



**Rural Subdivision – Lots 1000, 2240,
2275, 2657 And 3045 Preston Beach
Road Lake Clifton**

Cape Bouvard Investments Pty Ltd



**Report and recommendations
of the Environmental Protection Authority**



**Environmental Protection Authority
Perth, Western Australia**

**Report 1401
May 2011**

Environmental Impact Assessment Process Timelines

Date	Progress stages	Time (weeks)
1 October 2002	Level of Assessment set (date appeals process completed)	
11 January 2010	Proponent Document Released for Public Comment	378
8 March 2010	Public Comment Period Closed	8
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Dr Paul Vogel
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Report 1401: Rural Subdivision – Lots 1000, 2240, 2275, 2657 and 3045
Preston Beach Road, Lake Clifton.

Proponent: Cape Bouvard Investments Pty Ltd

Summary and recommendations

This report provides the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for Environment on the proposal to subdivide lots 1000, 2240, 2275, 2657 and 3045 Preston Beach Road, Lake Clifton by Cape Bouvard Investments Pty Ltd.

Section 44 of the *Environmental Protection Act 1986* (EP Act) requires the EPA to report to the Minister for Environment on the outcome of its assessment of a proposal. The report must set out:

- The key environmental factors identified in the course of the assessment; and
- The EPA's recommendations as to whether or not the proposal may be implemented, and, if the EPA recommends that implementation be allowed, the conditions and procedures to which implementation should be subject.

The EPA may include in the report any other advice and recommendations as it sees fit.

The EPA is also required to have regard for the principles set out in section 4A of the *Environmental Protection Act 1986*.

Key environmental factors and principles

The EPA decided that the following key environmental factors relevant to the proposal required detailed evaluation in the report:

(a) Biodiversity

There are three key issues that require discussion under the factor of biodiversity. These are:

- (1) direct and indirect impacts on threatened, priority and regionally significant vegetation and flora;
- (2) direct and indirect impacts on fauna, including threatened, priority and regionally significant species and assemblages; and
- (3) indirect impacts to the adjacent Yalgorup National Park (Yalgorup NP).

(b) Water quality

There were a number of other factors which were relevant to the proposal, but the EPA is of the view that the information set out in Appendix 4 provides sufficient evaluation.

The following principles were considered by the EPA in relation to the proposal:

- (a) The precautionary principle;
- (b) The principle of intergenerational equity; and

- (c) The principle of the conservation of biological diversity and ecological integrity.

Conclusion

The EPA has considered the proposal by Cape Bouvard Investments Pty Ltd to subdivide lots 1000, 2240, 2275, 2657 and 3045 Preston Beach Road, Lake Clifton. This proposal would result in the clearing of 114.5 hectares (ha) of native vegetation.

The EPA released Report 1359 *Strategic Environmental Advice on the Dawesville to Binningup Area* (Dawesville to Binningup Report) in May 2010. This report provides the EPA's advice to the Minister for Environment under section 16(e) of the EP Act on the significant environmental values of the Dawesville to Binningup area. This report sets out the EPA's general position to development in the Dawesville to Binningup area, including for the area in which the proposal is located (EPA, 2010a).

In reviewing the information provided as part of its assessment, the EPA has concluded that proposal site is of regional significance, meeting all six criteria for regional significance as per EPA Guidance Statement 10. These criteria are: representation of ecological communities; diversity; rarity; maintaining ecological processes and natural systems; scientific or evolutionary importance; and protection of wetland, streamline and estuarine fringing vegetation and coastal vegetation. This regional significance has been previously identified in the EPA's Dawesville to Binningup Report (EPA, 2010a) and the *Swan Bioplan – Peel Regionally Significant Natural Areas* (EPA, 2010b).

Based on the results of Cape Bouvard's surveys, the proposal site contains two Threatened Ecological Communities, four Priority Ecological Communities, Declared Rare Flora, Priority Flora and two wetlands of conservation significance. Approximately 74% of the vegetation on site is in good or better condition and 70% of the clearing proposed are Priority Ecological Communities. The proposal site is also in one of the few remaining areas on the Swan Coastal Plain where a full suite of vegetated Quindalup Dunes occur, which is considered of high conservation value as older phases of the Quindalup Dunes are inadequately reserved on the Swan Coastal Plain. The proposal would involve further loss of older phases of Quindalup Dune vegetation. It is also likely that further losses of vegetation would occur given the highly susceptible nature of the Quindalup Dunes to erosion and blow outs. The site also contains healthy tracts of tuart woodlands and shrublands, which have been in decline across the Swan Coastal Plain. The proposal has the potential to increase the occurrence of *Phytophthora* in the area, which could impact tuart recovery.

Yalgorup National Park is one of the largest and most important coastal conservation reserves on the Swan Coastal Plan. However, the geographic distribution of Yalgorup NP (a long but narrow area consisting of several disconnected blocks of land), makes it particularly vulnerable to edge effects impacting on the core of the park, which is not the case for all national parks.

This proposal, being an enclave within the Yalgorup NP, therefore has the potential to significantly increase these edge effects thereby introducing negative impacts into the national park's core. The site also forms an important ecological link between disjunct areas of Yalgorup NP and development on the proposal site would disrupt this linkage. No other significant north/south ecological linkage such as this exists elsewhere along the coast between Dawesville and Binningup.

The proposal would involve removing up to 114.5 ha of vegetation which would fragment the area and open it up to increased risk of further weed infestation and loss of native species and would also increase the risk of introducing disease and pathogens to the vegetation. Over time, this has the potential to cause a decline in vegetation condition, affecting both the regional significance of the site and the adjacent Yalgorup NP.

The proposal site contains habitat for a range of threatened, priority and regionally significant species and assemblages. The development has the potential to impact fauna species through habitat loss, fragmentation and a decline in habitat condition over time from indirect impacts such as weed invasion, pathogens and disease and erosion. Of the area proposed to be cleared, 65% is habitat for either Carnaby's black cockatoo or the graceful sun-moth (GSM), both of which are endangered species.

Carnaby's black cockatoos are nesting locally on the Swan Coastal Plain, which is significant given its traditional nesting sites are in the Wheatbelt. Given the significant decline in available nesting habitat in the Wheatbelt, confirmed nesting sites outside the traditional range are important for long-term species survival. The proposal site contains nesting habitat and the critical foraging habitat within the 12 kilometres required for breeding success and further loss of foraging and nesting habitat could impact the species' survival.

The proposal also has the potential to significantly impact a population of the GSM. This species has a short life-cycle and extremely limited dispersal characteristics and are known to be only able to fly short distances. The development footprint in the Quindalup Dunes would create a wide cleared strip and the potential to fragment what is currently one population, putting it at risk of isolation and decline.

The impacts of fragmentation and decline in vegetation condition over time resulting from the development are not restricted to the GSM, but have the potential to affect a wider range of species. One of the most significant conservation values of this area is that it consolidates areas of good quality fauna habitat for a diverse assemblage of vertebrate species including threatened and regionally significant species. For many of the species on the proposal site, the populations are part of one of the largest and most significant on the southern Swan Coastal Plain, as elsewhere they are generally scarce, continuing to decline or locally extinct as a consequence of habitat clearing. Maintaining a large and ecologically linked area will help ensure that species continue to persist and thrive.

The EPA notes the significant concern raised by the community and agencies regarding the health of the thrombolite community within Lake Clifton and the veracity of the hydrological modelling required to determine potential environmental impacts. The EPA also notes that the hydrogeology of the area is extremely complex and this complexity is difficult to model. All numerical modelling has an inherent uncertainty and differing opinions regarding the veracity and predictive capability of the model have been received by the EPA. The EPA concludes that overall the predictions regarding the nutrient and water balance impacts of the proposed development to Lake Clifton are considered reasonable. The EPA considers that the proponent has provided an acceptable buffer from the building envelopes to Lake Clifton (over 300 metres) to mitigate the domestic nutrient impacts.

Considering the predicted nutrient export to Lake Clifton in context of the total catchment load, the nitrogen export to Lake Clifton from the rural subdivision can be considered negligible.

The EPA considers the proposal's potential impacts to water quality could be managed to meet the EPA's objectives for this environmental factor. However the EPA concludes the proposal to subdivide rural lots 1000, 2240, 2275, 2657 and 3045 Preston Beach Road, Lake Clifton is environmentally unacceptable as it cannot be managed to meet the EPA's objectives in relation to biodiversity.

Recommendations

The EPA submits the following recommendations to the Minister for Environment:

1. That the Minister considers the report on the key environmental factors and principles of biodiversity and water quality, as set out in Section 3;
2. That the Minister notes that the EPA has concluded that the proposal cannot meet the EPA's environmental objectives for biodiversity;
3. That the Minister notes that the EPA has not included in this Report conditions and procedures to which the proposal should be subject, if implemented, because the EPA holds the view that the proposal should not be implemented;
4. That the Minister not issue a statement that the proposal may be implemented; and
5. That the Minister notes the EPA's other advice presented in Section 4 in relation to continuing pressures and threats to the thrombolite community, consolidation of Yalgorup NP, the requirements for a second egress for the development and the approvals likely to be required should Cape Bouvard propose to recommence cattle grazing.

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1. Introduction and background

This report provides the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for Environment on the key environmental factors and principles for the proposal by Cape Bouvard Investments Pty Ltd to subdivide lots 1000, 2240, 2275, 2657 and 3045 Preston Beach Road, Lake Clifton.

The proposed subdivision was referred to the EPA in June 2002. The EPA decided to assess the proposal at the level of Public Environmental Review (PER) with an eight-week review period due to the potential impacts to biodiversity, including significant flora, vegetation and fauna; wetlands of international significance, water quality and conservation reserves. The PER was available for public review from 11 January to 8 March 2010.

The proposal was determined to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in 2004 as it may impact on wetlands of international importance (Sections 16 and 17B), listed threatened species and communities (Sections 18 and 18A) and listed migratory species (Sections 20 and 20A). The proposal is being jointly assessed under the bilateral agreement between the Commonwealth and Western Australian Governments.

