

A Level 1 Flora Survey of Lot 1 Southeast Highway Boyanup

Prepared for
SJ Roadworks
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Summary

A Level 1 flora survey, targeting rare flora, was carried out over 26 ha of Lot 1, SW Highway, Boyanup. The client is proposing to develop a sand pit over about 13 ha of the site and is in the early stages of seeking an extractive industry license and DEC Clearing permit. As well as the rare flora survey, numbers of trees and shrubs within two 100 m² quadrats were counted as part of developing a rehabilitation plan for the proposed sandpit.

One hundred and eight species of flora were found in the Survey Area, this includes 15 introduced species. One Priority 4 species, *Acacia semitrullata*, was found in the eastern part of the road reserve and along the eastern boundary of Lot 1. All of the *A. semitrullata* plants were situated outside of the proposed sandpit area. No other rare flora or conservation significant flora were found within the Survey Area.

Eleven shrubs and two trees were found within the two 100 m² quadrats, with one tree (*Banksia attenuata*) and six shrubs occurring in both quadrats. For those species that occurred in both quadrats variation in numbers between the quadrats was generally high.

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1. Background

A vegetation survey, particularly with regard to rare flora was required of approx 26 ha of bushland (the “Survey Area”), forming Lot 1, SW Highway, Boyanup (Figure 1). The Survey Area lies 15.6 km south east of the port city of Bunbury. Much of the site has been disturbed by previous sand extraction activities as well as by tracks and the construction of buildings.

The client (SJ Roadworks) is proposing to develop a sand pit over about 13 ha of the site and is in the early stages of seeking an extractive industry license and DEC Clearing permit. In addition, floristic quadrats placed during a previous vegetation and dieback disease survey of the land (Smith, 2012) were to be re-visited and used to obtain an estimate of density of trees and shrubs to be used in developing a rehabilitation plan for the proposed sandpit.

2. Scope and Objectives

Carry out a spring survey flora and vegetation assessment that,

- Determines whether any Declared Rare Flora or Priority Flora occurs on Lot 1, South West Highway, Boyanup
- Determines the plant density of native species occurring within the two 100 m² quadrats previously installed on Lot 1.

3. Regional Setting, Landforms and Soils

The Survey Area lies on the Swan Coastal Plain approximately 16 km south east of the regional city of Bunbury. Elevation rises from about 28 m AHD at the northern and southern boundaries to 43 m AHD at the top of the low hill in the middle of the Study Area. The soils of most of the Survey Area belong to the Bassendean Dune System; B1a phase (Tille, 1996), which are described as;

“Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands sometimes with a pale yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2 m; *Banksia* dominant.”

Small areas of Bassendean Dune System, B3 phase and Pinjarra Plain, P1a phase soils occur in the south part of the Survey Area, within and adjacent to the wetland.

4. Vegetation

The Survey Area falls within the area mapped as Bassendean System by Beard (1980). The previous survey (Smith, 2012) identified four vegetation communities, these being:

- *Banksia* Woodland (SWAFCT¹ 21b)
- *Kunzea* Tall Shrubland (Modified SWAFCT 21b)
- Flooded Gum-Marri-Peppermint-Paperbark Woodland or Open Forest (SWAFCT15)
- *Melaleuca* Wet Shrubland (Possibly SWAFCT 09, which is classified as a Threatened Ecological Community with the status of “Vulnerable”). (see Appendix B).

Banksia Woodland and *Kunzea* Tall Shrubland (which is a degraded version of the preceding) occur over most of the Survey Area. The other two communities are associated with the wetland in the southern part of the Survey Area. This wetland is classified as “Resource Enhancement” – these wetlands “have been partially modified but still support substantial wetland attributes and functions” (Waters and Rivers Commission, 2001).

5. Threatened and Priority Flora

Species of flora and fauna are defined as Declared Rare or Priority conservation status where their populations are restricted geographically or threatened by local processes. The Department of Environment and Conservation (DEC) recognises these threats of extinction and consequently applies regulations towards population and species protection.

