponent or another party may be the IP owner. It is the responsibility of proponents, consultants and any other parties to determine who is the IP owner, and to ensure that the correct person or group completes the Metadata and licensing statement.

For more information on intellectual property rights, refer to the [Instructions – Index of Biodiversity Surveys for Assessments \(IBSA\) data packages](#) document on the Environmental Protection Authority website.

### Section 1: Report metadata

All fields in this section must be completed.

The purpose of this section is to capture basic information about the surveys and the report, to aid indexing of the IBSA data package on the IBSA website. This information also assists IBSA website users in identifying multiple IBSA data packages related to the same assessment.

### Section 2: Data quality certification

The certification in this section must be given.

The purpose of this section is to ensure that IBSA data packages meet basic expectations for quality control. This responsibility lies with the author of the report and the electronic data files; the

State of Western Australia is unable to take any further steps for quality control of IBSA data packages.

### **Section 3: Licence to publish the IBSA data package on the IBSA website**

One of the two options in this section must be selected.

The purpose of granting a licence in this section is to allow the State of Western Australia to make the IBSA data package publicly available via the IBSA website. In accordance with its [Whole of Government Open Data Policy](#), the State believes that making such data easier to find and use will unlock opportunities for the public sector, businesses and communities to utilise data in more effective and diverse ways. The granting of this licence is therefore strongly encouraged.

If the licence is not granted, only the Metadata and licensing statement will be made publicly available via the IBSA website. The remainder of the IBSA data package will be archived offline.

### **Section 4: Licence to third parties to re-use the information in the IBSA data package**

This section must be completed if a licence to publish the IBSA data package on the IBSA website was granted in Section 3, in which case one of the two options must be selected. If the licence in Section 3 was not granted, this section must **not** be completed.

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If the CC licence is not granted (but the licence in Section 3 is), third parties may still view and refer to the IBSA data package via the IBSA website, but will not have any right to share, adapt or build on the information, for any purpose, without first obtaining the copyright holder's consent.

### **Section 5: Execution**

All fields in this section must be completed.

#### **Definitions**

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'Report' means the report identified in Section 1 under the heading 'Title', and includes any attachments or appendices to the report.

'State of Western Australia' includes the Western Australian Department of Water and Environmental Regulation, the Western Australian Environmental Protection Authority and the Western Australian Department of Mines, Industry Regulation and Safety.



**Metadata and licensing statement**

**Index of Biodiversity Surveys for Assessments (IBSA) – data packages**

Sections 1, 2, 3 and 5 must be completed for all IBSA data packages. Section 4 is to be completed only if a licence is granted in Section 3. Prior to completing this statement, ensure you have read and understood the explanatory notes and definitions provided (pp. 3-4).

**1. Report metadata**

| Field                                |   | Value  |
|--------------------------------------|---|--|
| <b>Title</b>                         | The report's full title.  | Armstrong Reserve, Dunsborough – Flora and Vegetation Assessment   |
| <b>Author</b>                        | The name of the person or group who authored the report and the electronic data files.  | Ecoscape (Australia) Pty Ltd   |
| <b>Year</b>                          | The report's year of publication.   | 2010   |
| <b>Survey type†</b>                  | A description of the type of field survey(s) in the report.   | Targeted Conservation Significant Flora and Floristic Survey   |
| <b>Proponent</b>                     | The name of the proponent the report was prepared for.  | Ray Village Aged Services  |
| <b>Proposal</b>                      | The name of the proposal, project or area the report was prepared for.  | Armstrong Reserve Aged Care Facility   |
| <b>Start date</b>                    | The commencement date of the first field survey in the report.  | 30/10/2009   |
| <b>End date</b>                      | The conclusion date of the last field survey in the report.   | 19/11/2009   |
| <b>Overall survey boundary</b>       | An attached image, spatial data file or reference to a part of the report, depicting an overall boundary enclosing the individual boundaries of all field surveys in the report.  | Refer to spatial data file: 1_SurveyDetails  |
| <b>List of electronic data files</b> | The name of each electronic data file accompanying the report in the IBSA data package. For files that exist in sets, e.g. shapefiles, only list a single file name for each set. | <ul style="list-style-type: none"> <li>• 1_SurveyDetails.shp</li> <li>• 2A_SampleSites.shp</li> <li>• 2B_Flora_pt.shp</li> <li>• 2C_VegetationMapping.shp</li> </ul> |

