FLORA AND VEGETATION SURVEY OF THE MANGLES BAY AREA

CAPE PERON, ROCKINGHAM

Prepared for

STRATEGEN CONSULTING

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TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

STATEMENT OF LIMITATIONS

Scope of Services

This environmental site assessment report ('the report') has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and ENV.Australia Pty Ltd (ENV) ('scope of services'). In some circumstances the scope of services may have been limited by factors such as time, budget, access and/or site disturbance constraints.

Reliance on Data

In preparing the report, ENV has relied on data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations, most of which are referred to in the report ('the data'). Except as otherwise stated in the report, ENV has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ("conclusions") are based in whole or in part on the data, those conclusions are contingent upon the accuracy and completeness of the data. ENV will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, unavailable, misrepresented or otherwise not fully disclosed to ENV.

Environmental Conclusions

In accordance with the scope of services, ENV has relied on the data and has conducted environmental field monitoring and/or testing in the preparation of the report. The nature and extent of monitoring and/or testing conducted is described in the report.

Within the limitations imposed by the scope of services, the monitoring, testing, sampling and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care ordinarily exercised by reputable environmental consultants under similar circumstances. No other warranty, express or implied, is made.

Report for Benefit of Client

The report has been prepared for the benefit of the Client and for no other party. ENV assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including, without limitation, matters arising from any negligent act or omission of ENV or for any loss or damage suffered by any other party relying on the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions, and should make their own enquiries and obtain independent advice in relation to such matters.

Other Limitations

ENV will not be liable to update or revise the report to take into account any events or circumstances occurring or facts becoming apparent after the date of the report.

The scope of services did not include any assessment of the title to or ownership of the properties, buildings and structures referred to in the report, nor the application or interpretation of laws in the jurisdiction in which those properties, buildings and structures are located.

EXECUTIVE SUMMARY

ENV.Australia Pty Ltd (ENV) was commissioned by Strategen in October 2009 to undertake a targeted declared rare flora, priority flora and floristic community type assessment for the Mangles Bay Area in Cape Peron, Rockingham (the project area). The assessment has been undertaken as part of the concept planning process for the development of a marina-based tourism precinct.

This targeted spring survey, recommended by Bennett (2005), was undertaken to supplement and complete the botanical data for the survey area. In particular the objectives of the assessment were to: re-assess Floristic Community Types; determine the presence of Threatened Ecological Communities; and re-survey for Declared Rare and Priority Flora species.

A database search of the area resulted in four Declared Rare, 15 Priority Flora species and four Threatened Ecological Communities being identified as potentially occurring in the area.

During the survey, a total of 75 taxa, from 37 families and 65 genera were recorded within the survey area (41 native flora taxa and 34 introduced taxa).

No Endangered species pursuant to the *Environment Protection and Biodiversity Conservation Act 1999*, Declared Rare Flora pursuant to the *Wildlife Conservation Act 1950* or Priority Flora species listed by the Department of Environment and Conservation were located.

One Declared Plant (i.e. weed) species was found in the study area:

- **Asparagus asparagoides* (Bridal Creeper), this species is listed as Priority 1 for the whole State.

The site is mapped as containing the Quindalup Vegetation Complex: Coastal dune complex consisting mainly of two alliances – the standard fore-dune alliance and the mobile and stable dune alliance. Local variations include the low closed forest of *Melaleuca lanceolata – Callitris preissii* and the closed scrub of *Acacia rostellifera.* This complex exceeds the 10% retention status recommended for Western Australia by the Environmental Protection Authority's *Position Statement No. 2* and is therefore considered to be adequately represented.

The following Floristic Community Types have been identified as occurring on site:

- **SCP16**: Highly saline seasonal wetlands
- **SCP29a:** Coastal shrublands on shallow sands
- **SCP29b:** *Acacia* shrublands on taller dunes
- **S13:** Northern *Olearia axillaris – Scaevola crassifolia* shrublands

- **S14:** *Spinifex longifolius* grasslands and low shrublands
- **SCP30a:** *Callitris preissii* (or *Melaleuca lanceolata*) forest and woodlands
- **SCP30b:** Quindalup *Eucalyptus gomphocephala* and/or *Agonis flexuosa* woodlands
- **S15:** Weed Group

One Threatened Ecological Community, Floristic Community Type SCP30a *Callitris preissii* (or *Melaleuca lanceolata*) forest and woodlands was identified as occurring in three locations within the project area. This Floristic Community Type is listed as Vulnerable by the State but is not listed by the Commonwealth.

The Floristic Community Type 30a is located on the boundary of the school is not a good representation of the Floristic Community Type and is not likely to be a viable site to preserve due to its perimeter to area ratio, surrounding degrading influences and the lack of understorey species.

The Threatened Ecological Community site surrounding the small grassed area on the corner of Memorial Drive and Safety Bay Road has been subject to various degrading influences such as weeds and human activity, however the site is surrounded by native vegetation and therefore has the potential to be remediated to improve its condition. There are many informal tracks that dissect the area and rubbish has been dumped adjacent to the site so these degrading influences will need to be resolved if the vegetation community is to be conserved.

The third Threatened Ecological Community site located at the base of the most western car park has a walking track that runs adjacent to the site and, although it experiences degradation from people deviating off the path, is still in relatively good condition. The spread of weeds needs to be resolved to protect the vegetation community.

Two of the Floristic Community Types are listed as Priority 3 Priority Ecological Communities by the Department of Environment and Conservation; Floristic Community Type SCP30b Quindalup *Eucalyptus gomphocephala* and/or *Agonis flexuosa* woodlands and Floristic Community Type SCP29b *Acacia* shrublands on taller dunes. Priority Ecological Communities are not protected under legislation however they should be treated as significant and taken into consideration during the planning phase.

1 INTRODUCTION

ENV.Australia Pty Ltd (ENV) was commissioned by Strategen in October 2009 to undertake a targeted Declared Rare Flora, priority flora and floristic community type assessment for the Mangles Bay Area in Cape Peron, Rockingham (the project area). The assessment has been undertaken as part of the concept planning process for the LandCorp Cape Peron marina-based tourist precinct development (the Project).

Bennett Environmental Consulting Pty Ltd previously surveyed the project area in 2005, identifying Floristic Community Types and the potential presence of Threatened Ecological Communities. A flora and vegetation survey was also conducted by Keating and Trudgen in October 1986.

This targeted spring survey, recommended by Bennett (2005), was undertaken to supplement and complete the botanical data for the survey area. In particular the objectives of the assessment were to: re-assess Floristic Community Types; determine the presence of Threatened Ecological Communities; and re-survey for Declared Rare and Priority Flora species.