The site is located on the sand dunes of the Quindalup and Spearwood systems, which extends up to 2 kilometres (km) inland before dropping to below sea level to form the Yalgorup Lakes adjacent to the proposal site. The site is vegetated with the majority of the vegetation being classed as 'Good' to 'Excellent', with some small areas considered 'Completely Degraded' to 'Degraded'. In a regional context the site contains significant vegetation which also provides significant fauna habitat. Its setting as an enclave results in the site acting as an important ecological linkage between disconnected areas of Yalgorup National Park (Yalgorup NP).

The EPA released Report 1359 *Strategic Environmental Advice on the Dawesville to Binningup Area* (Dawesville to Binningup Report) in May 2010. This report provides the EPA's advice to the Minister for Environment under section 16(e) of the EP Act on the significant environmental values of the Dawesville to Binningup area. It applied current knowledge and scientific data about the values to identify areas of conservation significance and areas that may have potential for development and land use compatible with the environmental values of the area. In summary, the report sets out the EPA's general position to development in the Dawesville to Binningup area (EPA, 2010a). With specific regard to the location of the proposal site, the Dawesville to Binningup Report states that "*there is a presumption against further subdivision and residential development between the western side of the Yalgorup lake system and the coast*". The report further stated that all proposals would be considered on its merits and after considering the detailed environmental investigations.

Further details of the proposal are presented in Section 2 of this report. Section 3 discusses the key environmental factors and principles for the proposal. Section 4 provides Other Advice by the EPA. Appendix 6 contains a summary of submissions and the proponent's response to submissions and is included as a matter of information only and does not form part of the EPA's report and recommendations. Issues arising from this process, and which have been taken into account by the EPA, appear in the report itself.

2. The proposal

The proposal area is located 22 km south of Mandurah, north of the Preston Beach township between Lake Clifton and the coast (refer Figure 1). The proposal site is within the boundaries of the City of Mandurah and the Shire of Waroona and is zoned rural under the two local planning schemes as well as the Peel Region Scheme. Cape Bouvard propose subdividing its 975.2 hectare (ha) landholding to create 24 rural lots ranging in size from 19.5 ha to 181 ha. Access to the site would be from the south through Preston Beach.

The development footprint on the subject site is approximately 139.8 ha and includes building envelopes, roads and provisions for fire safety including building protection and hazard separation zones around the dwellings and a series of fire breaks and a fire bunker for emergencies (refer Figure 2). The proposal would involve onsite sewage management through anaerobic treatment unit sewage systems, with the wastewater disposed of through surface irrigation. Domestic water supplies would be through individual rainwater tanks and a domestic groundwater bore limited to 1,500 kilolitres (kL) per annum.

The main characteristics of the proposal are summarised in Table 1 below. A detailed description of the proposal is provided in Section 3 of the PER (ENV Australia, 2009).

Table 1: Summary of key proposal characteristics

Element	Description
Site description	Lots 1000, 2240, 2275, 2657 and 3045 Preston Beach Road, Lake Clifton
Site area	975.2 hectares
Number of strata lots	24
Area of development footprint, including: <ul style="list-style-type: none"> • Building envelopes • Roads and driveways • Firebreaks • Building separation and hazard separation zones • Fire bunker area 	Not more than 139.8 hectares
Area of native vegetation to be cleared within development footprint	Not more than 114.5 hectares
Conservation area to be ceded to Yalgorup NP	Not less than 84 hectares

Since release of the PER, the proponent has modified the proposal description in a number of ways. Firstly a number of subdivision elements have been modified or specified including the location of building envelopes, roads, firebreaks, hazard separation and building protection zones and the provision of a fire bunker.

Cape Bouvard also changed the type of subdivision model proposed. Submissions received from the City of Mandurah and Shire of Waroona raised a number of planning issues including capacity to service the development. In response a survey-strata subdivision model was proposed instead. This would involve the creation of one lot with 24 survey strata titles and the formation of a body corporate or strata title company to manage communal infrastructure (such as roads and firebreaks). It would also involve by-laws for management and regulation of other matters including environmental issues.

The potential impacts of the proposal initially predicted by the proponent in the PER document and the proposed management are summarised in Section 8 (Environmental Factors and Management) of the proponent's document (ENV Australia, 2009).

3. Key environmental factors and principles

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for Environment on the key environmental factors relevant to the proposal and the conditions and procedures, if any, to which the proposal should be subject. In addition, the EPA may make recommendations as it sees fit.

The identification process for the relevant factors selected for detailed evaluation in this report is summarised in Appendix 4. The reader is referred to Appendix 4 for the evaluation of factors not discussed below. A number of these factors, such as karst, stygofauna and rootmat communities are relevant to the proposal, but the EPA is of the view that the information set out in Appendix 4 provides sufficient evaluation.

It is the EPA's opinion that the following key environmental factors for the proposal require detailed evaluation in this report:

- (a) Biodiversity; and
- (b) Water quality.

In relation to the factor of Biodiversity, the EPA's assessment of this factor is based on the discussion of the proposal's impacts on the following three key issues:

- (1) direct and indirect impacts on threatened, priority and regionally significant vegetation and flora;
- (2) direct and indirect impacts on fauna, including threatened, priority and regionally significant species and assemblages; and

- (3) indirect impacts to the adjacent Yalgorup NP.

The above key factors were identified from the EPA's consideration and review of all environmental factors generated from the PER document and the submissions received, in conjunction with the proposal characteristics.

Details on the key environmental factors and their assessment are contained in Sections 3.1 – 3.2. The description of each factor shows why it is relevant to the proposal and how it would be affected by the proposal. The assessment of each factor is where the EPA decides whether or not a proposal meets the environmental objective set for that factor.

The following principles were considered by the EPA in relation to the proposal:

- (a) The precautionary principle;
- (b) The principle of intergenerational equity; and
- (c) The principle of the conservation of biological diversity and ecological integrity.

3.1 Biodiversity

Description

The primary impacts of the proposal on biodiversity would be due to loss of native vegetation and fauna habitat associated with clearing for construction. Ongoing indirect impacts are also likely, primarily from an increased risk of weeds, fire, pathogens and disease, and erosion; ultimately having the potential to result in a decline in vegetation condition over time including in the adjacent Yalgorup NP.

Based on the proposal footprint, up to 114.5 ha of native vegetation would be cleared for building envelopes, fire mitigation measures and road construction. The proponent has minimised the amount of clearing required by locating proposal features over existing cleared areas where possible. Cape Bouvard conducted flora, vegetation and fauna surveys of the project area as reported in the PER (ENV Australia, 2009).

Vegetation and flora

The proposal site contains vegetation ranging in condition from 'Excellent' to 'Completely Degraded', with approximately 74% of the vegetation on site being in 'Good' to 'Excellent' condition. The proposal site contains vegetation of the Quindalup, Cottesloe Central and South, and Yoogarillup Complexes as mapped by Heddle *et.al.*(1980). The pre-1750 extent of these complexes remaining is 47.1%, 41.1% and 40.1% respectively. The original extent of these complexes protected in secure tenure is 5.2%, 8.8% and 13.9% respectively. The aim is to seek to retain at least 30% of the original extent of each complex (EPA, 2000).



Figure 1: Regional location of the proposal site

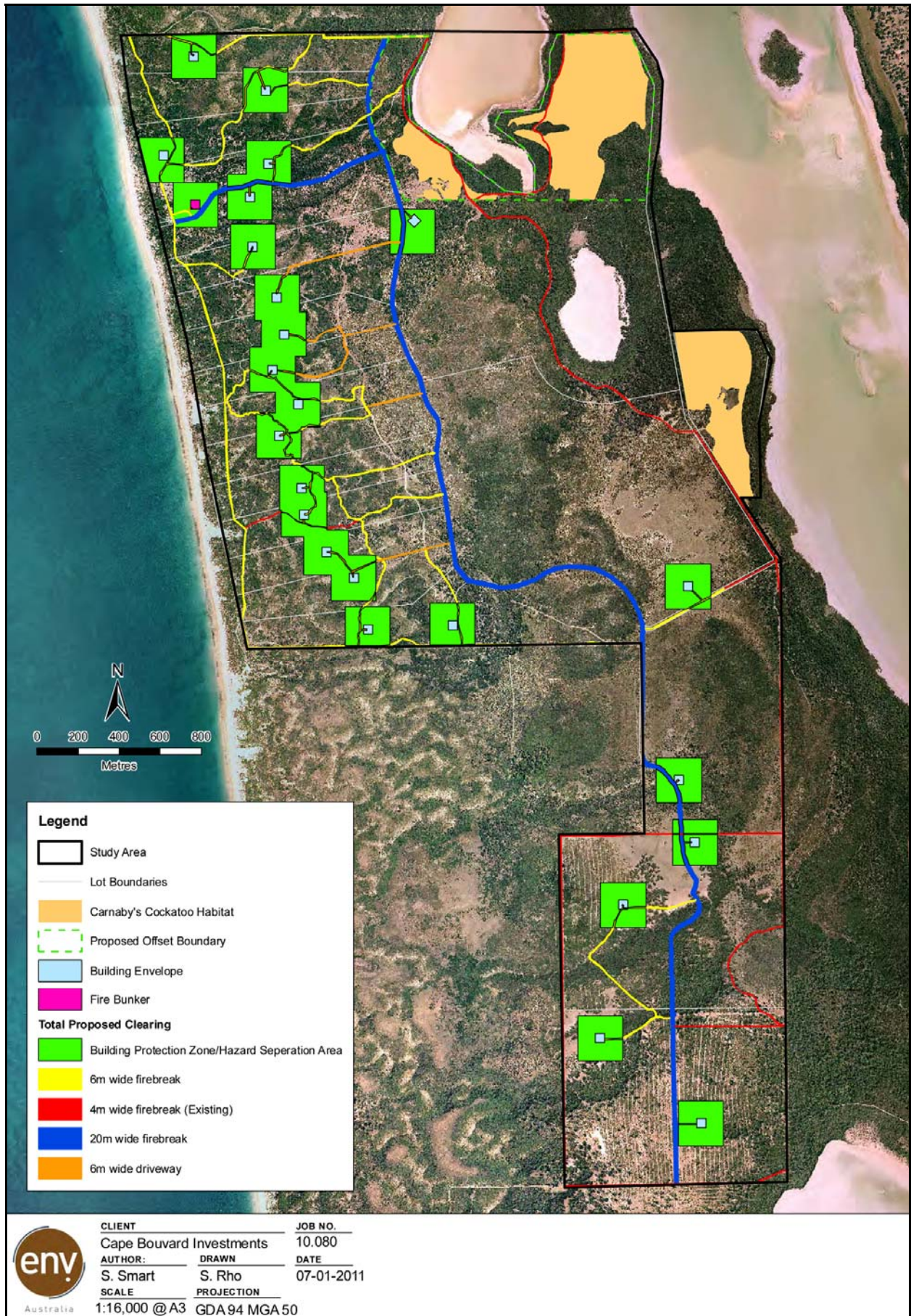


Figure 2: Proposal footprint

Floristic Community Types (FCTs) are floristic assemblages defined by all the vascular plant taxa that occur in standard areas (EPA, 2006). FCTs may be considered a Threatened Ecological Community (TEC) endorsed by the Minister for Environment or a Priority Ecological Community (PEC). A PEC is a naturally occurring biological assemblage that occurs in a particular type of habitat that is potentially considered threatened, but does not meet survey criteria (DEC, 2010b).