|                 |   |   |
|-----------------|---|---|
| <b>Citation</b> | The preferred citation for the report and electronic data files. This citation may be used by others in referencing the work. | Ecoscope (2010), <i>Armstrong Reserve, Dunsborough - Flora and Vegetation Assessment</i> . Unpublished report for Ray Village Aged Services |
|-----------------|---|---|

† This should include references to both the level of survey and the type of biodiversity being surveyed. For example, 'Detailed flora and vegetation Survey', 'Targeted threatened species survey', 'Pilot subterranean fauna survey', etc.

## 2. Data quality certification

|                                     |   |
|-------------------------------------|---|
| <input checked="" type="checkbox"/> | <p>I certify that the electronic data files:</p> <ul style="list-style-type: none"> <li>• contain the complete set of data arising from the surveys described in the report, per the requirements of the Instructions – Index of Biodiversity Surveys for Assessments (IBSA) data packages document;</li> <li>• are technically and scientifically accurate, at the time of this submission and for the purpose of the environmental assessment for which they were created; and</li> <li>• are consistent with the results presented in the report.</li> </ul> |
|-------------------------------------|---|

## 3. Licence to publish the IBSA data package on the IBSA website

|                                     |  |
|-------------------------------------|--|
| <input checked="" type="checkbox"/> | I grant the State of Western Australia an irrevocable, royalty-free, non-transferable, nonexclusive licence to communicate this IBSA data package to the public via the IBSA website, for the non-commercial purposes of the State. I warrant that I have the right and authority to grant this licence and confirm that I have obtained all necessary licences and consents from all owners of intellectual property rights in the IBSA data package. |
| <input type="checkbox"/>            | I do not grant the State of Western Australia any licence to communicate the report or electronic data files to the public. I understand that this Metadata and licensing statement will be made available on the IBSA website.  |

## 4. Licence to third parties to re-use the information in the IBSA data package

|                                     |   |
|-------------------------------------|---|
| <input type="checkbox"/>            | <p>I grant third parties the ability to re-use the information in this IBSA data package under a CC Licence.</p> <p>A summary of the CC Licence is provided below, for reference. This must be read in conjunction with the full licence text, available at <a href="http://creativecommons.org/licenses/by/3.0/au/legalcode">creativecommons.org/licenses/by/3.0/au/legalcode</a>. This summary is not a substitute for the full licence text and should not be relied upon.</p> <p>The third party is free to:</p> <p><b>Share</b> – Copy and redistribute the material in any medium or format.</p> <p><b>Adapt</b> – Remix, transform and build upon the material for any purpose, even commercially.</p> <p>Under these terms:</p> <p><b>Attribution</b> – The third party must give appropriate credit, provide a link to the licence, and indicate if changes were made. The third party may do so in any reasonable manner, but not in any way that suggests that you endorse the third party or the third party's use of the material.</p> <p><b>No additional restrictions</b> – The third party may not apply legal terms or technological measures that legally restrict others from doing anything the CC Licence permits.</p> |
| <input checked="" type="checkbox"/> | I do not grant third parties any licence to re-use this information.  |

## 5. Execution

I warrant that the information provided in this Metadata and licensing statement is true and correct and that I am authorised to execute this document on behalf of the company named below.

|          |                          |           |                 |
|----------|--------------------------|-----------|-----------------|
| Name     | BERNADETTE VAN DER VIELE | Signature | Bm van der Vele |
| Position | DIRECTOR                 | Date      | 30 MAY 2019     |
| Company  | KNDPLAN ENVIRONMENTAL    |           |                 |

## Office use only

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|----------------------------------|--|----------------------------|--|
| <b>Data package receipt date</b> |  | <b>Website upload date</b> |  |
| <b>Receiving agency</b>          |  |                            |  |
| <b>Assessment type</b>           |  |                            |  |

### Explanatory notes

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### Section 2: Data quality certification

The certification in this section must be given.