1.1 LOCATION

The survey area is located approximately 39 kilometres to the south-west of Perth's Central Business District in the Swan Coastal Plain region of Western Australia (Figure 1) and lies within the suburbs of Peron and Shoalwater on the shores of Mangles Bay, Rockingham. The survey area is bounded by Safety Bay Road and Boundary Road (Figure 2) and includes the Core Project Area for the Cape Peron marina-based tourist precinct development (impact area).

The site is located in the southwest province of Western Australia in the Darling Botanical District and within the Swan Coastal Plain Subregion in the Drummond Botanical Subdistrict (Beard 1990). The Drummond Botanical Subdistrict consists mainly of the following vegetation communities:

- *Banksia* Low Woodland on leached sands and *Melaleuca* Swamps in poorly drained areas;
- Woodland of Tuart (*Eucalyptus gomphocephala*); and
- Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*) woodlands on the less leached soils (Beard 1990).

1.2 CLIMATE

The climate of this region is warm Mediterranean, with an average maximum summer temperature of 28.3°C and an average minimum winter temperature of 10.9°C (Figure 3; Bureau of Meteorology [BoM] 2009). The region receives an average annual rainfall of 759.3mm, with the majority of precipitation occurring in winter (BoM 2009).

The Perth area received a slightly lower amount of rainfall than average in the three months preceding the survey (August to October), with the area having received 222 mm Figure 3). On average the area usually receives 235.3 mm of rainfall over this same period. For the two months of spring (September and October) preceding the survey the area received 97.2 mm, compared with 117.4 mm for the long term average for the same period (BoM 2009).

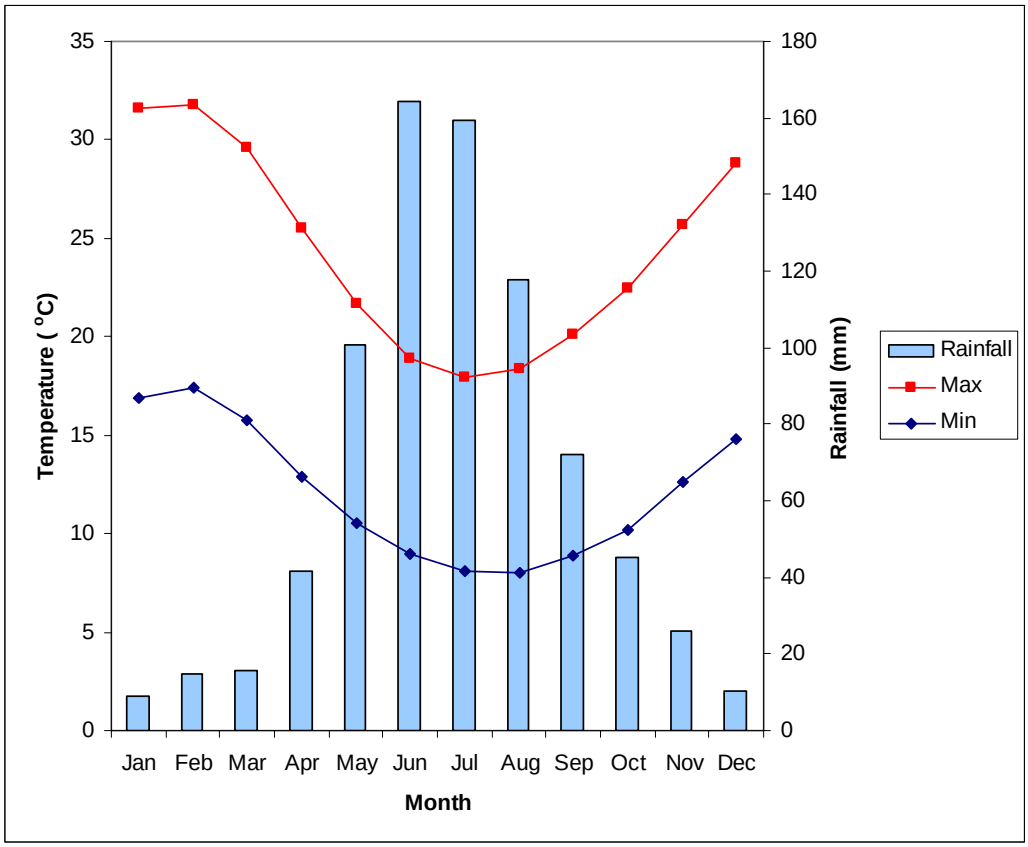

Figure 3: Average Monthly Rainfall and Maximum and Minimum Temperatures at Perth Airport from 1944-2009 (BoM 2009)

1.3 REGIONAL SOILS, LANDFORMS AND VEGETATION

For a development proposal to be assessed in terms of the flora and vegetation values that may be impacted upon, an understanding of the vegetation

communities at the site in question is required. In Western Australia, there are various floristic reports that detail a region's botanical values.

A widely-used vegetation classification system that maps and describes vegetation communities in south-west Western Australia is *Vegetation of the Darling System* in the *Atlas of Natural Resources, Darling System, Western Australia* (Department of Conservation and Environment 1980). This document describes vegetation communities as vegetation complexes, and maps the distribution of each complex.

Vegetation complexes are defined as a combination of distinct site vegetation types, usually associated with a particular geomorphic, climatic, floristic and vegetation structural association. Vegetation complexes are based on the pattern of vegetation at a regional scale, as it reflects the underlying key determining factors of landforms, climate and soils.

The soils and landform unit, as well as the vegetation complex Cape Peron supports, is described below:

1.3.1 Soils and Landforms

The site occurs on the Swan Coastal Plain portion of the Darling System (Churchward and McArthur 1978). The Swan Coastal Plain consists of aeolian and fluviatile deposits: specifically the site is on:

- Quindalup Unit: Dunes and beach ridges composed of calcareous sand.

1.3.2 Vegetation Complex Mapping

Heddle *et al.* (1978) mapped the area as containing one Swan Coastal Plain vegetation complex which is related to the underlying soil profile:

- Quindalup Complex: Coastal dune complex consisting mainly of two alliances – the standard fore-dune alliance and the mobile and stable dune alliance. Local variations include the low closed forest of *Melaleuca lanceolata – Callitris preissii* and the closed scrub of *Acacia rostellifera.*

The Environmental Protection Authority (EPA) recognises that native vegetation complexes which have less than 10% of pre-European clearing extent remaining in the Bush Forever study area may be considered regionally significant (EPA 2006). Proposals that would impact on a vegetation complex with 10% or less remaining are likely to be formally assessed by the EPA (EPA 2006).

Bush Forever gives an estimate of the percentage of each complex that remains within the Bush Forever study area compared to its pre-European settlement extent, so an estimate of the scarcity of each complex can be determined. On the

Swan Coastal Plain, within the Perth Metropolitan Region, 48% of the Quindalup Complex is estimated to remain, 20% of which is proposed for protection through Bush Forever (Government of Western Australia 2000a).

