Department of Environment and Conservation

Clearing Permit Decision Report

1. Application details

1.1. Permit application details

Permit application No.: 3161/1

Permit type: Area Permit

1.2. Proponent details

Proponent's name: Michele Monte

1.3. Property details

Property: LOT 52 ON PLAN 9474 (House No. 280 OLD YANCHEP CARABOODA 6033)

Local Government Area: City Of Wanneroo

Colloquial name:

1.4. Application

Clearing Area (ha)	No. Trees	Method of Clearing	For the purpose of:
18		Mechanical Removal	Horticulture

2. Site Information

2.1. Existing environment and information

2.1.1. Description of the native vegetation under application

Vegetation Description	Clearing Description	Vegetation Condition	Comment
Beard vegetation association 998: Medium woodland; tuart. 949: Low woodland; banksia (Hopkins et al., 2001, Shepherd et al., 2001). Heddle vegetation complex: Cottesloe Complex - Central and South: Mosaic of woodland of E. gomphocephala and open forest of E. gomphocephala - E. marginata - E. calophylla; closed heath on the Limestone outcrops (Heddle et al. 1980)	The applied area covers the whole of Lot 52 which has an overall vegetation condition rating of 'Very Good' (Keighery, 1994) condition. The vegetation consists of Banksia sp, Marri (Corymbia calophylla) and Jarrah (Eucalyptus marginata) over grasstrees (Xanthorrhoea sp) and small shrubs. The area around the shed on the eastern boundary has been subject to edge effects, resulting in the vegetation being in a more degraded condition. The condition of vegetation in the north eastern portion of the property appears to be in 'Excellent' condition, however there are signs of disturbance towards the base of the hill and near the centre of the applied area. The vegetation leading to the north western boundary is in a more degraded state and it appears as though the area may have had timber removed in the past. Mr Monte indicated that there had been approximately 35 cattle roaming the area in the past. There are signs of weeds within the applied area with some regrowth of Marri trees. The vegetation condition continues in a degraded state along the western boundary up until the midway point of the property. The vegetation towards the southern end of the western boundary does appear to get better. However the final 100m of the southern boundary suffers from a heavy weed presence which appears to have come from the neighbouring market garden south of the property. There is a road that traverses the centre of the property. An old abandoned shed is located towards the middle of the block and there is also a heavy weed presence in this area.	Very Good: Vegetation structure altered; obvious signs of disturbance (Keighery 1994)	The vegetation under application was cleared in 2007. The current condition of the vegetation is considered to be in degraded to completely degraded condition at the time of the site inspection (DEC, 2009). Provided that the measures contained within the Vegetation Conservation Notice are complied with, the environmental values that were present prior to clearing are likely to be restored. The vegetation will be considered for the purposes of this assessment in terms of its condition prior to being cleared, and therefore is considered overall to be in 'Very Good' condition (Keighery scale, 1994). The description of the vegetation within the applied area was obtained from a site inspection of the property on 5/5/2006 (TRIM ref DOC 6607). The vegetation was described at the time as 'The vegetation associated with Lot 52 overall is in good condition' with 'The eastern portion of the northern boundary shows vegetation to be in excellent condition however there are obvious signs of disturbance towards the base of the hill and the area close to the middle'.

3. Assessment of application against clearing principles

(a) Native vegetation should not be cleared if it comprises a high level of biological diversity.

Comments

Proposal may be at variance to this Principle

The area under application is 18 ha of native vegetation on Lot 52 Old Yanchep Road, Carabooda.

An application for the same area (CPS 675/1) was received in May 2005 and following an assessment of the environmental values was refused in December 2006.

The area currently under application was subsequently cleared in 2007. There is a vegetation conservation notice (VCN) over the property (CPS 2268/1). The clearing is currently under investigation. A site visit was undertaken in July 2009 to view the current regeneration of the vegetation (DEC, 2009a).

As determined in the site inspection carried out by the Department of Environment on 5 May 2006 the native vegetation that is under application to be cleared possessed significant environmental values. Provided the measures contained in VCN CPS 2268/1 are complied with, these environmental values are likely to be restored.

The property is in close proximity to Bush Forever Site 381 on the north eastern side and vacant blocks of native vegetation on the western side, which are in 'Very Good' to 'Excellent' (Keighery, 1994) condition. The vegetation on Lot 52 has an overall vegetation condition rating of 'Very Good' condition with some areas subject to edge effects or localised disturbance reducing the condition of the vegetation, while other areas remain in an 'Excellent' condition (DoE, 2006). Historically, there may have been selective timber harvesting and/or grazing within the area under application.

Additionally, 9 species of priority flora and 3 species of priority fauna have been recorded in the local area (5 km radius). No targeted flora, vegetation or fauna surveys were undertaken and it is considered the area under application has the potential to provide habitat for a range of fauna species.