The flora and vegetation surveys determined that 11 FCTs were present on site and are listed in Table 2.

Table 2: Floristic Community Types present on the proposal site

FCT	Description	Conservation status
S11	Northern <i>Acacia rostelifera</i> – <i>Melaleuca systena</i> shrublands	-
SCP17	<i>Melaleuca raphiophylla</i> – <i>Gahnia trifida</i> seasonal wetlands	-
SCP18	Shrublands on calcareous silts	Vulnerable TEC
SCP21a	Central <i>Banksia attenuata</i> – <i>Eucalyptus marginata</i> woodlands	-
SCP25	Southern <i>Eucalyptus gomphocephala</i> - <i>Agonis flexuosa</i> woodlands	Priority 3*
SCP26a	<i>Melaleuca huegelii</i> – <i>Melaleuca acerosa</i> shrublands on limestone ridges	Endangered TEC
SCP26b	Woodlands and mallees on limestone	-
SCP27	Species poor mallees and shrublands on limestone	-
SCP29a	Coastal shrublands on shallow sands	Priority 3*
SCP29b	<i>Acacia</i> shrublands on taller dunes	Priority 3*
SCP30b	Quindalup <i>Eucalyptus gomphocephala</i> and / or <i>Agonis flexuosa</i> woodlands	Priority 3*

*DEC, 2010a

Cape Bouvard does not propose clearing of either listed TEC, however does propose to clear a combined total of 80.9 ha of the four Priority 3 communities. The site also contains tuart woodlands in a variety of conditions from 'Poor' to 'Excellent'. Cape Bouvard undertook an assessment of the health of the tuart woodlands and shrublands to determine the condition and conservation value of the tuarts on the proposal site. The majority showed slight to no decline in canopy cover with an intact understorey and limited to no weed invasion (ENV Australia, 2009).

Surveys also identified a previously unmapped wetland in the south east of the site. This wetland is associated with the TEC SCP18 Shrublands on calcareous silts, and the recommendation put forward by the proponent is that this wetland should be included in the Department of Environment and Conservation's (DEC) *Geomorphic Wetlands Swan Coastal Plain* dataset as a 'Conservation' category wetland.

Surveys were also conducted to determine whether flora of conservation significance were present (Table 3). Some species found in earlier surveys were unable to be located by Cape Bouvard during their survey.

Table 3: Flora of conservation significance on the proposal site

Taxa	Quantity found	Conservation status
<i>Eucalyptus argutifolia</i>	>200	Declared Rare Flora (DRF)
<i>Stylidium maritimum</i>	>2800	Priority 3
<i>Hibbertia spicata</i> subsp. <i>leptotheca</i>	Found in Weston (2003) but not found during Cape Bouvard (2007) survey.	Priority 3
<i>Hakea</i> sp. Yalgorup		Priority 4
<i>Astroloma microcalyx</i>		Priority 2

Cape Bouvard were unable to determine what proportions of the state-wide population of *Eucalyptus argutifolia* and *Stylidium maritimum* were found on site as insufficient data exists in the Western Australia Museum/DEC records. Both of these species have predominately been recorded north of Perth, mainly in the coastal strip between Seabird and Mindarie (*E. argutifolia*) and Jurien, Cervantes, Seabird, Alkimos, Two Rocks and Yanchep (*S. maritimum*). Distribution of the species south of Perth is not known, although *E. argutifolia* has only been recorded on the proposal site while *S. maritimum* has also been recorded in the adjacent Yalgorup NP (ENV Australia, 2009). *E. argutifolia* is listed as vulnerable under the EPBC Act.

The proposal does not propose to remove any individual *E. argutifolia* plants. *S. maritimum* occurs in the Quindalup Dunes and would be impacted due to roads, firebreaks and building envelopes. The proponent has not calculated how many individuals would directly be lost due to construction or indirectly lost over time due to edge effects, weed introductions and disease.

The results of the vegetation and flora surveys undertaken on the proposal site are consistent with the results of the Dawesville to Binningup Report.

Fauna

Cape Bouvard's fauna assessment recorded a rich faunal assemblage with 113 species of vertebrate fauna on the proposal site including 12 mammal, 28 reptile, six amphibian and 67 bird species. These include a number of threatened and priority species, including:

- Carnaby's black cockatoo (listed in Schedule 1 of the *Wildlife Conservation Act 1950* (WC Act) and as endangered under the EPBC Act);
- southern carpet python (listed as specially protected under the WC Act); and
- quenda (Priority 5), *Lerista lineata* (Priority 3) and the hooded plover (Priority 4).

The site also contains regionally significant populations of other fauna species including 11 species of birds and three species of reptiles. For many species, the populations on the proposal site are part of one of the largest and most

significant on the southern Swan Coastal Plain, as elsewhere they are generally scarce, continuing to decline or locally extinct as a consequence of habitat clearing (EPA, 2010a).

Cape Bouvard also determined that suitable potential habitat exists for the western ringtail possum, chuditch, western false pipistrelle and brush-tailed phascogale. Baudin's black cockatoo was also seen adjacent to the study area. All of these species have the potential to exist in the area with populations of western ringtail possum and chuditch recorded in the adjacent Yalgorup NP and the western false pipistrelle located nearby.

Surveys also recorded significant populations of one invertebrate, the graceful sun-moth (GSM) which is listed in Schedule 1 of the WC Act and as endangered under the EPBC Act.

The proposal would result in the loss of 7.6 ha of foraging, 12.8 ha of nesting and 0.2 ha of both foraging and nesting habitat for Carnaby's black cockatoo. It would also result in the loss of 54.7 ha of habitat for the GSM and the loss of 19.6 ha and 16.3 ha of potential habitat for chuditch and western ringtail possum respectively. The proponent proposed two offset areas adjacent to Lake Clifton and Boundary Lakes, totalling 84 ha. Of this area, a large proportion of it is nesting and / or foraging habitat for Carnaby's black cockatoo and potential habitat for chuditch and western ringtail possum. The offset site would be ceded to the DEC for inclusion in Yalgorup NP. No offset area was proposed for the GSM.

Yalgorup NP

The proposal site is effectively an enclave within the adjacent Yalgorup NP, as it is bound by the ocean to the west, a rural property along a portion of its southern boundaries and Yalgorup NP along all the remaining boundaries. Yalgorup NP geographically covers a long but narrow area and consists of several disconnected blocks of land and the Yalgorup lakes system. This configuration makes it particularly vulnerable to edge effects impacting on the core of the park. Yalgorup NP is the largest conservation reserve on the Swan Coastal Plain and the vegetation complexes within it are not well represented in conservation reserves elsewhere in Western Australia. Yalgorup NP includes habitat for a range of threatened, priority and regionally significant fauna species and assemblages.

The proposal has the potential to impact Yalgorup NP primarily through indirect measures including increased access points, increased weed invasion, increased occurrence of fire, as a source of feral animals and by disrupting the ecological link between disjunct areas of the park. Cape Bouvard considers the potential impacts to Yalgorup NP could be adequately managed through the development of management plans, by-laws and the management statement required as part of a strata-title subdivision.

Submissions

Submissions were received from the public, community groups and government agencies. The proposal was not supported by the DEC, the City

of Mandurah or the Shire of Waroona. Submissions raised a number of similar issues including:

- loss and fragmentation of regionally significant vegetation due to construction of roads, building envelopes and firebreaks;
- impacts to nationally and regionally significant fauna species and assemblages due to loss of habitat;
- increased risk of fire, weed invasion, pathogens, pets and feral pests and the consequential potential for long-term ecological impacts including potential loss of species diversity;
- loss of tuart trees and the potential for the development to negatively impact on their overall health (given the decline in tuarts across the Swan Coastal Plain);
- increased risk of erosion due to construction on the erosion-prone Quindalup Dunes;
- potential cumulative and long term impacts on the environmental values of the adjacent Yalgorup NP from increased access, trail bikes, weed invasion, pathogens, domestic pets and fire;
- imposition non-conservation optimised fire regimes on Yalgorup NP from the adjacent development in order to mitigate concerns regarding safety of residents; and
- the inability of the management mechanisms proposed for the subdivision to deliver long-term protection for the environmental values of the area and the adjacent Yalgorup NP.

The proponent's summary of, and detailed response to issues raised in submissions is provided in electronic format (compact disk) in Appendix 6.

Assessment

The EPA's environmental objectives for the integrated factor of biodiversity that are of relevance to this proposal are:

- to maintain the abundance, diversity, geographic distribution and productivity of flora and fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge;
- to protect DRF, Priority flora and other species of conservation significance, consistent with the provisions of the WC Act; and
- to protect the environmental values of areas identified as having significant environmental attributes.

The EPA's assessment of this factor is based on the discussion of the proposal's impacts on the following three key issues:

- (1) direct and indirect impacts on threatened, priority and regionally significant vegetation and flora;
- (2) direct and indirect impacts on fauna, including threatened, priority and regionally significant species and assemblages; and
- (3) indirect impacts to the adjacent Yalgorup NP.