1.4 PROTECTION OF FLORA AND VEGETATION

Flora species are protected formally and informally at both the National and State level by various legislative and non-legislative measures, which are discussed below:

Legislative Protection

- *Environment Protection and Biodiversity Conservation Act 1999* (Cth): a Federal Act;
- *Wildlife Conservation Act 1950* (WA): a State Act; and
- *Environmental Protection Act 1986* (WA): a State Act.

Non-Legislative Protection

- Western Australian Department of Environment and Conservation (DEC) Priority lists for flora and vegetation; and
- informal recognition of locally significant populations

A short description of these measures is given below, and definitions of the species' conservation codes and ecological community categories they use, and those used by the DEC, are provided in Appendix A.

***Environment Protection and Biodiversity Conservation Act 1999* (Cth)**

The *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) aims to protect matters of national environmental significance, which are detailed in Appendix A.

Under the EPBC Act, the Commonwealth Department of Sustainability, Environment, Water, Populations and Communities (DSEWPaC) lists threatened species and Threatened Ecological Communities (TECs) in certain categories determined by criteria set out in the Act (*www.environment.gov.au/epbc/index.html*).

The Act provides for a national environmental assessment and approvals process for proposed actions likely to affect the prescribed matters of national environmental significance. If a proposed action is approved subject to certain conditions, the proponent of the action does not contravene the Act if the action is carried out in accordance with the conditions imposed.

Projects likely to cause impacts on matters of national environmental significance (as defined in the EPBC Act – see Appendix A) should be referred to DSEWPAC for assessment under the EPBC Act.

***Wildlife Conservation Act 1950* (WA)**

The Western Australian DEC recommends flora taxa for listing under the provisions of the *Wildlife Conservation Act 1950* (WC Act) as protected according to its need for protection (see Appendix A).

Flora species are given Declared Rare status when their populations are geographically restricted or are threatened by local processes. In addition, under the WC Act, by Notice in the Western Australian Government Gazette of 9 October 1987, all native flora (spermatophytes, pteridophytes, bryophytes and thallophytes) is protected throughout the State.

The Act makes it an offence to 'take' threatened species without an appropriate licence. There are financial penalties for contravening the Act.

***Environmental Protection Act 1986* (WA)**

Declared Rare Flora (DRF) and TECs are given special consideration in environmental impact assessment, and are Environmentally Sensitive Areas (ESAs) under the *Environmental Protection Act 1986* (EP Act) and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

The protection of DRF and TECs is a 'clearing principle' for assessing applications for permits to clear native vegetation, where exemptions for a clearing permit under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* do not apply. There are substantial penalties for unlawfully damaging ESAs.

DEC Priority Lists

The DEC lists 'Priority' flora species that have not been assigned statutory protection under the WC Act, but which are under consideration for declaration as 'Rare Flora' under the Act. Species assessed as Priorities 1-3 are in urgent need of further survey, whilst Priority 4 species require monitoring every 5-10 years (see Appendix A for definitions).

In addition, the DEC maintains a list of Priority Ecological Communities (PECs) which identifies those communities that need further investigation before possible nomination for TEC status. The DEC identifies and lists vegetation communities believed to be threatened. Once listed, a community is a PEC, but only when endorsed by the Minister for the Environment does it become a TEC, and

therefore becomes protected as an ESA under native vegetation clearing regulations (see Appendix A for definitions).

Informal Recognition of Flora and Vegetation

Certain populations or communities may be of local significance or interest because of their patterns of distribution and abundance. For example, flora may be locally significant because they are range extensions to the previously-known distribution or are newly-discovered taxa (and therefore have the potential to be of more than local significance). In addition, many species are in decline as a result of threatening processes (primarily land clearing), and relict populations of such species assume local importance.

Despite the lack of any formal protection for species in this category, project proponents are strongly advised to be aware of and to be sensitive to community concerns as to locally significant species or communities.

1.5 INTRODUCED SPECIES

The Environmental Weed Strategy for Western Australia (Department of Conservation and Land Management 1999) contains criteria for the assessment and ranking of weeds in terms of their environmental impact on biodiversity (Appendix B). The Strategy defines environmental weeds as 'plants that establish themselves in natural ecosystems and proceed to modify natural processes, usually adversely, resulting in the decline of the communities they invade.'

Plants may also be 'Declared' by the Agriculture Protection Board under the *Agriculture and Related Resources Protection Act 1979* (WA) (ARRP Act). Declared Plants are gazetted under five categories (P1-P5), which define the action required. Details of the definitions of these categories are provided in Appendix B. A declaration may apply to the whole State, to districts, individual properties or even to single paddocks. If a plant is Declared, landholders are obliged to control that plant on their properties (Department of Agriculture 2009).

1.6 BUSH FOREVER

Bush Forever is a State Government Policy and program which identifies 51,200 hectares of regionally significant bushland for protection, covering 26 vegetation complexes. This amounts to about 18% of the original vegetation on the Swan Coastal Plain portion of the Perth Metropolitan Region, and excludes local conservation reserves.

Regionally significant bushland has been identified on the basis of criteria relating to its conservation values. Important among these criteria is the achievement, where possible, of a comprehensive representation of all the ecological communities originally occurring in the region, principally through protecting a target of at least 10 per cent of each vegetation complex (Government of Western Australia, 2000a).

The Government of Western Australia has endorsed Bush Forever as the means of seeking the appropriate protection and management of areas of regionally significant bushland on the Swan Coastal Plain Portion of the Perth Metropolitan Region and a balance between environmental, social and economic objectives. As an endorsed government policy it is used as a basis for decision-making and an agreed framework for the protection and management of Bush Forever Sites through the implementation mechanisms identified in the plan (Government of Western Australia, 2000a).

The survey area is Bush Forever Site Number 355; the Point Peron and Adjacent Bushland, Peron/Shoalwater Bay.

2 METHODS

The aim of the assessment was to design and undertake the targeted spring vegetation and flora survey in the survey area to supplement previous biological survey work, in particular that undertaken by Bennett Environmental Consulting Pty Ltd (Bennett 2005).

All flora surveys undertaken by ENV are designed to be compliant with the Environmental Protection Authority (EPA) requirements for the environmental surveying and reporting of flora surveys in Western Australia, as set out in the following documents:

- *Terrestrial Biological Surveys as an Element of Biodiversity Protection. Position Statement No. 3* (EPA 2002); and
- *Guidance for the Assessment of Environmental Factors – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA 2004)

ENV then assesses and reports the results of its surveys with particular regard to the provisions of the EPBC Act, WC Act and EP Act.

The methodology for the work involved the following key steps:

PHASE 1 –SURVEY DESIGN

A vegetation and flora survey was completed within the survey area in August 2005 by Bennett Environmental Consulting Pty Ltd (Bennett). Prior to this a flora and vegetation survey was conducted by Keating and Trudgen in October 1986. Consequently a targeted spring survey was considered necessary to complete the botanical data for the survey area, with particular reference to determining the presence of Declared Rare and/or Priority Flora.