Additional information provided by the applicant considers that the vegetation on site would not comprise a high level of biodiversity and although DEC agrees that the applied area had been subjected to some historical disturbance, no fauna, flora or vegetation surveys have been provided by the applicant to provide information regarding the natural values of the applied area, which averages as being in 'Very Good' condition. The adjacent Bush Forever site, although in better condition, comprises a rich array of fauna and potentially flora that may have occurred within the applied area and therefore, the proposed clearing may be at variance to this Principle.

Methodology

Bailey (2009)
DEC (2009a)
CALM (2006)
Government of Western Australia (2000)
Keighery (1994)
ANCA (1996)
EPA (2000)
GIS databases:
- Metro-North 20 cm Orthomosaic - Landgate 2006
- CALM Managed Lands and Waters - CALM 2005
- SAC Biodatasets - accessed July 2009
- Declared Rare and Priority Flora List - DEC 2008
- Heddle Vegetation Complexes - DEP 1995
- Pre European Vegetation - DA 2001
- Environmentally Sensitive Areas 2009
- NLWRA, Current Extent of Native Vegetation 2001

(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

Comments

Proposal is at variance to this Principle

As determined in the site inspection carried out by DoE on 5 May 2006 the native vegetation that is under application to be cleared possessed significant environmental values. Provided the measures contained in VCN CPS 2268/1 are complied with, these environmental values are likely to be restored.

The area under application includes 18 ha of native vegetation, described as being predominantly marri-jarrah woodland with areas of banksia and tuart, ranging from 'Degraded' to 'Excellent' (Keighery, 1994) condition. The area lies between the Gnangara-Moore River State Forest and Yanchep National Park. The area under application would be utilised by a number of fauna species as habitat for foraging, roosting and nesting.

There are two records of threatened fauna occurring within a 5 km radius of the applied area including Endangered Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) and a Critically Endangered invertebrate Crystal Cave Crangonyctoid (*Hurleya* sp.). A flock of Carnaby's Black Cockatoo was observed in flight over the applied area during the most recent site inspection (DEC, 2009a).

The Carnaby's Black Cockatoo is known to feed on a large variety of plants including Proteaceous species (e.g. banksia, dryandra and grevillea), marri nuts (*Corymbia calophylla*), jarrah (*Eucalyptus marginata*), tuart (*Eucalyptus gomphocephala*), species of Casuarina and a range of introduced species (Shah, 2006). The vegetation within the area under application includes suitable species for foraging and potentially for roosting and is therefore considered significant habitat for Carnaby's Black Cockatoo.

The proposal will impact on vegetation connectivity, particularly to the north and east, and reduce the available habitat for local fauna populations. The Bush Forever site to the northeast has been surveyed for fauna and 134 species of birds, 15 species of mammals, and 47 species of reptile were listed. It is considered that the applied area may not have an equally diverse faunal assemblage but it is indicative of the diversity present in the local area, which would have utilised the vegetation.

Additional information provided by the applicant includes an assessment of the potential food source for Carnaby's Black Cockatoo provided by banksia trees within the applied area. The applicant considered that the Banksias could support 2.2 Carnaby's Black Cockatoos for a year and would be a minor impact on feeding and roosting habitat. DEC accepts the calculations made by the applicant's consultant, however does not concur with conclusion that this is not significant habitat. DEC considers that the estimated 800 food trees providing 2.2 cockatoos years worth of food is a significant amount. DEC has calculated that this equates to enough food to sustain a flock of 50 cockatoos for 16 days on end. Given flock sizes on the Swan Coastal Plain in recent years, this is (was) a significant food source. Additionally, the location of the applied area is significant, as it is close to the pines plantations and remnant vegetation to the northwest and east. Carnaby's Cockatoo will readily fly over small sections of open space if they can see suitable foraging habitat at the other end. The loss of this site was important (DEC 2009c). Incremental loss of banksia woodlands through the clearing of individual areas will cause a restriction in the availability if food sources on the Swan Coastal Plain to the detriment of the cockatoos. The significance of any individual area cannot be quantified completely as the system operates as a whole.

Given the significant habitat the area under application provides for Carnaby's Black Cockatoo, it is considered that the proposed clearing is at variance with this Principle.

Methodology

Bailey (2009)
CALM (2003)
CALM (2006)
DEC (2009a)
DEC (2009b)
DEC (2009c)
EPBC Act (1999)
Keighery (1994)
Shah (2006)
Templeman (2008)
GIS databases:
- Swan Coastal Plain North 20cm Orthomosaic - Landgate 2006
- DEC Managed Lands and Waters - DEC 2009
- Mattiske Vegetation 1998
- SAC Biodatasets - accessed July 2009
- Hydrography linear - DOW 2006
- Hydrography linear (hierarchy) - DoW 2006

(c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.

Comments

Proposal is not likely to be at variance to this Principle

As determined in the site inspection carried out by DoE on 5 May 2006 the native vegetation that is under application to be cleared possessed significant environmental values. Provided the measures contained in VCN CPS 2268/1 are complied with, these environmental values are likely to be restored.