Rare Flora species are gazetted under Subsection 2 of Section 23F of the Wildlife Conservation Act 1950 and therefore it is an offence to “take” or damage rare flora without Ministerial approval. Section 23F of the Wildlife Conservation Act 1950-1980 defines “to take” as “... to gather, pick, cut, pull up, destroy, dig up, remove or injure the flora or to cause or permit the same to be done by any means.”

Priority Flora are under consideration for declaration as ‘rare flora’, but are in need of further survey (Priority One to Three) or require monitoring every 5-10 years (Priority Four). Table 1 presents the categories of Declared Rare and Priority Flora as defined by the Wildlife Conservation Act 1950 (Department of Environment and Conservation 2012a, 2012b).

Threats of extinction of species are also recognised at a Federal Government level and are categorized according to the Environment Protection and Biodiversity Conservation Act (EPBC Act), 1999 (Department of Sustainability, Environment, Water, Population and Communities, 2012).

A search was made of Naturemap (DEC, 2012c) for Declared Rare Flora and Priority Flora occurring within 5 km of the Survey Area. The sixteen taxa of DRF and PF occurring within this area are shown in Table 2. All of them would have been flowering, or at least visible at the time of survey.

¹ SWAFCT; “Swan Coastal Plain Floristic Community Type” (Gibson *et al.*, 1994)

| Conservation Code | Category |
|-------------------|---|
| R | "Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection and have been gazetted as such." |
| P1 | "Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey." |
| P2 | Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey." |
| P3 | "Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (ie. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora', but are in need of further survey." |
| P4 | "Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years." |

Table 1. Categories of Declared Rare and Priority Flora as defined by the Wildlife Conservation Act 1950

6. Methods

6.1. *Rare flora survey*

The Survey Area was searched on 15th October 2012 by walking transects at 20 to 40 m intervals. The road reserve along the northern boundary of the Survey Area was also searched because it was in good-very good condition, particularly at the eastern end and may have contained rare flora. A comprehensive list of vascular flora, including introduced species, was compiled during the search. Taxonomy was checked using DEC (2012d, and 2012e).

6.2. *Species density in quadrats*

Numbers of shrubs and trees within the two 100m² quadrats previously installed within the Survey Area were counted. No attempt was made to count annual species, or species where it was difficult to distinguish individual plants.