In addition, Bennett (2005) identified one potential Threatened Ecological Community (SCP30a *Callitris preissii* (or *Melaleuca lanceolata*) forest and woodlands) at three sites within the survey area. Re-assessment of the species composition and condition of these sites is necessary to determine whether they represent viable examples of the TEC. This re-assessment includes re-visiting quadrats and recording the necessary data to confirm the floristic community type and to discuss its status as a TEC.

PHASE 2 - DESKTOP SURVEY

The purpose of a desktop survey is to obtain information on flora and vegetation constraints that may be present at the site. The tasks involved undertaking a desktop investigation on regional vegetation complexes, soils and landforms and

Bush Forever reference sites, and the review of available reports addressing the site.

In addition, a Geographic Information Systems (GIS) database search was submitted to the DEC to ascertain the locations of any DRF or Priority Flora species that have been recorded within the survey site and its surrounding areas. The search was within a 15km radius using coordinates from 32^0 0' - 32^0 25' S 115^0 33' - 115^0 51' E (GDA94).

A similar process is also undertaken to establish the locations of any additional TECs or Priority Ecological Communities (PECs) known from the area. Generally the search coordinates allow for a buffer of 15 km around the site.

Surveys undertaken by Keating and Trudgen (1986) and Bennett (2005) were also reviewed for flora species, vegetation community and vegetation condition information.

PHASE 3 – FIELD SURVEY

The field survey was undertaken in spring, between the 27th and 29th October 2009. The field survey consisted of:

- Establishment of two permanent quadrats within each of the inferred FCTs as described by Bennett (2005), at the same quadrat locations previously assessed. Rescoring of quadrat species data on two or more occasions is recommended by the DEC for performance of statistical analysis. Two quadrats within a vegetation community are recommended to adequately describe each community.

- Production of an inventory (list) of plant taxa associated with the potential TEC SCP30a. Each FCT has a list of common and indicator species which are diagnostic of the FCT ;

- searching for and mapping the location of any DRF and Priority Flora species and any other flora of local or taxonomic significance along 100 m spaced grid transects throughout the study area and intensified in their known habitats;

- providing a description and map/s of vegetation condition over the study area (as per the Keighery (1994) condition rating scale); and

- identifying and mapping any TECs within the study area.

PHASE 4 – DATA ANALYSIS AND REPORTING

Where field identification of plant taxa was not possible, specimens were collected systematically for later identification at the Western Australian

Herbarium (WAH) by comparison with the reference collection and use of identification keys.

Once all species were identified, plant taxa found within the study area were compiled into an inventory listed chronologically by family number. This list is checked against Florabase and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listing of Threatened species to determine species' conservation status and to determine records of species that constitute range extensions.

Where a significant species is found, an additional database search is submitted to the DEC to obtain data on the species' range and population details to determine the significance of the species at the site in a regional context.

Following completion of reporting, significant species will be vouchered with the Western Australian Herbarium (WAH) in accordance with conditions of DEC flora licences.

The data from the quadrats is compared against Gibson *et al.*'s (1994) Swan Coastal Plain (SCP) Floristic Community Types (FCTs) database using multivariate statistical analysis. This comprises transformation and normalisation of data and computation of a similarity matrix based on Bray-Curtis similarity to indicate similarity of the quadrat data (and therefore the vegetation unit) to documented FCTs.

The results of the statistical analysis are then considered in light of other site characteristics such as soils, landform and the presence of dominant, common or indicator species to draw conclusions on the FCT present.

When a conclusion has been reached over the FCT present, where this FCT is a TEC or PEC, further discussion of the site's characteristics, in particular vegetation condition and structure, size and edge to perimeter ratio are considered to determine whether the vegetation represents a viable example of the TEC or PEC.

2.1 FLORA SURVEY VARIABLES

It is important to note the specific variables imposed on individual surveys. Variables are often difficult to predict, as is the extent to which they influence survey effort. Survey constraints of the project area flora and vegetation survey are detailed in Table 1.

Table 1: Limitations and Constraints Associated with the project area Flora and Vegetation Survey

Variable	Impact on Survey Outcomes
Access Problems	No access problems were encountered during the field survey.
Experience levels	The botanists who executed these surveys were practitioners suitably qualified in their respective fields. • Coordinating Botanist: Narelle Whittington (Senior Botanist); • Field Staff: Narelle Whittington (Senior Botanist), Natalie Pawley (Botanist) and Peter Jobson (Taxonomist/Senior Botanist); • Taxonomy: Narelle Whittington (Senior Botanist); • Data Interpretation: Narelle Whittington (Senior Botanist);
Timing[1], weather, season.	The survey was undertaken in Spring, between 27-29th October 2009. The area (Garden Island) had received 483.8 millimetres of rain in the year to date (January to October 2009; Bureau of Meteorology 2009). Flora composition changes over time, with flora species having specific growing periods, especially annuals and ephemerals (some plants lasting for a markedly brief time, some only a day or two). Therefore the results of future botanical surveys in this location may differ from the results of this survey.
Completeness	Species that were insufficiently mature or dead were identified in the field to genus or family level only (where possible). A comprehensive species list has not been prepared for areas that do not constitute a natural vegetation area, such as gardens or areas that have been totally cleared.
Determination	This survey makes inferences about vegetation types that have the potential to be TECs. However, a decision as to the presence or absence of TECs at the site remains the responsibility of the DEC's Species & Communities Branch. The taxonomy and conservation status of the Western Australian flora are dynamic. This report was prepared in reliance on taxonomy and conservation current at the time issuing, but it should be noted this may change.

[1] EPA Guidance Statement 51 (2004) stipulates that flora and vegetation surveys should be undertaken following the season that contributes the greatest rainfall in the region. In the South-west Province the main rain is in winter, requiring surveys to be undertaken in spring. Short-term variations in normal weather patterns (e.g. drought) may necessitate supplementary survey work at other times of year or in later years to take into account temporal changes in diversity.

2.2 PERMITS

Specimens collected during the survey were taken by permit of and subject to the conditions of the following licences issued under sections 23C and 23F of the Wildlife Conservation Act:

- SL008739 and 72-0910 Narelle Whittington;
- SL008486 and 46-0910 Natalie Pawley; and
- SL008532 Peter Jobson.

3 RESULTS

3.1 DATABASE SEARCH

A database search of the area resulted in four Declared Rare and 15 Priority Flora species being identified as potentially occurring in the area. For a comprehensive list of species found during the database search, please refer to Appendix C.

The database search determined that four TECs are known to occur in the area (see Appendix C).