There are records for occurrences of one declared rare flora (DRF) taxon and 12 priority flora taxa within a 10 km radius of the applied area. The area under application includes 18 ha of native vegetation predominantly marri-jarrah woodland with some areas of banksia and tuart, ranging from 'Degraded' to 'Excellent' (Keighery, 1994) condition.

DRF species Eucalyptus argutifolia, which has been recorded within 10 km of the proposed clearing is 1.5m

to 4m high, has smooth bark and white flowers between March and April and it occurs on shallow soils over limestone in slopes or gullies of limestone ridges and outcrops. Populations of this DRF species have been recorded to the north, north-west and south-east of the area under application (DEC, 2009).

Two distinctive soil types have been described for the application area and were confirmed through a site visit, which noted the majority of the property showing yellow deep sands (DAWA, 2005) and are described as Spearwood sand phase over limestone and extends over approximately 70% of the area applied to be cleared. The second unit is Karrakatta sand yellow phase, described as undulating dunes on aeolian sand over limestone and covers approximately 30% of the area to be cleared (DAWA, 2005).

Given the soil types and substrate noted to occur within the applied area (DAWA, 2005), and the preference of Eucalyptus argutifolia for shallow soils over limestone, there was potential for this species to occur within the applied area.

Additional information provided by the applicant suggested that it was unlikely that DRF species Eucalyptus argutifolia existed within the applied area based habitat preferences. Records of the WA Herbarium hold 35 collections for the taxon which variously describe the habitat of this taxon as 'sand over limestone', 'sand dunes' and 'limestone cliffs'. DEC considers that the habitat within the applied area may not have been suitable for this taxon and therefore the proposed clearing is not likely to be at variance to this Principle (DEC 2009c).

Methodology

Bailey (2009)
CALM 2006
DEC (2009c)
Keighery 1994
DAWA 2005
WA Herbarium (1998-2009)
Mattiske Consulting (1998)
GIS databases:-
- Heddle Vegetation Complexes - DEP 1995
- Swan Coastal Plain North 20cm Orthomosaic - Landgate 2006
- Declared Rare and Priority Flora List - DEC 2008
- Pre-European Vegetation - DA 2001
- SAC Biodatasets - accessed July 2009
- Soils, Statewide DA 1999

(d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.

Comments

Proposal may be at variance to this Principle

As determined in the site inspection carried out by DoE on 5 May 2006 the native vegetation that is under application to be cleared possessed significant environmental values. Provided the measures contained in VCN CPS 2268/1 are complied with, these environmental values are likely to be restored.

There are 37 occurrences of threatened ecological communities (TECs) within a 10 km radius of the applied area, comprising 58 study sites which make up four TEC types (CALM 2006). The closest TEC is located 675m west of Lot 52 and is representative of the Caves SCP01 described as Aquatic Root Mat Community Number 1 of Caves of the Swan Coastal Plain. It is groundwater dependent and is particularly sensitive to hydrological change. A 1000 m radius from SCP01 is considered as the zone in which there is likely to be significant hydrological and other potential impacts from clearing and the associated changes in land use that may affect this TEC (CALM 2006). Additionally, recent hydrological advice (DEC 2009b) has indicated that caves and cave-dwelling fauna may also be adversely affected by the removal of 18 ha of native vegetation.

TEC type SCP26a is also located within close proximity (1.7 km) and is described as Melaleuca huegelii - Melaleuca acerosa shrublands on limestone ridges (CALM 2006). During the 2009 site visit (DEC 2009a) significant amounts of surface and stockpiled limestone was observed within the applied area.

A water monitoring bore (YN8) is located approximately 1.3 km from the proposed clearing area. The result of changes of land use (pine plantations), groundwater extraction (horticulture; Water Corporation; Yanchep National Park) and rainfall trends is that water levels in this monitoring bore are trending downwards (Peck 2006). Peck (2006) also noted that "the reduction of net recharge to the superficial formations at the proposed market garden would result in an increased rate of fall of the water table in the region of monitor bore YN8 unless compensated by other factors such as extensive logging of nearby pine plantations, or increased rainfall". A hydrological report provided with the clearing application noted that peak drawdown at caves in close proximity to the applied area would be reduced with the addition of a new bore and reduced extraction from existing bores (Rockwater 2009).

Furthermore, Department of Water (WIN) data from bores within a 2 km radius of the applied area show total nitrogen of up to 50 ppm/mg/L indicating leaching of nitrates into the groundwater. A recent assessment of hydrogeochemistry in superficial aquifers of the Perth metropolitan area (Yesertener 2009) found high nitrate

concentrations in the Carabooda area due to intensive horticulture, and that these excessive nitrate concentrations are extending over an increasingly widespread area. Increased phophorus concentrations were also recorded within the Carabooda vicinity and it is not known whether the adsorption capacity of some of the soil in the area has been exceeded.