Vegetation and flora

Vegetation on site is of high conservation value, due to the diversity of vegetation types, the presence of two TECs, four PECs and species of DRF and Priority flora. Approximately 74% of the vegetation on site is in good or better condition and 70% of the clearing proposed are of PECs. The proposal site is also in one of the few remaining areas on the Swan Coastal Plain where a full suite of vegetated Quindalup Dunes occurs, and in this location the Quindalup Dunes extends up to approximately 1.5km inland. This is considered of high conservation value as older phases of the Quindalup Dunes are inadequately reserved on the Swan Coastal Plain. Commonly, only the primary dune between 50-100 metres (m) of the coastline is retained in Public or Regional Open Space. The proposal would involve further loss of older phases of Quindalup Dune vegetation. It is also likely that further losses of vegetation would occur given the highly susceptible nature of the Quindalup Dunes to erosion and blow outs.

The occurrence of FCT SCP30b on site is significant as it has previously only been found south of this area, and this identification of SCP30b is now the northern-most known occurrence of this community (Freeman *et al.*, 2009). The proposal would remove 3.76 ha of this community and through the placement of the road, open the community up to further risks of weed invasion, and thereby impact a community at the limit of its range.

While no impacts *E. argutifolia* are predicted, the significance of the population cannot be underestimated as it is currently unknown whether the species is genetically similar to the northern population or the population status of this species south of Perth. Finally, the proposal site also forms an important ecological linkage between disjunct areas of Yalgorup NP. Development of the proposal site would disrupt this linkage. No other significant north/south ecological linkage such as this exists elsewhere along the coast between Dawesville and Binningup and clearing on the Swan Coastal Plain has resulted in the isolation and fragmentation of many ecological communities and a subsequent loss of environmental values.

Tuarts are the only forest tree endemic to the Swan Coastal Plain, and the presence of healthy stands of tuarts on the proposal site is significant as the species has been in decline across its range. Recent research has implicated *Phytophthora* in the decline along with other factors including habitat loss and fragmentation (Conservation Commission of Western Australia, 2009). A regional review of tuart health was undertaken in 2003, (Government of Western Australia, 2003) and the ENV Australia (2009) assessment of the tuart woodlands and shrublands on the proposal site shows tuarts are recovering from tuart decline. The introduction of people via a rural subdivision would increase the risk of *Phytophthora* spreading, which has the potential to impact tuart recovery and potentially cause further decline.

In considering the above factors and the requirements in EPA Guidance Statement 10, the EPA concludes that the site is of regional significance, meeting all six criteria for regional significance (refer Appendix 1). These criteria are representation of ecological communities; diversity; rarity;

maintaining ecological processes and natural systems; scientific or evolutionary importance; and protection of wetland, streamline and estuarine fringing vegetation and coastal vegetation.

The regional significance of the site has also been consistently recognised in other publications:

- The Dawesville to Binningup Report (EPA 2010b);
- Swan Bioplan – Peel Regionally Significant Natural Areas (EPA 2010a); and
- South West Regional Ecological Linkages Technical Report (Molloy *et. al.*, 2009).

The proposal site is well vegetated and an enclave within the Yalgorup NP and has been classified as an extreme fire hazard, as per the *Planning for Bush Fire Protection Guidelines* (Western Australian Planning Commission and Fire and Emergency Services Authority, 2010). In order to minimise this risk to life and property, extensive clearing of regionally significant vegetation in good or better condition would be required. The building footprints in Figure 2 would also need to be maintained at low fuel levels. This would result in significant modification and increased fragmentation of the remaining vegetation. Removing the vegetation would also open the area up to an increased risk of further weed infestation and the potential loss of native species. It would also increase the risk of introducing disease and pathogens to the vegetation. Additionally, much of this disturbance would occur within the elevated dune systems close to the coast, resulting in a risk of significant wind erosion. Over time, this has the potential to cause an ongoing decline in vegetation condition and regional significance.

Indirect impacts from the development to TEC FCT26a resulting from both weeds and clearing for fire protection measures are also likely. The primary location of TEC FCT26a is adjacent to the main access road into the property with the road cutting through the TEC buffer. The road provides a large front for weed invasion, which has the potential to result in a decline in the condition of this floristic community over time. A second isolated occurrence of TEC FCT26a is adjacent to a building envelope with its buffer within the area required to be cleared for fire safety. While the proponent proposed measures to minimise impacts, it is likely that long-term incremental clearing, inadequate weed control and concern over safety would result in loss or degradation of this floristic community.

There is also the potential for direct and indirect impacts to the wetlands located either on site or adjacent to the proposal property. Clifton, Pollard and Boundary Lakes are located adjacent to the proposal site and all are listed under the Ramsar Convention, and in addition to Unnamed Lake, are also protected under the *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992*. Uncontrolled access to these wetlands, lack of foreshore reserves and concern regarding the long-term protection and management of these wetlands are issues of concern to the EPA.

The EPA does not have confidence in the ability of the survey-strata subdivision model, either in the short or long term, to manage complex environmental impacts as it relies primarily on self-regulation and self-enforcement. The survey-strata model involves individual landholders being responsible for determining and reporting actions contravening the management statement and by-laws.

The EPA is of the view that the environmental impacts of the proposal are unacceptable given the significant flora and vegetation values of the site, the proposal's location within an enclave of Yalgorup NP, the importance of connectivity with disjunct areas of the park, and the potential for indirect impacts including fragmentation, weeds, diseases and pathogens to impact the very high values of both the proposal site and Yalgorup NP.

Fauna

The proposal site contains habitat for a range of threatened, priority and regionally significant species, and one of the most significant conservation values of this area is that it consolidates areas of good quality fauna habitat for a diverse assemblage of vertebrate species. It provides for part of a vegetated habitat continuum with disjunct areas of Yalgorup NP. This represents the most significant north/south ecological linkage for Yalgorup NP between Dawesville and Binningup.

Impacts to fauna species have the potential to result from habitat loss, fragmentation and a decline in habitat condition over time through indirect impacts such as weed invasion, pathogens and disease and erosion. Of the area proposed to be cleared, 65% is habitat for either Carnaby's black cockatoo or the GSM, both of which are endangered species.

Other regionally significant fauna includes:

- populations of five species of lizards and one frog species known to be at the southern and northern limits of their distribution respectively;
- a population of the skink lizard *Ctenotus labillardieri* which is likely to be genetically distinct from populations on the Darling Scarp and Range and is more likely to be the Schedule 1 Threatened Lancelin Island Skink (*Ctenotus lancelini*); and
- populations of a large number of regionally significant bushland bird species, listed in Bush Forever as regionally significant, and whose populations are declining on the Swan Coastal Plain (EPA, 2010a).

The Western Australian Museum has recently confirmed that Carnaby's black cockatoos are nesting locally on the Swan Coastal Plain, both east and west of Lake Clifton. The Museum has advised that although limited surveys have been undertaken in the area, additional nesting sites are likely to be confirmed with further surveys including to the west of Lake Clifton. This is important as traditionally the species was only known to nest in the Wheatbelt, and therefore confirmed nesting sites outside of the traditional range are important for long-term species survival.

A key requirement for Carnaby's black cockatoo is the location of adequate foraging habitat located within 12 km of the nest site. Loss of this feeding habitat could lead to the local extinction of breeding populations (Saunders, 1977). The proposal site contains nesting habitat and the critical foraging habitat within the 12 km required for breeding success. While an offset was proposed for the loss of Carnaby's black cockatoo habitat, the area proposed was highly constrained and never proposed for development, and therefore there is still a net loss as no new habitat would be secured for conservation.

The proposal has the potential to have direct significant impacts on the GSM due to the clearing proposed. Until recently the GSM was only known from remnants of native vegetation between Mandurah and Neerabup but surveys conducted during 2010 have greatly extended the known range and significant populations have been found from Leeman to Binningup. Surveys in seven sites were undertaken south of Mandurah and survey results to date place 157 individual moths in three conservation reserves, 122 on three other sites in the region and 116 on the proposal property. While the known range of the species has been greatly expanded, currently of the 43 known locations of the GSM, 75% are either threatened by proposed development or severely fragmented and at risk. The current available information on the GSM does not warrant a reclassification of its protected status. In addition, disjunctions in the known distribution, combined with the extremely limited dispersal characteristics, raise the issue of genetic differences between the various populations (Bishop *et al.*, 2010).

Requirements for fire safety would result in an approximately 220m wide cleared strip bisecting the GSM habitat, due to the location of building envelopes for the 15 coastal lots and proposed fire bunker. The GSM has a short life-cycle and extremely limited dispersal characteristics and are known to be only able to fly short distances. The creation of a wide cleared strip has the potential to fragment what is currently one population. Furthermore, this wide cleared strip would provide a large front for weed invasion which has the potential to cause a decline in vegetation condition over time. Current findings show that the GSM have a preference for habitat in Good or Better condition, and therefore isolation and decline in habitat condition may place additional pressures on the remaining population (Bishop *et al.*, 2010).

The impacts of fragmentation and decline in vegetation condition over time are not restricted to the GSM, but have the potential to affect a wider range of species and assemblages. Loss of vegetation of sufficient size and spatial replication as well as the connectivity between areas on the Swan Coastal Plain has resulted in the local extinction of many species and consequently the populations within the wider region are probably the largest and most significant on the southern Swan Coastal Plain.

The EPA is of the view that further fragmentation or loss of vegetation has the potential to result in the reduction of the abundance, diversity, geographic distribution and productivity and hence the long-term survival of many fauna species.

Yalgorup NP

One of the most significant conservation values of this area is that it consolidates areas of good quality fauna habitat for a diverse assemblage of vertebrate species including threatened and regionally significant species. However Yalgorup NP, due to its geographic nature of being long and narrow, is particularly susceptible to edge effects, which is not the case for all national parks. This proposal, being an enclave within Yalgorup NP has the potential to significantly increase these edge effects, thereby introducing negative impacts into the national park's core.

This area of Yalgorup NP is currently relatively inaccessible to people, which in turn provides a buffer to the core area of this important conservation reserve. The EPA does not believe that edge effects and the consequential impacts to the core of Yalgorup NP could be avoided and that the potential impacts to the park are both unmanageable and unacceptable.

The EPA is also of the view that development would interrupt the important north-south linkage that currently exists between the disjunct areas of the park. The proposal site is part of a vegetated habitat continuum and very little area remains on the Swan Coastal Plain where such linkages can be maintained. The regional significance of the site for ecological linkages has been recognised in the Swan Bioplan (EPA, 2010b) and the South West Regional Ecological Linkages Technical Report (Molloy *et. al.*, 2009).