3.2 FIELD SURVEY - FLORA

3.2.1 Flora

The Bennett (2005) survey recorded an additional 21 taxa, which were not recorded by ENV. These additional species were recorded within quadrats that were not rescored by ENV. The majority of these species are weeds (15 species). These species were not used in the statistical analysis and 19 have not been discussed below. Two of these species are significant flora and have been discussed (*Allocasuarina lehmanniana* and *Hibbertia cuneiformis).* All of these species are listed in Appendix D.

Seventy five taxa comprising 37 families and 65 genera were recorded in the survey area (41 native flora taxa and 34 introduced). One species was unable to be identified below family level while one species was unable to be identified past genus level. Refer to Appendix D for the flora species matrix and Appendix E for the flora survey field datasheets and site photographs.

The plant families most frequently recorded from the survey were as follows:

- Poaceae 13 species;
- Fabaceae 10 species;
- Asteraceae six species; and
- Myrtaceae five species

The plant genera most frequently recorded from the survey were as follows:

- *Acacia* five species; and
- *Euphorbia* three species.

The average species richness is 15 taxa per quadrat.

3.2.2 Protected Flora

No Threatened species pursuant to the EPBC Act were located during the survey.

No plant taxa gazetted as Declared Rare pursuant to the WC Act were located in the survey area.

No Priority Flora species were located in the survey area.

3.2.3 Locally Significant Flora

Bush Forever lists species that are considered to be of particular interest in the Perth Metropolitan Area. Other than DRF or Priority Flora these species may be of interest due to being restricted in distribution, endemic to a particular location or have some other distinctive feature (Government of Western Australia 2000b) and are presented as being locally significant flora.

Species that were located by ENV and Bennett Consulting (2005) within the Cape Peron Survey area that are considered to be of significance and the reason for that significance as per Bush Forever are listed in Table 2. See Figure 4 for significant flora locations.

Table 2: Significant Flora Locations

Species	Significance Category	Location
Agonis flexuosa var. *flexuosa*	At northern extension of Known range; Significant population.	ENV 378 408E 6427831N 376977E 6428639N
Allocasuarina lehmanniana	Significant population.	ENV did not record this species Bennett recorded this species but its co-ordinates were not recorded
Callitris preissii	Significant population. Taxa endemic to the Swan Coastal Plain in the Perth Metropolitan Region.	ENV 387408E 6427831N 376415E 6428720N
Diplolaena dampieri	At northern extension of known range; significant population.	ENV 376477E 642883N Bennett 376477E 6428883N 376894E 6428773N
Hibbertia cuneiformis	At northern extension of known range; significant	ENV did not record this species

Species	Significance Category	Location
	population.	Bennett 377968E 6426050N
Melaleuca lanceolata	Disjunct population; significant population.	ENV 376890E 6428951N 376416E 6428721N Bennett 376930E 6428962N

3.2.4 Flora Potentially Sensitive to Groundwater Changes

The species listed in Table 3 are those that are susceptible to either changes in the level of the water table, or to changes in the water quality within the water table.

Table 3: Flora Potentially Sensitive to Groundwater Changes

Family	Species	Susceptible to Changes in Groundwater Levels	Susceptible to Changes in Groundwater Quality
Cupressaceae	*Callitris preissii*		**X**
Poaceae	*Spinifex hirsutus*	**X**	
Poaceae	*Spinifex longifolius*	**X**	
Cyperaceae	*Ficinia nodosa*	**X**	
Cyperaceae	*Lepidosperma gladiatum*	**X**	
Cyperaceae	*Lepidosperma* sp. Coastal Dune (R. J. Cranfield 9963)	**X**	
Restionaceae	*Desmocladus flexuosus*		**X**
Myrtaceae	*Agonis flexuosa*	**X**	
Myrtaceae	*Eucalyptus gomphocephala*	**X**	
Myrtaceae	*Melaleuca lanceolata*	**X**	
Frankeniaceae	*Frankenia pauciflora*	**X**	
Epacridaceae	*Leucopogon parviflorus*		**X**

3.2.5 Introduced Flora

The table below (table 4) contains the weed species identified during the field survey, with their ratings and criteria according to the Environmental Weed Strategy for Western Australia (refer to Appendix B for the criteria used for ranking).

Table 4: Weed Species Identified

Taxon	Common Name	Criteria			
		Rating	Invasiveness	Distribution	Impacts
**Anagallis arvensis*	Pimpernel	Moderate	Yes	Yes	
**Arctotheca calendula*	Cape Weed	Moderate	Yes	Yes	
**Asparagus asparagoides*	Bridal Creeper	High	Yes	Yes	Yes
**Avena barbata*	Bearded Oat	Moderate	Yes	Yes	
**Bromus diandrus*	Great Brome	High	Yes	Yes	Yes
**Cakile maritima*	Sea Rocket	Moderate	Yes	Yes	
**Carpobrotus edulis*	Hottentot Fig	Moderate	Yes	Yes	
**Crassula glomerata*		Moderate	Yes	Yes	
**Cuscuta epithymum*	Lesser Dodder	Moderate	Yes	Yes	
**Cynodon dactylon*	Couch	Moderate	Yes	Yes	
**Ehrharta calycina*	Perennial Veldt Grass	High	Yes	Yes	Yes
**Ehrharta longiflora*	Annual Veldt Grass	Moderate	Yes	Yes	
**Eragrostis curvula*	African Love Grass	High	Yes	Yes	Yes
**Euphorbia paralias*	Sea Spurge	Moderate	Yes	Yes	
**Euphorbia peplus*	Petty Spurge	Moderate	Yes	Yes	
**Euphorbia terracina*	Geraldton Carnation Weed	High	Yes	Yes	Yes
**Foeniculum vulgare*	Fennel	N/A	N/A	N/A	N/A
**Fumaria capreolata*	Whiteflower Fumitory	Mild			Yes
**Geranium molle*	Dove's Foot	Low	N/A	N/A	N/A

Taxon	Common Name	Criteria			
		Rating	Invasiveness	Distribution	Impacts
	Cranesbill				
**Hyparrhenia hirta*	Tambookie Grass	High	Yes	Yes	Yes
**Lagurus ovatus*	Hare's Tail Grass	High	Yes	Yes	Yes
**Lolium rigidum*	Wimmera Ryegrass	Moderate	Yes	Yes	
**Melilotus indicus*		N/A	N/A	N/A	N/A
**Olea europaea*	Olive	Moderate	Yes	Yes	
**Pelargonium capitatum*	Rose Palargonium	High	Yes	Yes	Yes
**Pennisetum clandestinum*	Kikuyu Grass	Moderate	Yes	Yes	
**Plantago lanceolata*	Ribwort Plantain	Low	N/A	N/A	N/A
**Rhamnus alaternus*	Buckthorn	Moderate	Yes	Yes	
**Romulea rosea*	Guildford Grass	High	Yes	Yes	Yes
**Schinus terebinthifolius*		N/A	N/A	N/A	N/A
**Sonchus oleraceus*	Common Sowthistle	Moderate	Yes	Yes	
**Tetragonia decumbens*	Sea Spinach	Moderate	Yes	Yes	
**Trachyandra divaricata*	Onion Weed	Mild		Yes	
**Urospermum picroides*	False Hawkbit	Moderate	Yes	Yes	

One Declared Plant species, **Asparagus asparagoides*, was found in the study area. This species is listed as Priority 1 for the whole State.