Additional information provided by the applicant concurs that the Critically Endangered TEC (cave YN555) is located to the west of the proposed clearing. DEC accepts that groundwater modelling provided by the consultant shows that water drawdown may be reduced if changes in the groundwater abstration proposed by the applicant were initiated however, no additional information was provided in relation to groundwater quality.

The consultant for the applicant has stated in their documentation that the property is at least 1.6 km upgradient of the nearest significant water quality-sensitive ecosystem (Wilgarup Lake). Yet the map provided by the applicant's consultant shows that the Critically Endangered TEC (cave YN555) is less than 1 km down hydraulic gradient (DEC 2009d) and therefore could be influenced hydrologically by activities undertaken within the applied area.

Therefore the proposed clearing may be at variance to this Principle.

Methodology

Bailey (2009)
CALM (2003)
CALM (2006)
DEC (2009d)
Department of Water (2009)
A.J. Peck and Associates (2006)
Rockwater Pty Ltd (2009)
TEC Database (Accessed July 2009)
Yesertener (2009)
GIS databases:
- Threatened Ecological Communities DEC 2009
- Pre-European Vegetation - DA 2001
- SAC Biodatasets - accessed July 2009
- Mattiske Vegetation 1998
- Heddle Vegetation Complexes - DEP 1995
- Soils, Statewide DA 1999
- WIN database 2009

(e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

Comments

Proposal is not likely to be at variance to this Principle

The National Objectives and Targets for Biodiversity Conservation 2001-2005 include a target to prevent the clearance of ecological communities with an extent below 30% of that present pre-European settlement (Department of Natural Resources and Environment 2002).

Pre-European	Current extent (ha)	Remaining (ha)	% In reserves (%)	DEC Managed Land
IBRA Bioregions*				
Swan Coastal Plain^				
	1 501 208	583 141	38.8	32.6
Shire*				
Wanneroo				
	67 697	33 637	49.7	47.8
Heddle**				
Cottesloe Central and South				
	44 995	18 473	41	21
Beard Vegetation Association*				
998	51 995	21 226	41.6	38.1
949	218 914	124 865	57.2	49.2
Beard Vegetation Association with Bioregion*				
998	50 867	21 226	41.7	38.1
949	209 984	122 678	58.4	49.4

* (Shepherd et al. 2007)

** (Heddle et al 1980)
^ Area within Intensive Land Use Zone

Heddle et al (1980) defines the vegetation under application as Cottesloe Complex - Central and South, which is a mosaic of woodland of E. gomphocephala and open forest of E. gomphocephala - E. marginata - E. calophylla; closed heath on limestone outcrops. The remaining extent is mapped at 41% and therefore above target thresholds. It is considered that vegetation mapping of the Swan Coastal Plain (Heddle et al 1980) is a more accurate representation of ecological communities than Beard (Shepherd et al 2007), due to the scale at which mapping occurred.

Given the vegetation associations are above 30% and the area under application is not considered significant as a remnant in an area that has been extensively cleared, the proposal is not likely to be at variance with this principle.

Methodology/Limitation
ANZECC (2000)
EPA (2000)
Hopkins et al. (2001)
Mattiske Consulting (1998)
Shepherd (2007)
Shepherd et al (2001)

Methodology GIS Databases:
- Swan Coastal Plain North 20 cm Orthomosaic - Landgate 2006
- Heddle Vegetation Complexes - DEP 1995
- Interim Biogeographic Regionalisation of Australia - EA 2000
- Local Government Authorities - DLI 2004
- Mattiske Vegetation - CALM 1998
- Pre European Vegetation - DA 2001
- SAC Biodatasets - accessed July 2009
- NLWRA, Current Extent of Native Vegetation 2001

(f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

Comments **Proposal is not likely to be at variance to this Principle**
There are four significant wetlands within the local area (5 km radius): ANCA Wetland, Loch McNess System is situated 4km north-west of the applied area; Pippidinny Swamp 2.3 km W, Yonderup Lake 2.2 km NW, and Wilgarup Lake 1.5 km west. Additionally, a Multiple Use Wetland (MUW), a Conservation Category Wetland (CCW) and a Resource Enhancement Wetland (REW) are all located within 1.5km. Mindarie Lake (a MUW) is the closest wetland and is approximately 320 metres to the west.

Given the distance it is unlikely the 18 ha of native vegetation within the area under application could be considered to growing in or in association with a wetland and is therefore considered not likely to be at variance with this principle.