Furthermore, the EPA believes that development within the enclave has the potential to impact regional significance through decline in the values of the Yalgorup NP. Clearing and the potential risks of weed invasion, disease and pathogens has the potential to spread into Yalgorup NP, decreasing the values of the national park over time. Increased fire frequency and/or changed fire regimes, particularly in areas with such high fuel loads are also likely given the introduction of people. Pressure to change conservation optimised fire regimes has occurred in other national parks where developments are sited in close proximity.

Summary

Having particular regard to the:

- (a) direct loss of regionally significant vegetation and flora;
- (b) significant impact of fragmentation and loss of fauna habitat for the regionally important fauna assemblages;
- (c) potential for significant indirect impacts to vegetation, flora and fauna;
- (d) susceptibility of Yalgorup NP to edge effects and the location of the proposal site as an enclave;
- (e) potential for a decline in environmental values to one of the most significant conservation reserves on the Swan Coastal Plain; and
- (f) fact that these potential impacts are unmanageable;

it is the EPA's opinion that the proposal is unlikely to meet the EPA's objective for biodiversity.

3.2 Water quality

Description

The proposal site is adjacent to Clifton, Boundary and Pollard Lakes which form part of the Peel/Yalgorup system. This system is one of nine wetland areas within Western Australia recognised under the Ramsar Convention. Within Lake Clifton, is the State and Federally listed *Thrombolite Community of a Coastal Brackish Lake*. This community is listed as critically endangered by both State and Federal Governments.

The thrombolite community occurs in a 15 km long and 15 m wide zone on the north eastern edge of the lake. Thrombolites are a type of microbialite, which are discrete organosedimentary structures formed by the activities of specific benthic microbial communities. Cyanobacteria and eukaryotic microalgae photosynthesise and precipitate calcium carbonate (limestone), which lead to the formation of rock-like structures. Microbialites are one of the oldest life forms on Earth. The thrombolite community relies on continuous groundwater inputs that are low in salinity and nutrients, but highly alkaline and rich in calcium and bicarbonate ions (Threatened Species Scientific Committee, 2010).

Significant changes to the lakes' water quality and quantity have occurred since the early 1980s. Within Lake Clifton nutrients have increased two to four-fold. Decreased groundwater input has caused salinity to double, and the lake has now changed from predominately hyposaline to hypersaline. Recent research has shown that the change in lake salinity has resulted in a shift in species composition of the thrombolites to more saline tolerant species. The historically dominant species of cyanobacteria important for microbial growth (*Scyonema cyanobacterium*) is no longer present. It appears that thrombolite growth does not seem to be occurring (J. Alexander *pers. comm.*, 2011).

The increasing nutrients in the lake have resulted in the growth of benthic microbial mats and an increase of the presence and abundance of the macroalgae *Cladophora*, which appears to be out-competing and smothering the thrombolites. The low winter rainfall in 2010 has meant that salinity levels have remained high in Lake Clifton and the presence of *Cladophora* has also increased significantly (J. Alexander *pers. comm.*, 2011).

The thrombolites are under increasing pressure and were listed in 2010 as critically endangered under the EPBC Act. In its listing advice, it is stated that increasing salinity from increasing groundwater extraction and altered groundwater flows are the current greatest threat to the ongoing growth and survival of the thrombolite community. They further state that increased nutrient levels coming from adjacent agricultural and rural-residential properties are the other main threat (Threatened Species Scientific Committee, 2010).

The direct threats and impacts to the Yalgorup Lakes and the thrombolite community from the proposal relate to the extraction of groundwater for domestic purposes and a decline in water quality resulting from the discharge of nutrients from households. The proponent proposes that each of the 24 lots would be limited to 1500 kL/annum of groundwater abstraction and serviced by an anaerobic treatment unit (ATU) sewage system.

The proponent undertook hydrological modelling of the proposed development to assist in providing confidence regarding the potential environmental impacts. The proponent compared the potential nutrient impacts of the subdivision scenario to those of cattle grazing, which they deem as a valid use should the rural subdivision proposal not proceed.

As a result of the modelling, the proponent believes there is a low probability that the development would have a measurable impact on Lake Clifton. At the end of the 100 year modelling period, the model predicts the following impacts:

- no addition of any salt load;
- total phosphorus generated by the addition of the ATUs is small and likely to be adsorbed by the soil;
- total nitrogen concentrations are predicted to increase by 6% or 15 kg/yr in comparison to the existing levels; and
- no change to water levels in Lake Clifton or its groundwater catchment (ENV Australia, 2010).

The cattle grazing scenario modelled by the proponent used a moderate stocking rate in accordance with the Department of Agriculture guidelines and only proposed grazing within 397 ha of the total 975 ha. Grazing was not modelled in areas of high conservation significance including habitat for the GSM, areas of TEC, Declared Rare Flora, wetlands or buffers to key conservation features. However, some of the area modelled in the grazing scenario included habitat for other threatened species (e.g. Carnaby's black cockatoo) and PECs. The results of the modelling show that the total nitrogen export to Lake Clifton at the end of the 100 year modelling period is predicted to be 1,910 kg/yr (ENV Australia, 2010).

To assist with the confidence in the groundwater model outputs, the proponent contracted the Commonwealth Scientific and Industrial Research Organisation (CSIRO) to be involved in model development. CSIRO concluded that the model and modelling results *“present a creditable, state of the art assessment in respect of the likely effects of the proposed development at eastern Lake Clifton on nutrient loadings to Lake Clifton itself”* (ENV Australia, 2009, Appendix G, p 1).

At the request of the EPA, additional scenarios were modelled as part of the Response to Submissions report. These scenarios predict that nitrogen export to Lake Clifton would increase based on factors including additional nitrogen inputs at source, specific climate change factors and a shift in the groundwater divide. The proponent has not provided total nitrogen loadings

from these additional scenarios however the total nitrogen loading would increase beyond the 15 kg/yr modelled in the development case.

Submissions

Submissions were received from the public, community groups and government agencies. Submissions raised a number of similar issues including:

- significant concern regarding the declining health of the thrombolite community and the potential for the proposal to further impact the community;
- concern that changes to water quality and quantity could affect the health of the remaining tuart trees;
- that potential changes in lake levels due to the proposal could impact wader species of birds, including the hooded plover;
- that enforcing water usage (1,500 kL/annum of groundwater extraction) would be unenforceable once the lots were sold;
- the subdivision scenario presented was a 'best case' scenario and didn't consider climate change or changes to model parameters;
- that the agricultural scenario presented was not relevant as it is a future use and future potential uses are not the appropriate basis for environmental impact assessment;
- that the predicted changes to the water quality did not take adequate consideration of the wetland values, functions, attributes, nutrient additions or climate change;
- the PER did not provide sufficient basis for the conclusion that the thrombolites would not be impacted by the proposal; and
- the veracity of the model made it difficult to rely on the predictions presented.

Assessment

The EPA's environmental objective for this factor is to maintain the quantity and quality of water so that existing and potential environmental values, including ecosystem maintenance, are protected.

The veracity of the hydrological modelling and its acceptability for environmental impact assessment was a significant issue raised in the assessment process.

Issues raised by the Department of Water in its initial review included the average error ratings (which were between 15-30%) and the inadequate data to verify the model. Consequently, the proponent was advised that it was expected to collect further data during the public review stage of the PER to allow for verification of the model and for the proponent to also undertake additional scenarios, including those regarding climate change and changes to abstraction and nutrient loading. Further data was collected over an 18 month period and the average absolute error for the verification flow model was 4%, which is within accepted guidelines.

The DEC also provided advice on the modelling, stating that all hydrological components had not been incorporated into the model including subsurface flows, hydraulic connectivity between the lakes and the karstic nature of the area. The DEC advised that adequate information and hydrological modelling to understand the pre-development water balance were not presented and therefore it wasn't possible to determine whether the development would *"maintain the water balance as close to pre-development conditions as possible"* in accordance with EPA Guidance Statement 28.

The DEC further advised that the lack of sufficient time series data to verify the model compromised the reliability of its predicted outputs. The DEC did not believe the PER provided convincing monitoring data nor a rigorous and accurate hydrological model and therefore did not meet the requirement of the objective in the ESD to "confirm the conceptual hydrogeological model of the flow system." The DEC did not consider that the conceptual model for the groundwater system was confirmed and therefore the hydrology of the system was understood. In reviewing the additional work undertaken as part of the Response to Submissions report, the DEC did not consider that the hydrological issues raised previously had been addressed and that uncertainties remained in the water balance components modelled and that these needed to be included in the model to significantly reduce uncertainty and increase confidence in the predicted impacts.

The hydrogeology of the area is extremely complex due to variations in the differing hydraulic properties of the underlying geology. All the lakes are below sea level and act as groundwater sinks and have no inflow or outflow channels. Water levels are therefore maintained by direct precipitation, localised run off and groundwater, which is the primary water source. Hydraulic connectivity exists between the lakes, the groundwater and ocean (ENV Australia, 2009). This complexity is difficult to model.

All numerical modelling has an inherent uncertainty and differing opinions regarding the veracity and predictive capability of the model have been received by the EPA. The EPA believes that due to the complexity of the geology, reducing the uncertainty and improving its predictive capacity would prove difficult and the collection of further data and modelling may still not resolve these differing opinions.

On balance and based on a review of the proponent's information and advice received from other agencies, the EPA believes that overall the predictions regarding the nutrient and water balance impacts of the proposed development to Lake Clifton are considered reasonable.

The EPA considers that the impacts of the proposal on Lake Clifton are primarily determined by water extraction and nutrient inputs at the source and the number and location of these sources. In this particular case, it is noted that the groundwater extraction is for domestic use and that nutrient sources are primarily about domestic effluent and grey water entering the superficial aquifer. The proponent has committed to locating sources at least 300 meters away from Lake Clifton and the EPA considers this to be an acceptable buffer

width to mitigate the domestic impacts. Out of the 24 lots, there are approximately 12 lots which are likely to extract water destined to flow into the lake and provide a source for nutrient inputs into the lake. The other lots would discharge into the ocean. The EPA notes however that under some climate change scenarios, the number of lots impacting the lake could increase up to 24.