3.3 FIELD SURVEY – VEGETATION

3.3.1 Floristic Community Types

The Quindalup Complex on the Quindalup landform is recognised as being composed of 12 SCP and supplementary FCTs. These are:

SCP 17: *Melaleuca rhaphiophylla – Gahnia trifida* seasonal wetlands;

SCP 19: Sedgelands in Holocene dune swales;

SCP 29a: Coastal shrublands on shallow sands;

SCP 29b: *Acacia* shrublands on taller dunes;

SCP 30a *Callitris preissii* and/or *Melaleuca lanceolata* forests and woodlands;

SCP 30c Woodlands and shrublands on Holocene dunes (re-allocated from 30c);

SCP 30b: Quindalup *Eucalyptus gomphocephala* and/or *Agonis flexuosa* woodlands;

SCP S11: Northern *Acacia rostellifera – Melaleuca acerosa* shrubands;

SCP S12: Rottnest Island *Melaleuca lanceolata* and/or *Callitris preissii* forests and woodlands;

SCP S13: Northern *Olearis axillaris – Scaevola crassifolia* shrublands;

SCP S14: *Spinifex longifolius* grassland and low shrublands;

SCP S 15: Weed group. Not allied with any supergroup.

The vegetation units of the site have been mapped previously (Bennett 2005) and these have been inferred to eight Floristic Community Types (FCTs). The eight inferred Floristic Community types are as follows:

FCT SCP16: Highly saline seasonal wetlands

FCT SCP29a: Coastal shrublands on shallow sands

FCT SCP29b: *Acacia* shrublands on taller dunes

FCT S13: Northern *Olearia axillaris – Scaevola crassifolia* shrublands

FCT S14: *Spinifex longifolius* grasslands and low shrublands

FCT SCP30a: *Callitris preissii* (or *Melaleuca lanceolata*) forest and woodlands

FCT SCP30b: Quindalup *Eucalyptus gomphocephala* and/or *Agonis flexuosa* woodlands

FCT S15: Weed Group

ENV established sixteen quadrats within the eight FCTs within the survey site. To ensure the survey is undertaken in accordance with Guidance Statement 51 (EPA 2004), replication quadrats were established to increase the number of

species for each vegetation unit. Opportunistic collections were also recorded for each of the units to add to the species total.

To conform that these eight FCTs occur within the study area, data analysis was undertaken.

Determination of Floristic Community Type by Similarity

The analysis suggested that the site appeared to belong to several FCTs. The results of the data analysis are shown in Table 5. The data analysis results illustrating the Bray-Curtis similarity is illustrated within the dendrogram included as Appendix G.

Table 5: Summary of PRIMER Analysis

Floristic Community Type (Quadrat)	Analysis FCT	% Similarity
SCP 29b (Q1 &8)	30a	33
SCP 16 (Q3 & 5)	29a	24
SCP 30a (Q2, 11 & 12)	30a	38
S13 (Q6 & 15)	30a	24
S15 (Q7)	19	18
SCP 30b (Q9 & 10)	30a	19
SCP 29a (Q13 & 16)	30a	30
S14 (Q4 & 14)	29a	27

The results suggest that the FCTs that have been previously inferred vary from the data analysis. Importantly, all but one site have low similarity percentages, with them being below 30%, which means that further investigation into the quadrats' characteristics are needed in order to allocate the vegetation to FCTs.

It was found, however, that all the sites are clearly related to Quindalup Complex communities.

Due to the inconclusive results of the statistical analysis there was a need to further analyse the data to clarify what FCTs best correlate with the quadrats independently of the statistical analysis. This involves reviewing site data for other factors that are diagnostic for FCTs, including the presence of indicator species, soil types and landform position.

Table 6: Floristic Community Type Determination

Vegetation Unit (Quadrat)	Primer Analysis	% Similarity	Comments	ENV inferred	% Similarity
SCP 29b (Q1 &8)	30a	33	The main indicator species for SCP 30a is absent from the sites and is more characteristic of FCT 29b	29b	31
SCP 16 (Q3 & 5)	16 and 29a	24	ENV concurs with the analysis results that it is characteristic of both SCP 16 and 29a.	16 and 29a	24
SCP 30a (Q2, 11 & 12)	30a	38	ENV concurs with the analysis results	30a	38
S13 (Q6 & 15)	30a	24	The main indicator species for SCP 30a is absent from the sites and even though the data for the supplementary community types is not available for analysis, the site is characteristic of S13	S13	Not available
S15 (Q7)	19	18	ENV disagrees with the prospect of it being SCP 19 as the vegetation unit lacks the characteristics and dominant species of this FCT. The site is dominated by weeds with minimal native species making it more affiliated with S15	S15	Not available

Vegetation Unit (Quadrat)	Primer Analysis	% Similarity	Comments	ENV inferred	% Similarity
SCP 30b (Q9 & 10)	30a	19	The main indicator species for SCP 30a is absent from the sites however the dominant indicator species of SCP 30b is present and the quadrats occur on the correct landform.	30b	-
SCP 29a (Q13 & 16)	30a	30	ENV disagrees with the prospect of it being SCP 19 as the vegetation unit lacks the characteristics and dominant species of this FCT. The site have more affiliation with 29a based on species present.	29a	28
S14 (Q4 & 14)	29a	27	Due to the dominant species present the two quadrats are not compatible with the analysis results and are more characteristic of FCT S14.	S14	Not available

See Figures 4 and 5 for Quadrat locations and FCT locations.

3.3.2 Priority Ecological Communities and Threatened Ecological Communities

FCT SCP30a *Callitris preissii* (or *Melaleuca lanceolata*) forest and woodlands is listed as a TEC and is listed as Vulnerable by the State

FCT SCP30b Quindalup *Eucalyptus gomphocephala* and/or *Agonis flexuosa* woodlands is listed as a Priority Ecological Community (Priority 3).

FCT SCP29b *Acacia* shrublands on taller dunes is listed as a Priority Ecological Community (Priority 3).

3.3.3 Vegetation Condition

The condition scale commonly used in the Perth metropolitan area and Bush Forever (Government of Western Australia 2000), was used for this assessment. The definition of the condition scales is in Appendix F.

The condition of the vegetation on site varies between Very Good and Completely Degraded (excluding development areas). Refer to Figure 6 for a map of bushland condition.