| Taxon | Description |
|--|--|
| <i>Drakaea elastica</i> (DRF) | Tuberous, perennial, herb, 0.12-0.3 m high. Fl. red, green, yellow, Oct-Nov. White or grey sand. Low-lying situations adjoining winter-wet swamps. |
| <i>Drakaea micrantha</i> (DRF) | Tuberous, perennial, herb, 0.15–0.3 m high. Fl. red, yellow, Sep–Oct. White-grey sand. |
| <i>Eleocharis keigheryi</i> (DRF) | Rhizomatous, clumped perennial, grass-like or herb (sedge), to 0.4 m high. Fl. green, Aug–Nov. Clay, sandy loam. Emergent in freshwater: creeks, claypans |
| <i>Boronia humifusa</i> (P1) | Low-growing, wiry perennial, herb, 0.1–0.2 m high. Fl. pink, red, Jun/Sep. Gravelly clay loam over laterite. Jarrah-marri open forest. |
| <i>Synaphea odocoileops</i> (P1) | Tufted, compact shrub, 0.2–0.5 m high. Fl. yellow, Aug–Oct. Brown-orange loam & sandy clay, granite. Swamps, winter-wet areas. |
| <i>Leptomeria furtiva</i> (P2) | Lax, sprawling shrub, 0.2–0.45 m high. Fl. orange, brown, Aug–Oct. Grey or black peaty sand. Winter-wet flats. |
| <i>Leucopogon</i> sp. Busselton (D. Cooper 243) (P2) | Low sprawling shrub 40 cm high x 70 cm wide, Sep-Oct. Wet flats, grey sand. |
| <i>Boronia tetragona</i> (P3) | Perennial, herb, 0.3–0.7 m high, leaves sessile, entire, with papillate margins, branches quadrangular, sepals ciliate. Fl. pink, red, Oct–Dec. Black/white sand, laterite, brown sandy loam. Winter-wet flats, swamps, open woodland. |
| <i>Mitreola minima</i> (P3) | Slender, erect annual, herb, 0.025–0.04 m high. Fl. white, Oct–Dec. Grey sand. Peaty swampy areas. |
| <i>Thelymitra variegata</i> (P3) | Tuberous, perennial, herb, 0.1–0.35 m high. Fl. orange, red, purple, pink, Jun–Sep. Sandy clay, sand, laterite. |
| <i>Acacia flagelliformis</i> (P4) | Rush-like, erect or sprawling shrub, 0.3-0.75(-1.6) m high. Fl. yellow, May-Sep. Sandy soils. Winter-wet areas. |
| <i>Acacia semitrullata</i> (P4) | Slender, erect, pungent shrub, (0.1-)0.2-0.7(-1.5) m high. Fl. cream, white, May-Oct. White/grey sand, sometimes over laterite, clay. Sandplains, swampy areas. |
| <i>Aponogeton hexatepalus</i> (P4) | Rhizomatous or cormous, aquatic perennial, herb, leaves floating. Fl. green, white, Jul–Oct. Mud. Freshwater: ponds, rivers, claypans. |
| <i>Franklandia triaristata</i> (P4) | Erect, lignotuberous shrub, 0.2-1 m high. Fl. white, cream, yellow, brown, purple, Aug-Oct. White or grey sand. |
| <i>Ornduffia submersa</i> (P4) | Tuberous emergent aquatic perennial dwarf shrub, height to 35 cm; flowers white; leaves floating on surface of water. Fl. Sept-Oct. |
| <i>Pultenaea skinneri</i> (P4) | Slender shrub, 1-2 m high. Fl. yellow, orange, red, Jul-Sep. Sandy or clayey soils. Winter-wet depressions. |

Table 2. Declared Rare Flora and Priority Flora occurring within 5 km of the Survey Area

7. Results and Discussion

7.1. Flora, including rare flora

One hundred and eight species of flora were found in the Survey Area, this includes 15 introduced species (Appendix A). One Priority 4 species, *Acacia semitrullata*, was found in the eastern part of the road reserve and along the eastern boundary of Lot 1. All of the *A. semitrullata* plants were situated outside of the proposed sandpit area (Figure 2). No other rare flora or conservation significant flora were found within the Survey Area.

7.2. Plant density

Eleven shrubs and two trees were found within the two 100 m² quadrats, with one tree (*Banksia attenuata*) and six shrubs occurring in both quadrats (Table 3). For those species that occurred in both quadrats variation in numbers between the quadrats was generally high. The density of *B. attenuata* per hectare based on these figures is in the range of 200 - 1,200/ha. Research in *Banksia* woodland in the Perth area found an average of 334/ha of this species (Valentine *et al.*, 2011). It appears that the time since the last fire within the part of the Survey Area that the quadrats were situated in explains the low numbers of the short-lived, post-fire germinating, *Acacia pulchella* present.

| Species | Life Form | Number Q1 | Number Q2 |
|------------------------------|------------|-----------|-----------|
| <i>Acacia pulchella</i> | shrub | | 2 |
| <i>Adenanthos meisneri</i> | shrub | 1 | |
| <i>Banksia attenuata</i> | small tree | 2 | 12 |
| <i>Calytrix fraseri</i> | shrub | 3 | 5 |
| <i>Eucalyptus marginata</i> | large tree | 4 | |
| <i>Hibbertia racemosa</i> | shrub | | 3 |
| <i>Hibbertia vaginata</i> | shrub | 1 | 2 |
| <i>Hypocalymma robustum</i> | shrub | 7 | 1 |
| <i>Kunzea glabrescens</i> | shrub | 7 | 4 |
| <i>Macrozamia riedlei</i> | shrub | | 1 |
| <i>Melaleuca thymoides</i> | shrub | 13 | 2 |
| <i>Stirlingia latifolia</i> | shrub | 15 | 38 |
| <i>Xanthorrhoea gracilis</i> | shrub | 3 | |