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### **Section 4: Licence to third parties to re-use the information in the IBSA data package**

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### **Section 5: Execution**

All fields in this section must be completed.

#### **Definitions**

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'State of Western Australia' includes the Western Australian Department of Water and Environmental Regulation, the Western Australian Environmental Protection Authority and the Western Australian Department of Mines, Industry Regulation and Safety.





**Metadata and licensing statement**

**Index of Biodiversity Surveys for Assessments (IBSA) – data packages**

Sections 1, 2, 3 and 5 must be completed for all IBSA data packages. Section 4 is to be completed only if a licence is granted in Section 3. Prior to completing this statement, ensure you have read and understood the explanatory notes and definitions provided (pp. 3-4).

**1. Report metadata**

| Field                                |   | Value   |
|--------------------------------------|---|---|
| <b>Title</b>                         | The report's full title.  | Armstrong Reserve, Level Two Fauna Survey   |
| <b>Author</b>                        | The name of the person or group who authored the report and the electronic data files.  | Ecoscape (Australia) Pty Ltd  |
| <b>Year</b>                          | The report's year of publication.   | 2012  |
| <b>Survey type†</b>                  | A description of the type of field survey(s) in the report.   | Level 2 terrestrial vertebrate fauna survey   |
| <b>Proponent</b>                     | The name of the proponent the report was prepared for.  | Ray Village Aged Services   |
| <b>Proposal</b>                      | The name of the proposal, project or area the report was prepared for.  | Armstrong Reserve Aged Care Facility  |
| <b>Start date</b>                    | The commencement date of the first field survey in the report.  | 12/09/2011  |
| <b>End date</b>                      | The conclusion date of the last field survey in the report.   | 16/09/2011  |
| <b>Overall survey boundary</b>       | An attached image, spatial data file or reference to a part of the report, depicting an overall boundary enclosing the individual boundaries of all field surveys in the report.  | Refer to spatial data file: 1_SurveyDetails   |
| <b>List of electronic data files</b> | The name of each electronic data file accompanying the report in the IBSA data package. For files that exist in sets, e.g. shapefiles, only list a single file name for each set. | <ul style="list-style-type: none"> <li>• 1_SurveyDetails.shp</li> <li>• 2A_SampleSites_In.shp</li> <li>• 2A_SampleSites_pt.shp</li> <li>• 2E_Fauna.shp</li> <li>• 2F_FaunaHabitat_pt.shp</li> </ul> |

|                 |   |   |
|-----------------|---|---|
| <b>Citation</b> | The preferred citation for the report and electronic data files. This citation may be used by others in referencing the work. | Ecoscape (2012), <i>Armstrong Reserve Level Two Fauna Survey</i> . Unpublished report for Ray Village Aged Services |
|-----------------|---|---|

† This should include references to both the level of survey and the type of biodiversity being surveyed. For example, 'Detailed flora and vegetation Survey', 'Targeted threatened species survey', 'Pilot subterranean fauna survey', etc.

## 2. Data quality certification

|                                     |   |
|-------------------------------------|---|
| <input checked="" type="checkbox"/> | <p>I certify that the electronic data files:</p> <ul style="list-style-type: none"> <li>• contain the complete set of data arising from the surveys described in the report, per the requirements of the Instructions – Index of Biodiversity Surveys for Assessments (IBSA) data packages document;</li> <li>• are technically and scientifically accurate, at the time of this submission and for the purpose of the environmental assessment for which they were created; and</li> <li>• are consistent with the results presented in the report.</li> </ul> |
|-------------------------------------|---|

## 3. Licence to publish the IBSA data package on the IBSA website

|                                     |  |
|-------------------------------------|--|
| <input checked="" type="checkbox"/> | I grant the State of Western Australia an irrevocable, royalty-free, non-transferable, nonexclusive licence to communicate this IBSA data package to the public via the IBSA website, for the non-commercial purposes of the State. I warrant that I have the right and authority to grant this licence and confirm that I have obtained all necessary licences and consents from all owners of intellectual property rights in the IBSA data package. |
| <input type="checkbox"/>            | I do not grant the State of Western Australia any licence to communicate the report or electronic data files to the public. I understand that this Metadata and licensing statement will be made available on the IBSA website.  |