The high variability of the condition is reflected by the fragmentation of the area by different infrastructure, roads, tracks, weeds and rubbish. The volume of people that use the area everyday has contributed to the degradation of the vegetation both directly through trampling and spread of weeds and indirectly through the need for additional infrastructure such as roads and amenities. In the majority of cases the vegetation is in Good condition however without protection or active remediation the condition of the site will further degrade.

3.3.4 Bush Forever

The entire survey site is mapped as a Bush Forever site; the Point Peron and Adjacent Bushland, Peron/Shoalwater Bay, Site Number 355. The Bush Forever site includes all the remnant vegetation within the survey site equating to approximately 107.1 ha.

Government of Western Australia (2000b) states a detailed survey was undertaken of the site by Keating and Trudgen in 1986, which resulted in 60% of the flora taxa being sampled with no significant species being found.

The site meets six specific coastal reserve criteria, these are:

- Quindalup Dune types: youngest, older and beach ridge plain
- Continuing natural processes: 174.5 ha (107.1 ha of bushland) of Quindalup Dunes extending to 3.1 km inland fro the point
- Shoreline: soft (sandy) and Hard (rock)
- Linkage: contains Quindalup/Spearwood Dunes (Tamala Limestone) interface; roads and developments fragment site
- Vegetation: typical Quindalup/Spearwood units
- Habitats: significant reptile species

4 DISCUSSION

Flora

During the survey, a total of 75 taxa, from 37 families and 65 genera were recorded within the survey area (41 native flora taxa and 34 introduced taxa). Of these, no Threatened species pursuant to the EPBC Act, Declared Rare Flora pursuant to the WC Act or Priority Flora species were located.

ENV considers the number of flora taxa reported here is not an accurate representation of the potential amount of flora species present within the survey site. ENV only established 16 quadrats within FCTs and did not survey vegetation units which would have created a more robust species list and thus a better representation of the flora species present.

Six locally significant species were found across the site (details in Section 3.2.3). The reasons for their significance are attributed to them occurring at the northern extension of their known range and are considered a significant population according to Government of Western Australia (2000b). These species are not listed for protection, however are considered to be of interest.

A number of species have also been identified as potentially sensitive to changes in groundwater levels and or quality. Plants such as *Ficinia nodosa* and *Frankenia pauciflora* commonly occur in areas that are seasonally inundated, requiring their roots to be in waterlogged conditions for short periods. The lowering of the water table from current levels could reduce the regularity or occurrence of these low-lying areas experiencing inundation. Community composition could change as a result.

Larger tree species such as *Agonis flexuosa*, *Eucalyptus gomphocephala* and *Melaleuca lanceolata* have shallow root systems and are commonly found in low lying areas, with raised water table levels. The lowering of the water table could induce stress and potentially cause the death of individuals of these plants.

Threatened, Declared Rare and Priority Flora

No Threatened species pursuant to the EPBC Act, Declared Rare Flora pursuant to the WC Act or Priority Flora species were located in the survey area during the survey. Consequently, based on the legislative framework there are no species of international, National or State significance located within the project area.

ENV considers that the potential for the site to contain Declared Rare or Priority Flora is low. This is because the survey was undertaken in spring at peak flowering time and due to the nature of the project area the entire site was able to

be extensively traversed on foot. If any Threatened, Declared Rare or Priority flora species were present on site they would have been easily located.

Dodonaea hackettiana, which is the only priority flora that has been previously recorded within the project area was not recorded by ENV at the time of the survey. The species was also not located by Bennett Consulting during the 2005 survey. Considering the species was not found in the location that it was previously known to occur, nor the rest of the Cape Peron survey area by two intensive surveys undertaken by ENV and Bennett Consulting, it can be assumed that it was misidentified or the individuals have subsequently died.

Weeds

Thirty four weed species were identified during the survey. Had a extensive weed survey been undertaken on the Degraded to Completely Degraded areas then it is probable the number of species present would have been higher. Weed species were only recorded if they were dominant, occurred within a quadrat, or are listed as a Declared Plant. Due to the survey site being used heavily by people, weeds are the main disturbance factor of the native vegetation (besides clearing for infrastructure). The weeds present are typical for urban sites.

One Declared Plant species, **Asparagus asparagoides*, listed by the ARRP Act was found in the study area. This species is listed as Priority 1 for the whole State.

Vegetation Complexes

The Environmental Protection Aurthority (EPA) recognises that native vegetation complexes which have less than 10% of pre-European clearing extent remaining in the Bush Forever study area within the Perth Metropolitan Region (PMR) may be considered regionally significant (EPA 2006). Proposals that would impact on a vegetation complex with 10% or less remaining may be formally assessed by the EPA (EPA 2006).

The site is mapped as Quindalup Complex: Coastal dune complex consisting mainly of two alliances – the standard fore-dune alliance and the mobile and stable dune alliance. Local variations include the low closed forest of *Melaleuca lanceolata – Callitris preissii* and the closed scrub of *Acacia rostellifera.*

Bush Forever gives an estimate of the percentage of each complex that remains within the Bush Forever study area compared to its pre-European settlement extent, so an estimate of the scarcity of each complex can be determined. On the Swan Coastal Plain, within the PMR, 48% of the Quindalup Complex is estimated to remain, 20% of which is proposed for protection through Bush Forever which aims to retain at least of 10% of each vegetation complex within the Bush Forever policy area (Government of Western Australia 2000a).

As the entire survey site is included in the Bush Forever site, the remnant vegetation (equating to approximately 107.1 ha) is classified as regionally significant and contributes to the retention targets documented in Bush Forever (Government of Western Australia 2000a).

The site does have some existing protection and it is recommended in the Bush Forever report (Government of Western Australia 2000b) that the care, control and management of the site for conservation purposes within the Rockingham Lakes Regional Park is endorsed. Part of the site is designated as government lands (including existing and proposed public utilities).

Floristic Community Types

The vegetation identified in this assessment can broadly be related to eight of Gibson *et al* (1994) Floristic Community Types, as described in Section 3.3.1.

Due to the inconclusive results of the statistical analysis, attributed to low species diversity, the limited survey work that has been undertaken on the Quindalup Dune System and the condition of the vegetation in some instances, there was a need to review the species data and site information to clarify what FCTs best correlate with the quadrats in collaboration with the data analysis.