Table 3. Number of trees and shrubs within the two 100 m² quadrats in the Survey Area.

References

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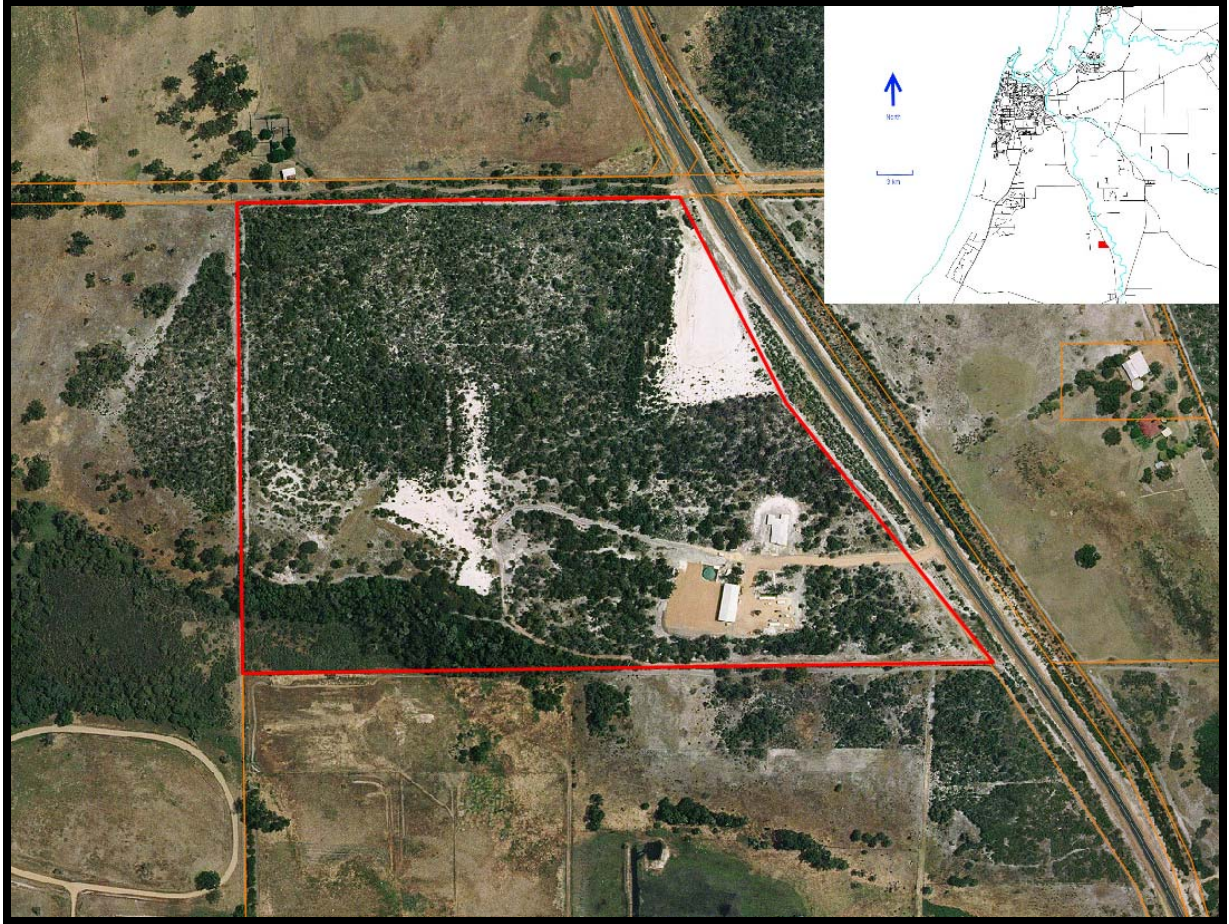


Figure 1. The Survey Area, Lot 1, South West Highway, Boyanup.