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|                                     |   |
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## 5. Execution

I warrant that the information provided in this Metadata and licensing statement is true and correct and that I am authorised to execute this document on behalf of the company named below.

|                 |                          |                  |                  |
|-----------------|--------------------------|------------------|------------------|
| <b>Name</b>     | BERNADETTE VAN DER WIELE | <b>Signature</b> | B. van der Wiele |
| <b>Position</b> | DIRECTOR                 | <b>Date</b>      | 30 MAY 2019      |
| <b>Company</b>  | ENDPLAN ENVIRONMENTAL    |                  |                  |

## Office use only

|                                  |  |                            |  |
|----------------------------------|--|----------------------------|--|
| <b>Data package receipt date</b> |  | <b>Website upload date</b> |  |
| <b>Receiving agency</b>          |  |                            |  |
| <b>Assessment type</b>           |  |                            |  |

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### Section 1: Report metadata

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### Section 2: Data quality certification

The certification in this section must be given.

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The purpose of granting a licence in this section is to allow others to re-use the report and electronic data files in IBSA data packages for research, environmental impact assessment, decision-making and other purposes. The CC licence is widely used for disseminating creative works, and in particular is a common choice for 'open access' scientific publications. Granting this licence will allow a IBSA data package to deliver the greatest possible value to all stakeholders, and is strongly encouraged.

If the CC licence is not granted (but the licence in Section 3 is), third parties may still view and refer to the IBSA data package via the IBSA website, but will not have any right to share, adapt or build on the information, for any purpose, without first obtaining the copyright holder's consent.

### **Section 5: Execution**

All fields in this section must be completed.

#### **Definitions**

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'Report' means the report identified in Section 1 under the heading 'Title', and includes any attachments or appendices to the report.

'State of Western Australia' includes the Western Australian Department of Water and Environmental Regulation, the Western Australian Environmental Protection Authority and the Western Australian Department of Mines, Industry Regulation and Safety.



**Metadata and licensing statement**

**Index of Biodiversity Surveys for Assessments (IBSA) – data packages**

Sections 1, 2, 3 and 5 must be completed for all IBSA data packages. Section 4 is to be completed only if a licence is granted in Section 3. Prior to completing this statement, ensure you have read and understood the explanatory notes and definitions provided (pp. 3-4).

**1. Report metadata**

| Field                                |   | Value  |
|--------------------------------------|---|--|
| <b>Title</b>                         | The report's full title.  | Armstrong Reserve, Dunsborough – Ctenotus ora Potential Impact Assessment  |
| <b>Author</b>                        | The name of the person or group who authored the report and the electronic data files.  | Ecoscape (Australia) Pty Ltd   |
| <b>Year</b>                          | The report's year of publication.   | 2012   |
| <b>Survey type†</b>                  | A description of the type of field survey(s) in the report.   | Targeted conservation significant fauna survey and impact assessment   |
| <b>Proponent</b>                     | The name of the proponent the report was prepared for.  | Ray Village Aged Services  |
| <b>Proposal</b>                      | The name of the proposal, project or area the report was prepared for.  | Armstrong Reserve Aged Care Facility   |
| <b>Start date</b>                    | The commencement date of the first field survey in the report.  | 11/11/2012   |
| <b>End date</b>                      | The conclusion date of the last field survey in the report.   | 11/11/2012   |
| <b>Overall survey boundary</b>       | An attached image, spatial data file or reference to a part of the report, depicting an overall boundary enclosing the individual boundaries of all field surveys in the report.  | Refer to spatial data file: 1_SurveyDetails  |
| <b>List of electronic data files</b> | The name of each electronic data file accompanying the report in the IBSA data package. For files that exist in sets, e.g. shapefiles, only list a single file name for each set. | <ul style="list-style-type: none"> <li>• 1_SurveyDetails.shp</li> <li>• 2A_SampleSites.shp</li> <li>• 2E_Fauna.shp</li> <li>• 2F_FaunaHabitat.shp</li> </ul> |

|                 |   |  |
|-----------------|---|--|
| <b>Citation</b> | The preferred citation for the report and electronic data files. This citation may be used by others in referencing the work. | Ecoscape (2012), <i>Armstrong Reserve, Dunsborough – Ctenotus ora Potential Impact Assessment</i> . Unpublished report for Ray Village Aged Services |
|-----------------|---|--|

† This should include references to both the level of survey and the type of biodiversity being surveyed. For example, 'Detailed flora and vegetation Survey', 'Targeted threatened species survey', 'Pilot subterranean fauna survey', etc.