The following FCTs have been identified by this assessment as occurring on site:

FCT SCP16: Highly saline seasonal wetlands

FCT SCP29a: Coastal shrublands on shallow sands

FCT SCP29b: *Acacia* shrublands on taller dunes

FCT S13: Northern *Olearia axillaris* – *Scaevola crassifolia* shrublands

FCT S14: *Spinifex longifolius* grasslands and low shrublands

FCT SCP30a: *Callitris preissii* (or *Melaleuca lanceolata*) forest and woodlands

FCT SCP30b: Quindalup *Eucalyptus gomphocephala* and/or *Agonis flexuosa* woodlands

FCT S15: Weed Group

One TEC, SCP30a *Callitris preissii* (or *Melaleuca lanceolata*) forest and woodlands was identified as occurring within the survey area at three locations. This FCT is listed as Vulnerable by the State and is not listed by the Commonwealth. This FCT is represented by quadrats two, eleven and twelve. This TEC is considered to be of State significance.

Three quadrats were established within the SCP30a to record the viability of the vegetation community at those locations. The SCP30a located on the boundary of the school has been mapped as being in Good condition, however there are important factors to take into account that contribute to the vegetation community's survival. The site is very small (7 m x 30 m) and is located between the coastal sand dunes and a school oval and there is a pathway that dissects the vegetation to allow students to access the beach. There is no native understorey present and since the 2005 survey all the *Callitris preissii* have died. This leads to the conclusion that the vegetation community is subject to recent degrading factors. ENV concludes that this particular example is not a viable representation of this FCT and does not represent the TEC.

The site surrounding the small grassed area on the corner of Memorial Drive and Safety Bay Road is in Good to Degraded condition and is partly located within the impact area (Figure 7). The TEC is approximately 1.5ha in size, of which 0.4 ha is in degraded condition and 1.1 ha is in Good condition. Approximately 709 m^2 of TEC in Good condition occurs within the impact area, this represents approximately 6% of the 1.1 ha of TEC in Good condition.

Due to its location and being surrounded by native vegetation, the site has the potential to be remediated to improve its condition. There are many informal tracks that dissect the area and rubbish has been dumped adjacent to the site so these degrading influences will need to be resolved if the vegetation community is to be conserved.

The third site located at the base of the western-most car park is surrounded by dunal vegetation and therefore the degrading factors are at a minimum, thus the site is a viable representation of the vegetation community. However there is a walking track that runs adjacent to the site and therefore issues such as people deviating off the path and the spread of weeds needs to be resolved to protect the community.

Two of the FCTs are listed as Priority 3 PECs by the State, FCT SCP30b Quindalup *Eucalyptus gomphocephala* and/or *Agonis flexuosa* woodlands (quadrats 9 and 10; Figure 4). The occurrences of this FCT are in Good condition but are under threat by direct human disturbances (trampling, rubbish and weeds) and therefore would benefit from fencing and weed management. FCT SCP29b *Acacia* shrublands on taller dunes (quadrats 1 and 8; Figure 4) occurs across the majority of the site. Portion of this FCT are in Very Good condition and efforts should be made to preserve these in their current state. As PECs these areas of vegetation are considered to be of a Regional to State level of significance.

Vegetation Condition

The condition of the vegetation on site varies from Very Good to Completely Degraded, with the majority of the site in Good condition. There is no vegetation within the project area that is considered in excellent condition and there are only patches of vegetation mapped as Very Good condition (see Figure 6). This can be attributed to the various land uses and the high human traffic throughout the area.

5 SUMMARY AND RECOMMENDATIONS

The flora and vegetation survey undertaken by ENV.Australia determined that:

- A total of 75 taxa, from 37 families and 65 genera were recorded within the project area (41 native flora taxa and 34 introduced taxa).
- No Threatened species pursuant to the EPBC Act, Declared Rare Flora pursuant to the WC Act or Priority Flora species were located. Consequently, based on the legislative framework there are no species of international, National or State significance located within the survey area.
- Six species identified as being locally significant occur within the survey area.
- Twelve species are identified as being flora potentially sensitive to changes in groundwater levels and/or quality.
- One Declared Plant species (**Asparagus asparagoides)* was found in the survey area:
- The survey area is mapped as a Bush Forever site and the vegetation within the survey area is therefore classified as being of regionally significant. The site is mapped as Quindalup Complex: Coastal dune complex, which exceeds the 10% recommended retention status for Western Australia by the EPA's *Position Statement No. 2.* Bush Forever recommends 20% of this complex for retention within the Perth Metropolitan area.
- The following FCTs have been identified as occurring on site:
  - **SCP16**: Highly saline seasonal wetlands
  - **SCP29a**: Coastal shrublands on shallow sands
  - **SCP29b:** *Acacia* shrublands on taller dunes
  - **S13:** Northern *Olearia axillaris* – *Scaevola crassifolia* shrublands
  - **S14:** *Spinifex longifolius* grasslands and low shrublands
  - **SCP30a:** *Callitris preissii* (or *Melaleuca lanceolata*) forest and woodlands
  - **SCP30b:** Quindalup *Eucalyptus gomphocephala* and/or *Agonis flexuosa* woodlands
  - **FCT S15:** Weed Group

- One TEC, FCT SCP30a *Callitris preissii* (or *Melaleuca lanceolata*) forest and woodlands was identified as occurring on site. This FCT is considered to be of State significance.

- Two of the FCTs are listed as Priority 3 PECs; FCT SCP30b Quindalup *Eucalyptus gomphocephala* and/or *Agonis flexuosa* woodlands and FCT SCP29b *Acacia* shrublands on taller dunes. These FCTs are of Regional to State significance.

5.1 RECOMMENDATIONS

ENV makes the following recommendations:

- The FCT located on the boundary of the school is not a good representation of the TEC and is not considered viable.

- The TEC site surrounding the small grassed area on the corner of Memorial Drive and Safety Bay Road is surrounded by native vegetation and therefore has the potential to be remediated to improve its condition. There are many informal tracks that dissect the area and rubbish has been dumped adjacent to the site so these degrading influences will need to be resolved if the vegetation community is to be conserved.

- The third TEC site located at the base of the western-most car park has a track that runs adjacent to the site and therefore issues regarding people deviating off the path and the spread of weeds needs to be resolved to protect the vegetation community.

- Two of the FCTs are listed as Priority 3 PECs by the state, FCT SCP30b Quindalup *Eucalyptus gomphocephala* and/or *Agonis flexuosa* woodlands and FCT SCP29b *Acacia* shrublands on taller dunes. PECs are not protected under legislation however should be treated as significant and taken into consideration during the planning phase.

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FIGURES

APPENDIX A

DEFINITIONS OF DECLARED RARE / PRIORITY / THREATENED FLORA AND THREATENED / PRIORITY ECOLOGICAL COMMUNITIES

APPENDIX B
ENVIRONMENTAL WEEDS AND DECLARED PLANT CATEGORIES

APPENDIX C
DEC DATABASE SEARCH RESULTS

APPENDIX D
FLORA SPECIES LIST

APPENDIX E

FLORA SURVEY FIELD DATASHEETS AND SITE PHOTOGRAPHS

APPENDIX F
BUSH FOREVER CONDITION SCALE

APPENDIX G
FLORISTICS DENDOGRAM