Methodology DEC (2007)
DoE (2005)
EPP (1992)
Government of Western Australia (1997)
WRC (2001)
GIS Databases:
- ANCA wetlands - Environment Australia 1999
- DEC Managed Lands and Waters - DEC 2009
- EPP Lakes Policy Area - DEP 1997
- EPP, Wetlands 2004 (DRAFT) - EPA 2004
- Environmentally Sensitive Areas DEC 2009
- Geomorphic Wetlands (Mgt Categories), Swan Coastal Plain DEC 2007
- Hydrography linear - DoW 2006
- Ramsar wetlands - DEC 2003
- South Coast Significant Wetlands - WRC 2003

(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

Comments **Proposal is not likely to be at variance to this Principle**
As determined in the site inspection carried out by DoE on 5 May 2006 the native vegetation that is under application to be cleared possessed significant environmental values. Provided the measures contained in

VCN CPS 2268/1 are complied with, these environmental values are likely to be restored.

The area under application is identified as being within a low salinity risk area (<500mg/l) and is also recognised as having a Class 3 risk of acid sulphate soil (ASS), which is defined as having no known risk of ASS or potential ASS.

The property consists of two soil landscapes Spearwood sand phase extending over approximately 70% of the proposed area and Karrakatta sand yellow phase covering approximately 30% of the applied area. The land is gently undulating with some steeper areas with slopes of up to 10% (DAWA 2005). These soils can have a very high risk of wind erosion and eutrophication.

The Department of Agriculture and Food (DAFWA) undertook an assessment of Lots 52 on Plan 9474 (DAFWA 2009) and found that the area proposed for clearing has some potential for land degradation in the form of wind erosion and eutrophication, however concluded that the proposed clearing is unlikely to be at variance. During a recent site visit (DEC 2009a) some water erosion was observed where there were steeper slopes, but it is considered that this erosion could be effectively managed onsite.

Additional information provided by the applicant reiterated the applicants position that the site is well suited to horticulture and that any erosion risk could be managed.

Given that the potential for land degradation risks such as soil and water erosion could be managed on site, the proposed clearing is not likely to be at variance to this Principle.

Methodology

Bailey (2009)
DAFWA (2009)
DAWA (2005)
DEC (2009a)
DoW (2009)
Northcote et al. (1968)
Yesertener (2009)
GIS databases:
- Acid Sulphate Soil risk map, SCP DOE 2004
- Salinity Risk, LM 25m DOLA 2000

(h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

Comments

Proposal may be at variance to this Principle

As determined in the site inspection carried out by DoE on 5 May 2006 the native vegetation that is under application to be cleared possessed significant environmental values. Provided the measures contained in VCN CPS 2268/1 are complied with, these environmental values are likely to be restored.

Gnangara-Moore River State Forest, which is also Bush Forever site 381, is situated 80 metres east of the area under application and Yanchep National Park is located 1km west of the proposed clearing. Both conservation areas are separated from the applied area by privately owned remnant vegetation (CALM 2006) which collectively, including the area under application, provides a corridor for fauna movement between these two conservation areas.

Additional information provided by the applicant, indicated rehabilitation of 2 hectares could be undertaken on Lot 53 to improve ecological linkages. The value of this rehabilitation, of only 2 hectares, would be questionable when the proposed clearing of 18 hectares on Lot 52 would, in effect, sever the linkage to the west. Given the east-west ecological linkage that would be lost as a result of the proposed clearing on Lot 52, the proposed clearing may be at variance to this Principle.

Methodology

Bailey (2009)
CALM (2006)
GIS Databases:
- Swan Coastal Plain 20 cm Orthomosaic - Landgate 2006
- CALM Managed Lands and Waters - CALM 2005
- Hydrography, linear - DOW 2006
- Register of National Estate - Environment Australia, Australian and World Heritage Division 2002
- System 1 to 5 and 7 to 12 areas DEC 2006

(i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

Comments

Proposal is at variance to this Principle

As determined in the site inspection carried out by DoE on 5 May 2006 the native vegetation that is under application to be cleared possessed significant environmental values. Provided the measures contained in

VCN CPS 2268/1 are complied with, these environmental values are likely to be restored.

The property is located in the Coastal Catchment Area and is subject to an average annual rainfall of 800 mm. Regional groundwater salinity at this site ranges between 0 and 500mg/L with a nil to low risk of salinity. The area under application is approximately 80 metres from the Gnangara Mound, a proclaimed groundwater area. A priority 3 Public Drinking Water Source Area (PDWSA) is mapped 1.8 km east of the area under application. The proposed removal of native vegetation from Lot 52 is likely to result in the release of some nitrogen from the soil pools (DAFWA, 2009) and is also likely to increase the rate of groundwater recharge over the site.

The clearing of native vegetation and end use of the applied area for horticultural purposes may also result in eutrophication due to the application of fertilisers, which is supported by advice from DAFWA (2005 and 2009).

A hydrological assessment undertaken for DEC (Peck 2006) has indicated that due to a continuing trend in decreased rainfall and higher evaporation rates associated with horticulture, groundwater dependant ecosystems in the local vicinity may be adversely affected by the proposed clearing. Additionally, recent hydrological advice (DEC 2009b) has indicated that caves and cave-dwelling fauna may also be adversely affected by the removal of 18 ha of native vegetation. A hydrological report provided with the clearing application noted that peak drawdown at caves in close proximity to the applied area would be reduced with the addition of a new bore and reduced extraction from existing bores (Rockwater 2009).