## 2. Data quality certification

|  |   |
|--|---|
|  | <p>I certify that the electronic data files:</p> <ul style="list-style-type: none"> <li>• contain the complete set of data arising from the surveys described in the report, per the requirements of the Instructions – Index of Biodiversity Surveys for Assessments (IBSA) data packages document;</li> <li>• are technically and scientifically accurate, at the time of this submission and for the purpose of the environmental assessment for which they were created; and</li> <li>• are consistent with the results presented in the report.</li> </ul> |
|--|---|

## 3. Licence to publish the IBSA data package on the IBSA website

|                                     |  |
|-------------------------------------|--|
| <input checked="" type="checkbox"/> | I grant the State of Western Australia an irrevocable, royalty-free, non-transferable, nonexclusive licence to communicate this IBSA data package to the public via the IBSA website, for the non-commercial purposes of the State. I warrant that I have the right and authority to grant this licence and confirm that I have obtained all necessary licences and consents from all owners of intellectual property rights in the IBSA data package. |
| <input type="checkbox"/>            | I do not grant the State of Western Australia any licence to communicate the report or electronic data files to the public. I understand that this Metadata and licensing statement will be made available on the IBSA website.  |

## 4. Licence to third parties to re-use the information in the IBSA data package

|                                     |  |
|-------------------------------------|--|
|                                     | <p>I grant third parties the ability to re-use the information in this IBSA data package under a CC Licence.</p> <p>A summary of the CC Licence is provided below, for reference. This must be read in conjunction with the full licence text, available at <a href="http://creativecommons.org/licenses/by/3.0/au/legalcode">creativecommons.org/licenses/by/3.0/au/legalcode</a>. This summary is not a substitute for the full licence text and should not be relied upon.</p> <p>The third party is free to:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> <b>Share</b> – Copy and redistribute the material in any medium or format.</li> <li><b>Adapt</b> – Remix, transform and build upon the material for any purpose, even commercially.</li> </ul> <p>Under these terms:</p> <ul style="list-style-type: none"> <li><b>Attribution</b> – The third party must give appropriate credit, provide a link to the licence, and indicate if changes were made. The third party may do so in any reasonable manner, but not in any way that suggests that you endorse the third party or the third party's use of the material.</li> <li><b>No additional restrictions</b> – The third party may not apply legal terms or technological measures that legally restrict others from doing anything the CC Licence permits.</li> </ul> |
| <input checked="" type="checkbox"/> | I do not grant third parties any licence to re-use this information.   |

## 5. Execution

I warrant that the information provided in this Metadata and licensing statement is true and correct and that I am authorised to execute this document on behalf of the company named below.

|                 |                         |                  |                 |
|-----------------|-------------------------|------------------|-----------------|
| <b>Name</b>     | BERNADETTE VANDER WIELE | <b>Signature</b> | Bm Vander Wiele |
| <b>Position</b> | DIRECTOR                | <b>Date</b>      | 30 MAY 2019     |
| <b>Company</b>  | ENDPLAN ENVIRONMENTAL   |                  |                 |

## Office use only

|                                  |  |                            |  |
|----------------------------------|--|----------------------------|--|
| <b>Data package receipt date</b> |  | <b>Website upload date</b> |  |
| <b>Receiving agency</b>          |  |                            |  |
| <b>Assessment type</b>           |  |                            |  |

### Explanatory notes

A Metadata and licensing statement must be completed for each IBSA data package. The statement should be completed electronically and included in the IBSA data package in PDF format.