Figure 2. Location of *Acacia semitrullata* (Priority 4) shown by red crosses in relation to the proposed sandpit boundary (dashed line).

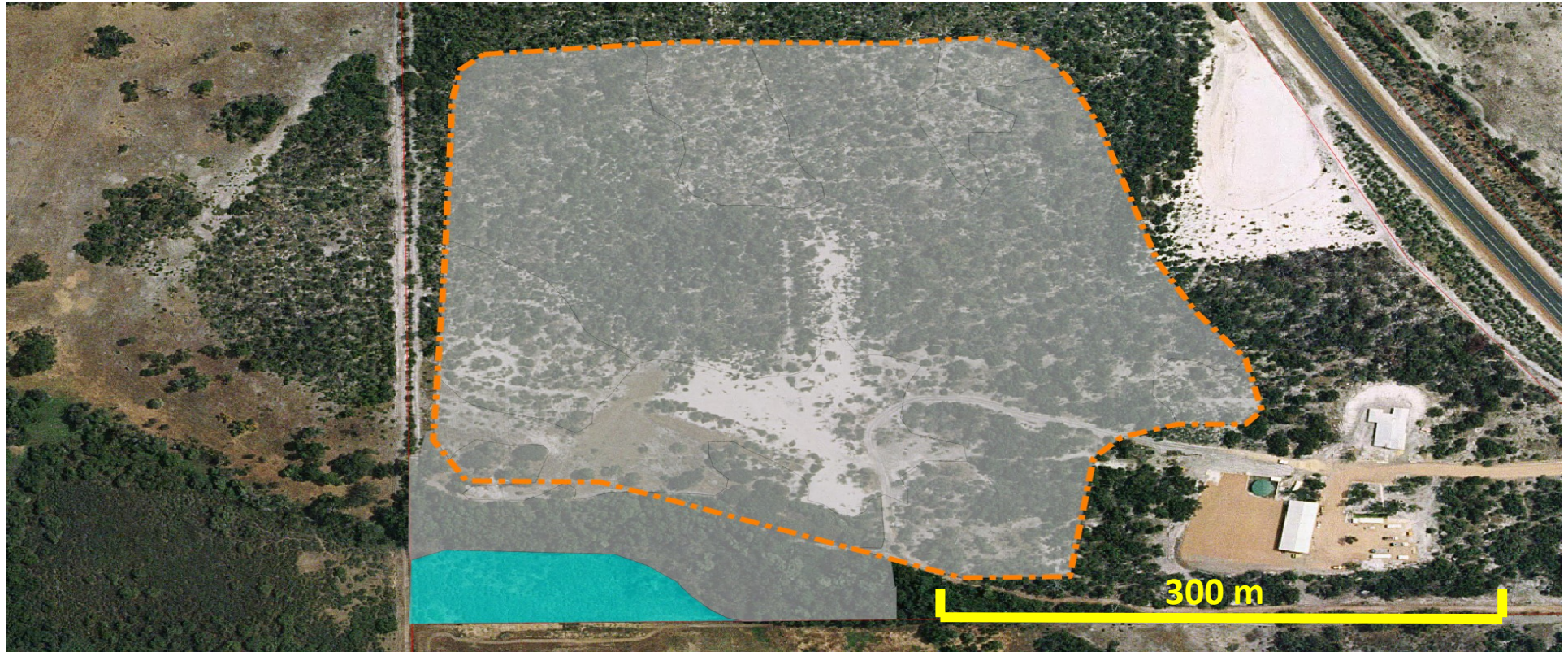
**Appendix A: List of vascular flora found within the Survey Area on Lot
1 South West Highway Boyanup.**