Additional information provided by the applicant, which is supported by DAFWA (2009), states that the soils within the applied area have moderate to high phosphorus retention rates and the leaching of phosphorus is unlikely to be significant. No additional information was provided by the proponent in regards to nitrogen or nitrates. DAFWA (2009) states that the soils within the area under application, like other sandy coastal plain soils, are unable to retain nitrogen. While DAFWA (2009) also advise that with careful irrigation and water management applied nitrogen can be maintained within the root zone, DEC is aware that nitrogen has been recorded at high levels in groundwater data collected by the Department of Water (2009) within a 2 km radius of the applied area.

Furthermore, a recent assessment of hydrogeochemistry in superficial aquifers of the Perth metropolitan area (Yesertener 2009) found that maximum nitrate concentrations of up to 292 mg/L in the Carabooda area due to intensive horticulture. This data contrasts with nitrate concentrations beneath native bushland which are less than 1 mg/L in the Perth region. Areas under intensive horticulture not only have elevated nitrate levels higher than previsouly recorded but they also now extend over a more widespread area. Elevated phophorus concentrations were also recorded within the Carabooda vicinity and it is not known whether the adsorption capacity of some soils in the area have been exceeded.

The applicant's consultant states that 'the property is at least 1.6 km upgradient of the nearest significant water quality-sensitive ecosystem' yet a Critically Endangered threatened ecological community (cave YN555) known as an occurrence of the TEC 'SCP01 Aquatic Root Mat Community' is within 1 km down hydrological gradient of the proposed clearing.

The potential for increase in nitrate concentrations, affecting water quality, associated with the proposed clearing of 18 ha of native vegetation for horticultural purposes is considered significant and therefore the proposed clearing is at variance to this Principle.

Methodology

Bailey (2009)
CALM (2003)
DoA (2005)
DoE (2006)
DEC (2007)
DEC (2009b)
DoW (2009)
Keighery (1994)
Peck (2006)
Rockwater Pty Ltd (2009)
Yesertener (2009)
GIS databases:
- Swan Coastal Plain 20cm Orthomasaic Landgate 2006
- Evapotransporation Isopleths WRC 1998
- Groundwater Salinity Statewide DoW 2006
- Hydrographic catchments DoW 2007
- Hydrography, linear DOW 2006
- Rainfall, Mean Annual BOM 2001
- Salinity Risk LM 25m DOLA 2000
- Topographic Contours, Statewide - DOLA 12/09/02

(j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.

Comments

Proposal is not likely to be at variance to this Principle

No floodway or areas of flooding exist within the area under application. The area shows a general relief in topography to the south-west towards Mindarie Lake. Given the amount of remaining vegetation in the surrounding area and the transmissive nature of the sands at the site, clearing is unlikely to cause or exacerbate the incidence of flooding.

Methodology

GIS databases:
- Swan Coastal Plain 20cm Orthomosaic - Landgate 2006
- Environmental Impact Assessments - EPA 2007
- Evaporation Isopleths - WRC 1998
- Hydrographic catchments, catchments - DoW 2007
- Hydrographic catchments, subcatchments - DoW 2007
- Hydrography, linear - DoW 2006
- Mean Annual Rainfall Isohytes (1975 - 2003) - DEC 2005
- Topographic Contours, Statewide - DOLA 2002

Planning instrument, Native Title, Previous EPA decision or other matter.

Comments

An initial application was lodged with DEC to clear 24.51 ha on Lot 52 & 53 Old Yanchep Road and was refused on 14 December 2006. DEC then received advice that between 26 September 2007 and 15 November 2007, the vegetation had been cleared. Following an investigation a Vegetation Conservation Notice was given on 24 January 2008. The VCN covers the area subject to this application.

The applied area is zoned 'rural' under the City of Wanneroo Town Planning Scheme but the Planning Department at the City of Wanneroo advised DEC that they have not received a Development Application for Lot 52 Old Yanchep Road Carabooda (applied area).

The applicant is the holder of a water licence (GWL156447) to extract groundwater with an annual allocation of 19,800KL. The licence expiry date is 3/9/2014. There is no other RIWI Act Licence, Works Approval or EP Act Licence that will affect the area that has been applied to clear.

A submission has been received by DEC raising objection to the clearing proposed. The issues raised have been considered during the assessment of this proposal.