The Metadata and licensing statement must be completed by the owner of the intellectual property rights (IP owner) in the report and electronic data files, or by a person who has obtained all necessary licences and consents from the IP owner. The IP owner will usually be the person or group named as the 'Author' in Section 1.

In practice, the person or group that conducts the field surveys, authors the report and prepares the electronic data files typically would be an environmental consultant; by doing this work the consultant would be the IP owner, and would therefore be responsible for preparing the IBSA data package and completing the Metadata and licensing statement.

In some cases however, the proponent or another party may be the IP owner. It is the responsibility of proponents, consultants and any other parties to determine who is the IP owner, and to ensure that the correct person or group completes the Metadata and licensing statement.

For more information on intellectual property rights, refer to the [Instructions – Index of Biodiversity Surveys for Assessments \(IBSA\) data packages](#) document on the Environmental Protection Authority website.

### Section 1: Report metadata

All fields in this section must be completed.

The purpose of this section is to capture basic information about the surveys and the report, to aid indexing of the IBSA data package on the IBSA website. This information also assists IBSA website users in identifying multiple IBSA data packages related to the same assessment.

### Section 2: Data quality certification

The certification in this section must be given.

The purpose of this section is to ensure that IBSA data packages meet basic expectations for quality control. This responsibility lies with the author of the report and the electronic data files; the



State of Western Australia is unable to take any further steps for quality control of IBSA data packages.

### **Section 3: Licence to publish the IBSA data package on the IBSA website**

One of the two options in this section must be selected.

The purpose of granting a licence in this section is to allow the State of Western Australia to make the IBSA data package publicly available via the IBSA website. In accordance with its [Whole of Government Open Data Policy](#), the State believes that making such data easier to find and use will unlock opportunities for the public sector, businesses and communities to utilise data in more effective and diverse ways. The granting of this licence is therefore strongly encouraged.

If the licence is not granted, only the Metadata and licensing statement will be made publicly available via the IBSA website. The remainder of the IBSA data package will be archived offline.

### **Section 4: Licence to third parties to re-use the information in the IBSA data package**

This section must be completed if a licence to publish the IBSA data package on the IBSA website was granted in Section 3, in which case one of the two options must be selected. If the licence in Section 3 was not granted, this section must **not** be completed.

The purpose of granting a licence in this section is to allow others to re-use the report and electronic data files in IBSA data packages for research, environmental impact assessment, decision-making and other purposes. The CC licence is widely used for disseminating creative works, and in particular is a common choice for 'open access' scientific publications. Granting this licence will allow a IBSA data package to deliver the greatest possible value to all stakeholders, and is strongly encouraged.

If the CC licence is not granted (but the licence in Section 3 is), third parties may still view and refer to the IBSA data package via the IBSA website, but will not have any right to share, adapt or build on the information, for any purpose, without first obtaining the copyright holder's consent.

### **Section 5: Execution**

All fields in this section must be completed.

#### **Definitions**

'CC licence' means the Creative Commons Attribution CC BY 3.0 licence between the person executing the Metadata and licensing statement and any third party, which is activated on the third party's use of the information contained in the IBSA data package. A copy can be viewed at: [creativecommons.org/licenses/by/3.0/au/legalcode](https://creativecommons.org/licenses/by/3.0/au/legalcode).

'Electronic data files' means all electronic data files submitted to the State of Western Australia, as listed in Section 1 and as accompanying the report and this Metadata and licensing statement.

'IBSA data package' means this Metadata and licensing statement, the report and the accompanying electronic data files.

'IBSA website' means the website maintained by the State of Western Australia for the purpose of hosting IBSA data packages. The website is currently titled Index of Biodiversity Surveys for Assessments (IBSA) and may be found at [biocollect.ala.org.au/ibsa](http://biocollect.ala.org.au/ibsa), but the name and location are subject to change without notice.

'Report' means the report identified in Section 1 under the heading 'Title', and includes any attachments or appendices to the report.

'State of Western Australia' includes the Western Australian Department of Water and Environmental Regulation, the Western Australian Environmental Protection Authority and the Western Australian Department of Mines, Industry Regulation and Safety.