| FAMILY | SPECIES | INTRODUCED | ROAD RESERVE | CONSV. CODE |
|-------------------|---|------------|--------------|-------------|
| Anarthriaceae | <i>Lyginia imberbis</i> | | | |
| Apiaceae | <i>Platysace filiformis</i> | | | |
| Apiaceae | <i>Xanthosia huegelii</i> | | | |
| Araliaceae | <i>Trachymene pilosa</i> | | | |
| Asparagaceae | <i>Chamaescilla corymbosa</i> | | | |
| | <i>Lomandra purpurea</i> | | | |
| | <i>Thysanotus patersonii</i> | | | |
| | <i>Thysanotus tenellus</i> | | | |
| Asteraceae | <i>Arctotheca calendula</i> | x | | |
| | <i>Asteridea pulverulenta</i> | | x | |
| | <i>Cotula turbinata</i> | x | | |
| | <i>Dittrichia graveolens</i> | x | | |
| | <i>Hypochaeris glabra</i> | x | | |
| | <i>Rhodanthe citrina</i> | | | |
| | <i>Sonchus oleraceus</i> | x | x | |
| | <i>Ursinia anthemoides</i> | x | | |
| Campanulaceae | <i>Wahlenbergia capensis</i> | x | | |
| Casuarinaceae | <i>Allocasuarina humilis</i> | | | |
| Celastraceae | <i>Stackhousia monogyna</i> | | | |
| Colchicaceae | <i>Burchardia congesta</i> | | | |
| Cyperaceae | <i>Lepidosperma leptostachyum</i> | | | |
| | <i>Lepidosperma longitudinale</i> | | | |
| | <i>Schoenus curvifolius</i> | | | |
| | <i>Tetraria octandra</i> | | | |
| Dasypogonaceae | <i>Dasypogon bromeliifolius</i> | | | |
| Dennstaedtiaceae | <i>Pteridium esculentum</i> | | | |
| Dilleniaceae | <i>Hibbertia racemosa</i> | | | |
| | <i>Hibbertia vaginata</i> | | | |
| Elaeocarpaceae | <i>Platytheca galioides</i> | | | |
| Ericaceae | <i>Conostephium pendulum</i> | | | |
| | <i>Leucopogon conostephioides</i> | | | |
| | <i>Leucopogon propinquus</i> | | | |
| Fabaceae | <i>Acacia extensa</i> | | | |
| | <i>Acacia huegelii</i> | | | |
| | <i>Acacia pulchella</i> | | | |
| | <i>Acacia semitrullata</i> | | | 4 |
| | <i>Bossiaea eriocarpa</i> | | | |
| | <i>Bossiaea</i> sp. Waroona (B.J. Keighery & N. Gibson 229) | | | |
| | <i>Callistachys lanceolata</i> | | | |
| | <i>Chorizema glycinifolium</i> | | | |
| | <i>Gompholobium tomentosum</i> | | | |
| | <i>Hardenbergia comptoniana</i> | | | |
| | <i>Hovea trisperma</i> | | | |
| | <i>Jacksonia furcellata</i> | | | |
| | <i>Trifolium glomeratum</i> | x | | |
| Goodeniaceae | <i>Dampiera linearis</i> | | | |
| Haemodoraceae | <i>Anigozanthos manglesii</i> | | | |
| | <i>Conostylis aculeata</i> | | | |
| | <i>Phlebocarya ciliata</i> | | | |
| Hemerocallidaceae | <i>Caesia occidentalis</i> | | | |
| | <i>Tricoryne elatior</i> | | | |