It is considered that the intended use of the site for horticulture will likely result in detrimental effects to the local hydrology. Detrimental changes to groundwater levels and quality have already been recorded in the local area, thought to be the result of intensive horticulture (DEC 2009b) may have a detrimental effect on both a critically endangered TEC (Aquatic Root Mat Community, less than 1 km west of the applied area) and possibly the critically endangered invertebrate *Hurleya* sp (Crystal Cave Crangonyctoid), which has been recorded within 3 km of the applied area in a cave system both of which are down gradient of the proposed clearing. Given the highly porous nature of the soils and substrate in the local area, and the significant use of fertiliser and horticultural pesticides and herbicides associated with vegetable growing, an impact on cave water quality is anticipated. Department of Water groundwater monitoring bores (WIN data 2009) have recorded elevated total nitrogen levels in bores within the local area of the proposed clearing. A recent assessment of hydrogeochemistry in superficial aquifers of the Perth metropolitan area (Yesertener 2009) found high nitrate concentrations in the Carabooda area due to intensive horticulture, and that these excessive nitrate concentrations are extending over an increasingly widespread area. Increased phophorus concentrations were also recorded within the Carabooda vicinity and it is not known whether the adsorption capacity of the soil sediments has been exceeded.

DEC Hydrologists (DEC 2009b) noted that cave, wetland and banksia woodland ecosystems are all typically highly sensitive to elevated nutrient loads. High value examples of each of these ecosystems occur down hydraulic gradient of the applied area. Cave systems are sensitive through increased competition with natural algal communities by undesirable strains of blue green algae and this may have impacts not only to microbial communities but also to dependant macroinvertebrates, including stygo and troglofauna. Changes to groundwater quality may detrimentally impact on groundwater dependant ecosystems and further threaten cave ecosystems, including those listed as Critically Endangered.

Methodology

CALM 2003
Submission 2009
City of Wanneroo 2006
DEC 2009b
Yesertener (2009)

GIS databases:
- Cadastre - Landgate 2007
- Native Title Claims - LA 2007
- RIWI Act, Groundwater Areas - DoW 2006
- RIWI Act, Irrigation Districts - DoW 2006
- Town Planning Scheme Zones - MFP 1998
- Country Area Water Supply Act (Part IIA) Clearing Control Catchments 2006
- Aboriginal Sites of Significance 2007
- Public Drinking Water Source Areas 2006

4. Assessor's comments

Comment

The application has been assessed and the assessing officer has found that the application is at variance to principles (b) and (i), may be at variance to principles (a), (d), (h) and unlikely to be at variance to principles (c), (e), (f), (g) and (j).

5. References

AGPS (2001) The national objective and targets for biodiversity conservation 2001-2005. Commonwealth of Australia, Canberra.

ANCA (1996) A Directory of Important Wetlands in Australia. Second Edition. Australian Nature Conservation Agency, Canberra

Brown A., Thomson-Dans C. and Marchant N. (1998). Western Australia's Threatened Flora, Department of Conservation and Land Management, Western Australia.

Burbidge, A. (2004) Threatened Animals of Western Australia, Department of Conservation and Land Management, Perth, Western Australia.

CALM (2003) Interim Recovery Plan No. 117 Aquatic Root Mat Community of Caves of the Swan Coastal Plain, and the Crystal Cave Crangonyctoid 2003-2008. Department of Conservation and Land Management, Perth, Western Australia.

CALM (2006) Land clearing proposal advice. Advice to A/Director General, Department of Environment (DoE). Department of Conservation and Land Management, Western Australia. DoE (TRIM DOC CRN218203).

Commonwealth of Australia (2001) National Targets and Objectives for Biodiversity Conservation 2001-2005, AGPS, Canberra.

Connell, S. (1995) Perth environment project; Remnant vegetation inventory and assessment. Unpublished report to the Australian Heritage Commission (National Estate Grants Programme) and the Ministry for Planning, Western Australia.

DAFWA (2009). Preliminary advice regarding land degradation issues for 502 (Lot 52) Old Yanchep Rd, Carabooda. Department of Agriculture and Food Western Australia (TRIM DOC 107427).

DAWA (2005) Land degradation assessment report. Office of the Commissioner of Soil and Land Conservation, Department of Agriculture Western Australia (DoE TRIM DOC EI2491).

DEC (2007) DEC Fauna Habitat Notes.xls. February 2007. Department of Environment and Conservation, Western Australia.
DEC (2009a) Field Inspection Report (TRIM DOC 92437).

DEC (2009b). Hydrological advice in regards to local hydrology and review of proponent hydrological report (TRIM DOC91715) and advice regarding potential impacts from eutrophication (TRIM DOC 91786).

DEC (2009c). Additional Carnaby's Black Cockatoo and rare flora advice from Species and Communities Branch DEC (TRIM DOC106425).

DEC (2009d). Additional hydrological advice from Natural Resource Management Branch DEC (TRIM DOC106656).

Del Marco, A., Miles, C., Taylor, R., Clarke, K. and Savage, K. (2004) Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region - Edition 1. Western Australian Local Government Association, West Perth.

DEP (2002) Remnant vegetation of the Swan Coastal Plain Bioregion within the System 6 and System 1. Department of Environmental Protection, Perth.

DOE (2006) Field Inspection Report. Department of Environment (DoE), Western Australia (TRIM DOC6607).