Guidance Statement 28 *Protection of the Lake Clifton Catchment* provides an overall objective for all new developments. This objective is “*that new developments be managed so that phosphorus and nitrogen export to the lake is negligible. A net reduction at least should be achieved*”. In 1999, the Waters and Rivers Commission estimated that the total annual nitrogen load to Lake Clifton from the catchment was approximately 15,000 kg/yr. In this context the nitrogen export to Lake Clifton from the rural subdivision could be considered negligible, although the EPA notes that it is not a net reduction.

The EPA, in considering the negligible impacts to Lake Clifton predicted by the proponent, believes that successful and ongoing management of nutrient inputs in the long-term is fundamental to ensuring maintenance of the negligible impact prediction.

Summary

Having particular regard to the:

- (a) advice received from agencies and the inherent uncertainty in numerical modelling;
- (b) negligible nitrogen loading predicted by the proponent’s numerical modelling;
- (c) buffer distance to the wetland; and
- (d) importance of ensuring long-term and effective management of nutrients;

it is the EPA’s opinion that it is likely that the EPA’s environmental objective for this factor could be achieved provided conditions are imposed requiring the proposal to:

- 1) Specify the location of the building envelopes and hence ATUs.
- 2) Limit groundwater extraction for each household to 1,500 kL/annum.
- 3) Prohibit gardens or lawns that would require any additional nutrients, fertilisers or groundwater.
- 4) Prohibit the grazing of cattle or other livestock, including on lots with already cleared pasture land.

3.3 Environmental principles

In preparing this report and recommendations, the EPA has had regard for the object and principles contained in s4A of the *Environmental Protection Act*

1986. Appendix 4 contains a summary of the EPA's consideration of the principles.

4. Other Advice

4.1 Continuing pressures on the Lake Clifton thrombolite community

The EPA is particularly concerned that the thrombolite community is in serious decline, caused by existing and increasing land use and development. Cumulative catchment pressures have resulted in a two to four fold increase in nutrients and a doubling of salinity since the 1980s. Climate change and developments will continue to place further pressures upon Lake Clifton and the thrombolite community.

Microbialites are now restricted to only a few places in the world and the community within Lake Clifton is the largest known example of a living non-marine microbialite community in the southern hemisphere. The current threats to the community are impacting an environmental asset of international and national importance and recent species loss and the apparent inability of the thrombolites to successfully grow highlight the need to urgently define and address the impacts occurring from existing developments.

The EPA would like to reiterate its advice provided as part of the Dawesville to Binningup Report that the current land management practices which are causing reductions in either groundwater quantity or quality should be rectified now to prevent further decline. Furthermore the Department of Water should establish a comprehensive and targeted monitoring program for key indicators of ground and surface water quality and quantity around the Yalgorup Lakes system, to detect trends and impacts from land use activities in the catchment.

4.2 Consolidation of Yalgorup NP

It is the EPA's preference to see the proposal site incorporated into Yalgorup NP as the site is within an enclave and has significant environmental values. The proposal site is one of the only remaining vegetated enclaves west of Lake Clifton, and is the last remaining area along the western boundary of Lake Clifton that remains in private ownership. The EPA believes this area should be incorporated into Yalgorup NP as a priority.

The DEC has also advised that the consequence of development proceeding is that the conservation values of the site would diminish over time and make the site unsuitable for incorporation into Yalgorup NP. The DEC has also advised the EPA that it remains interested in the acquisition of the site for inclusion in Yalgorup NP. This position is consistent with the EPA's advice provided in the Dawesville to Binningup Report.

4.3 Requirement for a second egress

A second egress to the proposal site is required by the Fire and Emergency Services Authority (FESA) should development proceed on the site. This issue remains unresolved as FESA has advised that it would be unlikely to approve a fire management plan for the site that does not include a second egress. The FESA has also advised that a fire bunker is not considered an appropriate alternative. The location of the proposal within an enclave of Yalgorup NP highly constrains the ability for a suitable and environmentally acceptable second egress to be implemented. The EPA does not support a second egress being created through the national park.

4.4 Cattle grazing as a potential future use

The EPA notes that the proponent undertook hydrological modelling of a cattle grazing scenario, deeming it as a valid use should the rural subdivision proposal not proceed. Based on advice from the DEC, the EPA advises that should the proponent wish to recommence cattle grazing in the future which involves the clearing of any native vegetation (regardless of vegetation condition) then a clearing permit is required under the EP Act.

The Commonwealth Department of Sustainability, Environment, Water, Population and Communities has advised that should the proponent wish to recommence cattle grazing as modelled in the PER, it is likely to require referral as it has the potential to impact matters of national environmental significance.

Appendix 1

EPA assessment of regional significance

Natural Area Assessment Sheet

Lots 1000, 2240, 2275, 2675 and 3045 Preston Beach Road, Lake Clifton

Background

A Natural Area Assessment Sheet delineates the natural values of a site against the six criteria used to identify regionally significant natural areas in EPA Guidance Statement 10 (EPA 2006). Information, such as regional datasets and area specific surveys, is considered against the criteria to determine which criteria are met.

INFORMATION	COMMENT
Background Information	
Area Name	Lake Clifton
Location	Lots 1000, 2240, 2275, 2675 and 3045 Preston Beach Road, Lake Clifton
Size (ha)	975.2 ha
Reason for assessment	Determination of regional significance

Environmental Considerations	
General Policy	
Environmental Protection Policies (eg. SCP Lakes)	EPP Lakes within and adjacent to proposal area.
Existing System 6 area	No
Adjacent System 6 Area	C54 - Yalgorup National Park
Submission System 6 Update	No
Others	No
Previous Environmental Assessments	
Relevant Structure Plans/ODPs etc.	Coastal and Lakelands Planning Strategy (WAPC 1999) Peel Region Scheme
DAs/Subdivisions	2002 subdivision submission to EPA withdrawn – no details available
Mineral Extraction	Unknown
Previous EPA advice	s16e – Dawesville to Binningup Region. s48a – Peel Region Scheme. EPA Bulletin 788 - Criteria of environmental acceptability for land use proposals within the catchment of Lake Clifton. EPA Guidance Statement 28 – Protection of the Lake Clifton Catchment. Environmental Protection Bulletin 12 – Peel Regionally Significant Natural Areas.
Other	N/A

Environmental Considerations - Natural Attributes	
Landforms	
Swan Coastal Plain - Quindalup and Spearwood Dune System, Vasse System Estuarine and Lagoonal Deposits.	
Vegetation & Flora	
Area Specific	
Vegetation & Flora Survey	ENV Australia (2009). <i>Clifton Beach Flora and Vegetation Assessment</i> . City of Mandurah. Unpublished report prepared for Cape Bouvard Investments. Trudgen, M. (1991). <i>A Flora and Vegetation Survey of the Coast</i>

	<p><i>of the City of Mandurah</i>. Department of Planning and Urban Development, Perth.</p> <p>Trudgen, M. (1997). <i>The Occurrences and Potential Occurrences of Rare and Priority Flora on Access Options to the Cape Bouvard Investments Block Near Boundary Lake</i>. Perth, WA.</p> <p>Weston (1998a) Vegetation Survey of the Eastern Part of Lake Clifton West- Location 4185 and parts of Locations 2240, 2275, 2657, 3045, 4981 and 5182.</p> <p>Weston (1998b) <i>Potential Rare Flora in the Proposed White Hill Road to Lake Clifton West Access Road Route Corridor</i>.</p> <p>Weston, A.S. (1998c). <i>Floristic Community Types and Comparable Vegetation Units in the Proposed White Hill Road to Lake Clifton West Access Road Route Corridor</i>. Perth, WA;</p> <p>Weston, A.S. (1998d). <i>Comparisons of Vegetation, Flora and Rare Flora of Proposed Exchange Areas in Lake Clifton West and Yalgorup National Park</i>. Perth, WA.</p> <p>Weston, A.S. (2003). <i>Vegetation and Flora of the Cape Bouvard Land Holding Lake Clifton West</i>. City of Mandurah, WA.</p>
Summary of findings	<p>Vegetation Swan Coastal Plain - 28% remaining, 18% in formal and informal reserves (2001 values).</p> <p>Area native remnant vegetation/Vegetation Condition: Site mostly vegetated (975.2ha lot area total). Excellent to Degraded Condition.</p> <p>Total Flora: 273 taxa.</p> <p>Significant Flora: <i>Eucalyptus argutifolia</i> was found during the survey which is a Vulnerable species pursuant to section 178 of the Environment Protection and Biodiversity Conservation Act (EPBC Act1999)and gazetted as Declared Rare pursuant to subsection 2 of section 23F of the Wildlife Conservation Act (WC Act 1950). Priority 3 species <i>Stylidium maritimum</i> also identified on site.</p> <p>Weston (2003) identified the two species above as well as: "<i>Hibbertia spicata</i> subsp. <i>leptotheca</i> (P3), <i>Hakea</i> sp. Yalgorup (P4) and <i>Acacia truncata</i> (Yalgorup form) in the inland, eastern part of the study area, on limestone, and <i>Astroloma microcalyx</i> (P2) and <i>Stylidium maritimum</i> (P3) and <i>Acacia truncata</i> (Yalgorup form) in the western, Quindalup Dunes."</p>
Vegetation & Flora Survey Limitations	<p>Report specific No limitations listed expected to impact on survey results.</p> <p>Information available Vegetation complex extent estimated from dated photos and may over-represent native vegetation remaining at present. Approximately 10% of WA flora is undescribed – taxonomic identification was undertaken with best available information</p>