| FAMILY | SPECIES | INTRODUCED | ROAD RESERVE | CONSV. CODE |
|---------------|--|------------|--------------|-------------|
| Iridaceae | <i>Patersonia occidentalis</i> | | | |
| | <i>Patersonia umbrosa</i> var. <i>xanthina</i> | | | |
| Juncaceae | <i>Juncus microcephalus</i> | x | | |
| Lamiaceae | <i>Hemiandra pungens</i> | | | |
| Loranthaceae | <i>Nuytsia floribunda</i> | | | |
| Myrtaceae | <i>Agonis flexuosa</i> | | | |
| | <i>Astartea scoparia</i> | | | |
| | <i>Babingtonia camphorosmae</i> | | | |
| | <i>Calytrix fraseri</i> | | | |
| | <i>Corymbia calophylla</i> | | | |
| | <i>Eremaea pauciflora</i> | | | |
| | <i>Eucalyptus marginata</i> | | | |
| | <i>Eucalyptus rudis</i> | | | |
| | <i>Hypocalymma angustifolium</i> | | x | |
| | <i>Hypocalymma robustum</i> | | | |
| | <i>Kunzea glabrescens</i> | | | |
| | <i>Melaleuca lateritia</i> | | | |
| | <i>Melaleuca preissiana</i> | | | |
| | <i>Melaleuca thymoides</i> | | | |
| | <i>Melaleuca viminea</i> | | | |
| | <i>Taxandria linearifolia</i> | | | |
| Orchidaceae | <i>Caladenia flava</i> | | | |
| | <i>Caladenia longicauda</i> | | | |
| | <i>Elythranthera brunonis</i> | | | |
| | <i>Pyrorchis nigricans</i> | | | |
| | <i>Thelymitra cornicina</i> | | | |
| | <i>Thelymitra crinita</i> | | | |
| Orobanchaceae | <i>Orobanche minor</i> | x | | |
| Papaveraceae | <i>Fumaria capreolata</i> | x | | |
| Poaceae | <i>Amphipogon turbinatus</i> | | | |
| | <i>Austrodanthonia setacea</i> | | | |
| | <i>Austrostipa campylachne</i> | | | |
| | <i>Austrostipa compressa</i> | | | |
| | <i>Briza maxima</i> | x | | |
| | <i>Briza minor</i> | x | | |
| | <i>Ehrharta calycina</i> | x | | |
| | <i>Lolium rigidum</i> | x | | |
| Podocarpaceae | <i>Podocarpus drouynianus</i> | | x | |
| Proteaceae | <i>Adenanthos meisneri</i> | | | |
| | <i>Banksia attenuata</i> | | | |
| | <i>Banksia ilicifolia</i> | | | |
| | <i>Hakea varia</i> | | | |
| | <i>Persoonia longifolia</i> | | | |
| | <i>Petrophile linearis</i> | | | |
| | <i>Stirlingia latifolia</i> | | | |
| Restionaceae | <i>Hypolaena exsulca</i> | | | |
| | <i>Hypolaena pubescens</i> | | | |
| | <i>Meeboldina roycei</i> | | | |
| Rutaceae | <i>Philotheca spicata</i> | | | |
| Stylidiaceae | <i>Stylidium ciliatum</i> | | | |
| | <i>Stylidium dichotomum</i> | | | |
| | <i>Stylidium diversifolium</i> | | | |
| | <i>Stylidium schoenoides</i> | | | |

| FAMILY | SPECIES | INTRODUCED | ROAD RESERVE | CONSV. CODE |
|------------------|------------------------------|------------|--------------|-------------|
| Xanthorrhoeaceae | <i>Xanthorrhoea brunonis</i> | | | |
| | <i>Xanthorrhoea gracilis</i> | | | |
| Zamiaceae | <i>Macrozamia riedlei</i> | | | |

Appendix B. Location of the *Melaleuca* Wet Shrubland in Relation to the Survey Area



Location of the *Melaleuca* Wet Shrubland (blue polygon) in relation to the Survey Area (dashed line)