DOW (2009) Water Information (WIN) database (16 November 2009). Department of Water, Water Information Provision Section, Perth Western Australia (TRIM DOC106648).

EPA (2001) Environmental Protection of Wetlands. Preliminary Position Statement No.4. Perth, Western Australia.

EPA (2002) Terrestrial Biological Surveys as an element of biodiversity protection. Position Statement No. 3. March 2002.

Environmental Protection Authority, Western Australia.

EPA (2004) Guidance for the Assessment of Environmental Factors - Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia. Guidance Statement No 51. Environmental Protection Authority, Western Australia.

EPA (2004) Guidance for the Assessment of Environmental Factors: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia. Guidance Statement No 56. Environmental Protection Authority, Western Australia.

Gibson N., Keighery B., Keighery G., Burbidge A. and Lyons M. (1994). A Floristic Survey of the Southern Swan Coastal Plain. Western Australian Department of Conservation and Land Management and the Western Australian Conservation Council.

Government of Western Australia (2000) Bush Forever Volumes 1 and 2. Western Australian Planning Commission, Perth WA.

Heddle, E. M., Loneragan, O. W., and Havel, J. J. (1980) Vegetation Complexes of the Darling System, Western Australia. In Department of Conservation and Environment, Atlas of Natural Resources, Darling System, Western Australia.

Hill, A.L., Semenuik, C. A, Semenuik, V. Del Marco, A. (1996) Wetlands of the Swan Coastal Plain. Volume 2b, Wetland mapping, classification and evaluation. Wetland Atlas. WRC and DEP. Perth WA.

Hopkins, A.J.M., Beeston, G.R. and Harvey J.M. (2001) A database on the vegetation of Western Australia. Stage 1.

CALMScience after J. S. Beard, late 1960's to early 1980's Vegetation Survey of Western Australia, UWA Press.

Keighery, B.J. (1994) Bushland Plant Survey: A Guide to Plant Community Survey for the Community. Wildflower Society of WA (Inc). Nedlands, Western Australia.

Mattiske, E.M. and Havel, J.J. (1998) Vegetation Complexes of the South-west Forest Region of Western Australia. Maps and report prepared as part of the Regional Forest Agreement, Western Australia for the Department of Conservation and Land Management and Environment Australia.

Northcote, K. H. with Beckmann G G, Bettenay E., Churchward H. M., van Dijk D. C., Dimmock G. M., Hubble G. D., Isbell R. F., McArthur W. M., Murtha G. G., Nicolls K. D., Paton T. R., Thompson C. H., Webb A. A. and Wright M. J. (1960-68): 'Atlas of Australian Soils, Sheets 1 to 10, with explanatory data'. CSIRO and Melbourne University Press: Melbourne.

Peck A.J. and Associates (2006) Consultant Hydrologists Report CPS 675 (Trim EI5739).

Rockwater Pty Ltd (2009) The results of modelling to assess impact of changed points of groundwater extraction, Carabooda. Unpublished report to Bayley Environmental Services.

Schoknecht N. (2002) Soil Groups of Western Australia. A simple guide to the main soils of Western Australia. Resource Management Technical Report 246. Edition 3

Shah, B. (2006) Conservation of Carnaby's Black-Cockatoo on the Swan Coastal Plain, Western Australia. December 2006. Carnaby's Black-Cockatoo Recovery Project. Birds Australia, Western Australia.

Shepherd, D.P. (2007). Adapted from: Shepherd, D.P., Beeston, G.R., and Hopkins, A.J.M. (2001), Native Vegetation in Western Australia. Technical Report 249. Department of Agriculture Western Australia, South Perth. Includes subsequent updates for 2006 from Vegetation Extent dataset ANZWA1050000124.

Shepherd, D.P., Beeston, G.R. and Hopkins, A.J.M. (2001) Native Vegetation in Western Australia, Extent, Type and Status. Resource Management Technical Report 249. Department of Agriculture, Western Australia.

Shepherd, D.P., Beeston, G.R. and Hopkins, A.J.M. (2001a) Native Vegetation in Western Australia, Extent, Type and Status. Resource Management Technical Report 249. Department of Agriculture, Western Australia (updated 2005).

Yesertener, C. (2009). Hydrogeochemical Assessment of Superficial Aquifers, Perth Metropolitan Area. Department of Water, Western Australia.

6. Glossary

Term	Meaning
BCS	Biodiversity Coordination Section of DEC
CALM	Department of Conservation and Land Management (now BCS)
DAFWA	Department of Agriculture and Food
DEC	Department of Environment and Conservation
DEP	Department of Environmental Protection (now DEC)
DoE	Department of Environment
DoIR	Department of Industry and Resources
DRF	Declared Rare Flora
EPP	Environmental Protection Policy

GIS	Geographical Information System
ha	Hectare (10,000 square metres)
TEC	Threatened Ecological Community
WRC	Water and Rivers Commission (now DEC)