Regional	
Vegetation Complex	<p>Swan Coastal Plain</p> <p>Quindalup Complex - coastal dune complex consisting of the strand and fore dune alliance and the mobile and stable dune alliance. 47.1% remaining with 5.2% in secure tenure.</p> <p>Cottesloe Complex – Central and South - mosaic woodland of <i>Eucalyptus gomphocephala</i> and open forest of <i>Eucalyptus gomphocephala</i> – <i>Eucalyptus marginata</i> – <i>Corymbia calophylla</i>, closed heath on the limestone outcrops. 41.1% remaining with 8.8% in secure tenure.</p> <p>Yoongarillup Complex - woodland to tall woodland of <i>Eucalyptus gomphocephala</i> with <i>Agonis flexuosa</i> in the second storey. 40.1% remaining with 13.9% in secure tenure.</p>
Vegetation types (Beard/Smith/Hopkins)	<p>Vegetation association 1007 (Mosaic: Shrublands; <i>Acacia lasiocarpa</i> & <i>Melaleuca acerosa</i> heath / Shrublands; <i>Acacia rostellifera</i> & <i>Acacia cyclops</i> thicket) – 71% remaining, 11% in reserves.</p> <p>Vegetation association 998 (Medium woodland; tuart) – 38% remaining, 40% in reserves.</p> <p>Vegetation association 125 (Bare areas; salt lakes) – 17% remaining, 38% in reserves.</p>
Floristic Community Types (FCT) *type inferred	<p>S11 – Northern <i>Acacia rostellifera</i> – <i>Melaleuca systena</i> shrublands.</p> <p>SCP17 – <i>Melaleuca raphiophylla</i> – <i>Gahnia trifida</i> seasonal wetlands.</p> <p>SCP18 – Shrublands on calcareous silts. (Vulnerable TEC at the state level, not listed by the Commonwealth).</p> <p>SCP21a – Central <i>Banksia attenuata</i> – <i>Eucalyptus marginata</i> woodlands.</p> <p>SCP25 - Southern <i>Eucalyptus gomphocephala</i> -<i>Agonis flexuosa</i> woodlands (Priority 3).</p> <p>SCP26a – <i>Melaleuca huegelii</i> – <i>Melaleuca acerosa</i> shrublands on limestone ridges (Endangered TEC at the state level, not listed by the Commonwealth).</p> <p>SCP26b – Woodlands and mallees on limestone.</p> <p>SCP27 – Species poor mallees and shrublands on limestone (only identified within Yalgorup National Park).</p> <p>SCP29a - Coastal shrublands on shallow sands (Priority 3).</p> <p>SCP29b - <i>Acacia</i> shrublands on taller dunes (Priority 3).</p> <p>SCP30b – Quindalup <i>Eucalyptus gomphocephala</i> and / or <i>Agonis flexuosa</i> woodlands (Priority 3, northern extension of range).</p>
National/International Significance	<p><i>Eucalyptus argutifolia</i> – Vulnerable (EPBC Act 1999), DRF (WC Act 1950). Disjunct population – commonly identified north of Perth.</p>

Other Special Attributes

- The site contains Tuart Woodlands in a variety of conditions from Poor to Excellent (ENV 2009). Tuart trees with intact canopy (good foliage cover and/or canopy structure) in this area are regionally significant. The ENV (2009) assessment of the tuart woodlands and shrublands on the proposal site show recovery from tuart decline since 2003.
- The vegetation of the limestone areas is of high conservation value, due to the diversity of vegetation types, the presence of two Threatened Ecological Communities (TECs) and a species of Declared Rare Flora and the generally good condition of the vegetation.
- The vegetation of the Quindalup dunes is of high conservation value as older phases of Quindalup Dunes are inadequately reserved on the Swan Coastal Plain. Commonly, the primary dune between 50-100m of the coastline is usually the only area retained in Public or Regional Open Space. Phases on the Quindalup Dunes relate to establishment of vegetation and stability of dunes, i.e. the vegetation becoming more diverse as the dune system becomes more stable.
- Previously SCP30b was only identified found south of this area. The identification of SCP30b on the site is the northern-most known occurrence of this community

Fauna

Area Specific

Fauna Survey	Three level 2 vertebrate fauna surveys: (Tingay 1998, Bamford 2003, ENV 2007).
Summary of findings	<p>67 bird species recorded including two Schedule 1 species (Carnaby’s Black-Cockatoo and Baudin’s Black-Cockatoo), and at least 19 species listed as conservation significant on the Swan Coastal Plain (including Emu, Whistling Kite, Brown Falcon, Australian Owlet Nightjar, Splendid Fairy Wren, White-browed Scrubwren, Scarlet Robin, Western Yellow Robin, Golden Whistler, Weebill, Grey Currawong, Western Thornbill, Broad-tailed Thornbill and Whistling Kite. Other significant bird species are likely to occur.</p> <p>Seven native mammal species recorded including one listed as Conservation Dependent by DEC. Other mammal species likely to occur including species listed either as Vulnerable under the EPBC Act and/or listed as Schedule 1 under the WA Wildlife Conservation Act (Western Ringtail Possum, Brush-tailed Phascogale) and DEC Priority listed fauna species (Western False Pipistrelle and Western Brush Wallaby).</p> <p>28 reptile species recorded including three DEC Priority listed species (<i>Lerista lineata</i>, <i>Neelaps calonotus</i>, and Carpet Python) and three regionally significant Swan Coastal Plain species (<i>Ctenophorus adelaidensis</i>, <i>Delma grayii</i>, <i>Egernia napoleonis</i>, <i>Demansia psammophis</i>).</p> <p>Twenty other reptile species likely to occur.</p> <p>Six amphibian species recorded and five other species likely to occur.</p> <p>The Threatened Graceful Sun Moth has significant populations in the region.</p>
Fauna Survey Limitations	Limited to assessments. Additional surveys at other seasons would increase the number of species known to occur.

Linkage Values

This site has a significant role in facilitating fauna movement between different parts of Yalgorup National Park, provides replicates of fauna habitat and helps to maintain genetic movement between different areas.

Regional

National/International	Three species protected under the <i>EPBC Act 2005</i> , Carnaby’s
------------------------	--------------------------------------------------------------------

Significance	Black-Cockatoo (Endangered) and Baudin's Black-Cockatoo (Vulnerable) and Graceful Sun Moth, all are also listed as Schedule 1 species.
Linkage Values	
Significant ecological linkage values. Stated in South-West Ecological Linkages project and EPA s16e advice (2010).	
Further field survey	YES: Additional surveys at appropriate times of year are likely to find a considerable number of additional species some of which would be of regional significance.
Wetlands, Creeklines, Rivers, Estuaries	
Type	Lake Clifton, Lake Pollard, Boundary Lake
Management Category	Conservation, EPP Lakes, Ramsar Wetlands
Suite	Unknown
Conclusions from survey	Wetlands of National and International Importance

Consideration Against Criteria	Criterion Met
Representation of Ecological Communities	YES
<i>Regional vegetation representation</i>	
Vegetation Complexes	Three; Quindalup Complex, Cottesloe Complex, Yoongarillup Complex.
Floristic Community types	11 FCTs on site – Two TECs, four PECs and one FCT with a restricted range. SCP18 – Shrublands on calcareous silts. (Vulnerable TEC at the state level, not listed by the Commonwealth) SCP26a – <i>Melaleuca huegellii</i> – <i>Melaleuca acerosa</i> shrublands on limestone ridges (Endangered TEC at the state level, not listed by the Commonwealth) SCP25 - Southern <i>Eucalyptus gomphocephala</i> - <i>Agonis flexuosa</i> woodlands (Priority 3) SCP29a - Coastal shrublands on shallow sands (Priority 3) SCP29b - <i>Acacia</i> shrublands on taller dunes (Priority 3) SCP30b – Quindalup <i>Eucalyptus gomphocephala</i> and / or <i>Agonis flexuosa</i> woodlands (Priority 3) SCP27 – Species poor mallees and shrublands on limestone (only identified within Yalgorup NP area).
Uplands and Wetlands	Both - wide variety of landforms and topography.
Habitats	
<i>Size and Shape</i>	
Part of a larger remnant (Yalgorup National Park), which is a long thin remnant, 13,137 hectares total. The proposal may negatively impact on the larger remnant as it is within the larger remnant, effectively making two smaller remnants. Impacts due to edge effect, fragmentation and improving access pressures are likely.	
<i>Vegetation Condition</i>	
Excellent to Degraded condition vegetation based on Bush Forever rating (Government of Western Australia 2000). ENV (2009) rates average vegetation condition across the site as Good.	
<i>Relationship/proximity to:</i>	
Naturally vegetated areas	Fragmented east-west corridor from coast to estuary, continuous north/south corridor
Protected areas	Yalgorup National Park to north, east and south, Indian Ocean to west.
Other regionally significant naturally	Peel-Harvey Estuary (Ramsar wetland) to east Other components of Yalgorup Lakes (Ramsar wetland) to the

vegetated areas	east) Lake Clifton Thrombolite community~2kms to the north-east.
<i>Contains areas suitable for ecological restoration</i>	The site is mostly intact and suitable for ecological restoration in degraded areas.
Comment: The site represents a variety of vegetation types found on Quindalup, Spearwood and Vasse landforms. It contains 11 floristic community types (7 of conservation significance), 68 local vegetation units and is a portion of a much larger and highly regionally significant remnant.	
Diversity YES	
Landforms	Three; Quindalup and Spearwood Dune System, Vasse System Estuarine and Lagoonal Deposits.
Vegetation Complexes	Three; Quindalup Complex, Cottesloe Complex, Yoongarillup Complex.
Floristic Community Types	Two TECs/Four PECs
Vegetation units	68 local vegetation units mapped. Condition varies from Excellent to Degraded, average condition is Good.
Flora	293 taxa, ~233 native and ~60 weed species
Habitats	
Fauna	High faunal richness and diversity including at least 67 bird species, seven native mammal species, six amphibian species and 28 reptile species. Other species known from the region and likely to be recorded during more comprehensive surveys
Comment: More work required to determine species richness and diversity.	
Rarity YES	
Vegetation Complex <10% remaining	Values for vegetation complexes are more than 30% remaining however these calculations are based on 1997 values and are therefore most likely much less in 2011. Inadequately reserved vegetation complexes - only Yoongarillup Complex has more than 10% (13.9%) in secure tenure, likely due to Yalgorup National Park reservation.
Threatened Ecological Communities	Two TECs (WC Act 1950) Four PECs (P3)
Flora	<i>Eucalyptus argutifolia</i> was found during the survey which is a Vulnerable species pursuant to section 178 of the EPBC Act 1999 and gazetted as Declared Rare pursuant to subsection 2 of section 23F of the WC Act 1950. Priority 3 species <i>Stylidium maritimum</i> also identified on site. Weston (2003) identified the two species above as well as: " <i>Hibbertia spicata</i> subsp. <i>leptotheca</i> (P3), <i>Hakea</i> sp. Yalgorup (P4) and <i>Acacia truncata</i> (Yalgorup form) in the inland, eastern part of the study area, on limestone, and <i>Astroloma microcalyx</i> (P2) and <i>Stylidium maritimum</i> (P3) and <i>Acacia truncata</i> (Yalgorup form) in the western, Quindalup Dunes part."
Habitats	
Fauna	Three species protected under the <i>EPBC Act 1999</i> (2011), Carnaby's Black Cockatoo (Endangered), Baudin's Black Cockatoo (Vulnerable) and Graceful Sun Moth, all are also listed as Schedule 1 species. One Priority listed mammal species (Quenda) and two Priority listed reptile species (Western Carpet Python and <i>Lerista lineata</i>). At least 19 other bird species are regionally significant on the Swan Coastal Plain.
Comment: A number of conservation significant flora, vegetation communities and fauna have been identified on site.	

Maintaining Ecological Processes and Natural Systems		YES
<i>Relationship/proximity to: Regional Ecological Link Creekline/River/Estuary</i>	East-West and North-South linkage present Ramsar wetlands adjacent and within the area.	
<i>Contains areas suitable for ecological restoration</i>	The site is mostly intact and suitable for ecological restoration in degraded areas.	
Size and Shape, Uplands and Wetlands & Vegetation Condition - see Representation of Ecological Communities		
Comment: One of the most significant conservation values of this area is that it consolidates areas of good quality fauna habitat for a diverse assemblage of vertebrate species including threatened and regionally significant species. It also provides for part of a vegetated habitat continuum through Yalgorup National Park. There is no other significant north/south ecological linkage such as this anywhere else along the coast between Dawesville and Binningup.		
Scientific or Evolutionary Importance		YES
Comment: Indirect impacts to the Lake Clifton Thrombolite community could impact the largest known occurrences of non-marine microbialites. This community is rare throughout the world and one of two occurrences in the Southern Hemisphere. Semeniuk (2009) found that <i>“under Geological World Heritage Criteria, the Yalgorup Plain is a page in the geoarchive of the history of the Earth. It demonstrates globally unique products of active and past process that include coastal and marine processes”</i> . Additionally, <i>“the wetlands of the area are, as an ensemble, unique globally because the style of development of landforms with Quaternary progradation of the limestone and quartz sand terrain appear to be globally unique. As such, globally, the wetlands of the Study Area are important, and at the National level very significant”</i> (Semeniuk 2009).		
General Criteria for the Protection of Wetland, Streamline and Estuarine Fringing Vegetation and Coastal Vegetation		YES
Comment: Coastline adjacent and Ramsar wetlands within and adjacent to proposal.		

SUMMARY NATURAL VALUES	
Regional Significance - Assessment area against the Criteria	
The area meets six of the six criteria for regional significance being Representation of Ecological Communities, Rarity, Diversity, Maintaining Ecological Processes and Natural Systems, Scientific or Evolutionary Importance and General Criteria for the Protection of Wetland, Streamline and Estuarine Fringing Vegetation and Coastal Vegetation.	
Summary Comment in relation to the proposal	
Yalgorup National Park is the most significant coastal reserve on the Swan Coastal Plain. The proposal would impact the significant north/south ecological linkage, vegetated habitat continuum, conservation significant flora and vegetation and displace significant fauna species.	

Appendix 2

List of submitters

Organisations:

City of Mandurah

Department of Environment and Conservation

Department of Planning – Peel Region

Department of Planning – State Strategic Policy

Department of Water

Friends of Ramsar Action Group for the Yalgorup Lakes Environment Inc.

Lake Clifton Herron Progress and Sporting Association Inc.

Mandurah Bird Observers Group

Peel Harvey Catchment Council Inc.

Peel Preservation Group Inc.

Shire of Waroona

Urban Bushland Council Inc.

Western Australian Naturalists' Club Inc.

Wildflower Society of Western Australia Inc.

Individuals:

P. Brown

L. Snell

Appendix 3

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Appendix 4

Summary of identification of key environmental factors and principles

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
BIOPHYSICAL			
Terrestrial flora and vegetation	Clearing of 114.5 ha of native vegetation for building envelopes, roads, firebreaks and fire bunker.	See section 3.1.	Terrestrial flora and vegetation is considered to be a relevant environmental factor and is discussed in section 3.1 – Biodiversity of the EPA’s report
Terrestrial fauna	Clearing of 114.5 ha of native vegetation and fauna habitats for building envelopes, roads, firebreaks and fire bunker.	See section 3.1.	Terrestrial fauna is considered to be a relevant environmental factor and is discussed in section 3.1 – Biodiversity of the EPA’s report
Wetlands	At least 15 kg/yr of nitrogen would be added to Lake Clifton from the rural subdivision.	See section 3.1 and section 3.2.	Wetlands is considered to be a relevant environmental factor and is discussed in section 3.1 – Biodiversity and section 3.2 – Water quality of the EPA’s report
Conservation area (Yalgorup NP)	Development to occur within an enclave	See section 3.1	Conservation area (Yalgorup NP) is considered to be a relevant environmental factor and is discussed in section 3.1 – Biodiversity of the EPA’s report
Costal processes and landforms	98 m coastal setback, construction and	Submissions from the public raised concerns regarding the susceptibility of the coast to erosion,	Revisions to Schedule 1 of the State Coastal Planning

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
	clearing on the Quindalup Dunes.	<p>primarily due to winter storms and surges and climate change, and whether the coastal setback proposed would be adequate to mitigate such impacts.</p> <p><u>City of Mandurah</u> The coastal setback proposed does not reflect current scientific knowledge with regard to sea level proposed. They do not support the setback proposed.</p> <p><u>Department of Planning</u> A better understanding of the coastal processes at this location would be desirable since part of the coastline is eroding and part of it is accreting. Excluding development from areas where the coastal setback extends further inland than the foreshore reserve is a reasonable approach provided the coastline is stable. A foreshore management plan should be prepared.</p>	<p>Policy 2.6 specifies that the minimum setback for consideration of sea level rise should be 98 m, effectively changing the setback for this site from 98 m to 150 m. However the proponent has identified the location of the building envelopes for each lot and no building would be within 150 m of the coastline.</p> <p>The requirement for a Foreshore Management Plan could be imposed by the WAPC as part of its approval process.</p> <p>Not considered a key environmental factor.</p> <p>Erosion impacts resulting from construction in the Quindalup Dunes are discussed in section 3.1 – Biodiversity.</p>
Karstic terrain and stygofauna and rootmat	Minimal area of karstic terrain impacted and no change in the	<p><u>DEC</u> These communities are likely to be sensitive to changes in groundwater quality and quantity and</p>	The modelling undertaken by the proponent showed no changes to water

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Key Environmental Factors
communities	hydrological regime.	therefore there could be justification to conclude extraction from any of the lots in the subdivisions is likely to impact on these communities.	balance and negligible nutrient impacts. Groundwater extraction would be limited to 1,500 kL/annum. Not considered a key environmental factor.
POLLUTION			
Water quality		See section 3.2.	Water quality is considered to be a relevant environmental factor and is discussed in section 3.2 – Wetlands of the EPA’s report
SOCIAL SURROUNDINGS			
Aboriginal heritage and culture	One site of Aboriginal significance registered with the Department of Indigenous Affairs is located in the north-east corner of the site. However no heritage values are expected to be affected by the proposal.	No submissions received.	The area containing the site of Aboriginal significance is proposed as an offset to be included within Yalgorup NP and therefore would not be disturbed by the proposal. In addition it is located wholly in one lot and therefore no significant impacts are considered likely. Not considered a key environmental factor.

PRINCIPLES		
Principle	Relevant Yes/No	If yes, Consideration
<p>1. The precautionary principle <i>Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.</i> <i>In application of this precautionary principle, decisions should be guided by –</i> <i>(a) careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and</i> <i>(b) an assessment of the risk-weighted consequences of various options.</i></p>		
	Yes	<p>The proposal would result in the direct loss and fragmentation of regionally significant flora and vegetation and fauna habitat.</p> <p>There is a significant risk that indirect impacts including weed invasion, disease and pathogens, erosion, fire and increased access by people could impact the regional significance of both the proposal site and the adjacent Yalgorup NP.</p> <p>The factor of biodiversity is considered in this report.</p>
<p>2. The principle of intergenerational equity <i>The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations.</i></p>		
	Yes	<p>The proposal would result in the loss of 114.5 ha of regionally significant vegetation and conservation significant fauna habitat and the loss of connectivity could reduce environmental productivity.</p> <p>The location of the proposal site within an enclave increases the risk that unmanageable impacts would impact the core of one of the most significant reserves on the Swan Coastal Plain.</p> <p>The factor of biodiversity is considered in this report.</p>
<p>3. The principle of the conservation of biological diversity and ecological integrity <i>Conservation of biological diversity and ecological integrity should be a fundamental consideration.</i></p>		
	Yes	<p>Loss of regionally significant fauna habitat for conservation significant species and assemblages could contribute to the loss of species.</p>

PRINCIPLES		
Principle	Relevant Yes/No	If yes, Consideration
		<p>Fragmentation and isolation of habitat areas could cause the loss of local fauna populations or limit the genetic diversity of populations.</p> <p>Loss of connectivity between areas of significant habitat could contribute to the loss of ecosystem integrity.</p> <p>The factor of biodiversity is considered in this report.</p>
<p>4. Principles relating to improved valuation, pricing and incentive mechanisms</p> <p><i>(1) Environmental factors should be included in the valuation of assets and services.</i></p> <p><i>(2) The polluter pays principles – those who generate pollution and waste should bear the cost of containment, avoidance and abatement.</i></p> <p><i>(3) The users of goods and services should pay prices based on the full life-cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste.</i></p> <p><i>(4) Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structure, including market mechanisms, which enable those best placed to maximize benefits and/or minimize costs to develop their own solution and responses to environmental problems.</i></p>	No	
<p>5. The principle of waste minimisation</p> <p><i>All reasonable and practicable measures should be taken to minimize the generation of waste and its discharge into the environment.</i></p>	No	

Appendix 5

Identified Decision-making Authorities

Identified Decision-making Authorities

Section 45(1) requires the Minister for Environment to consult with decision-making authorities, and if possible, agree on whether or not the proposal may be implemented, and if so, to what conditions and procedures, if any, that implementation should be subject.

The following decision-making authorities have been identified for this consultation:

Decision-making Authority	Approval
Western Australian Planning Commission	Subdivision approval

Appendix 6

Summary of Submissions and Proponent's Response to Submissions