# City of Wanneroo

## Neerabup District Planning Environmental Assessment

April 2020

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# 1. Introduction

## 1.1 Overview

The Neerabup Industrial Area (NIA) is located in the suburb of Neerabup within the City of Wanneroo. To the southeast of the NIA, there is significant current and future residential development within Banksia Grove. Residential estates along the coastal strip of the North West Corridor (including the suburbs of Clarkson, Merriwa, Kinross, Mindarie) are currently developing approximately 3 km to the west of the NIA (Figure 1).

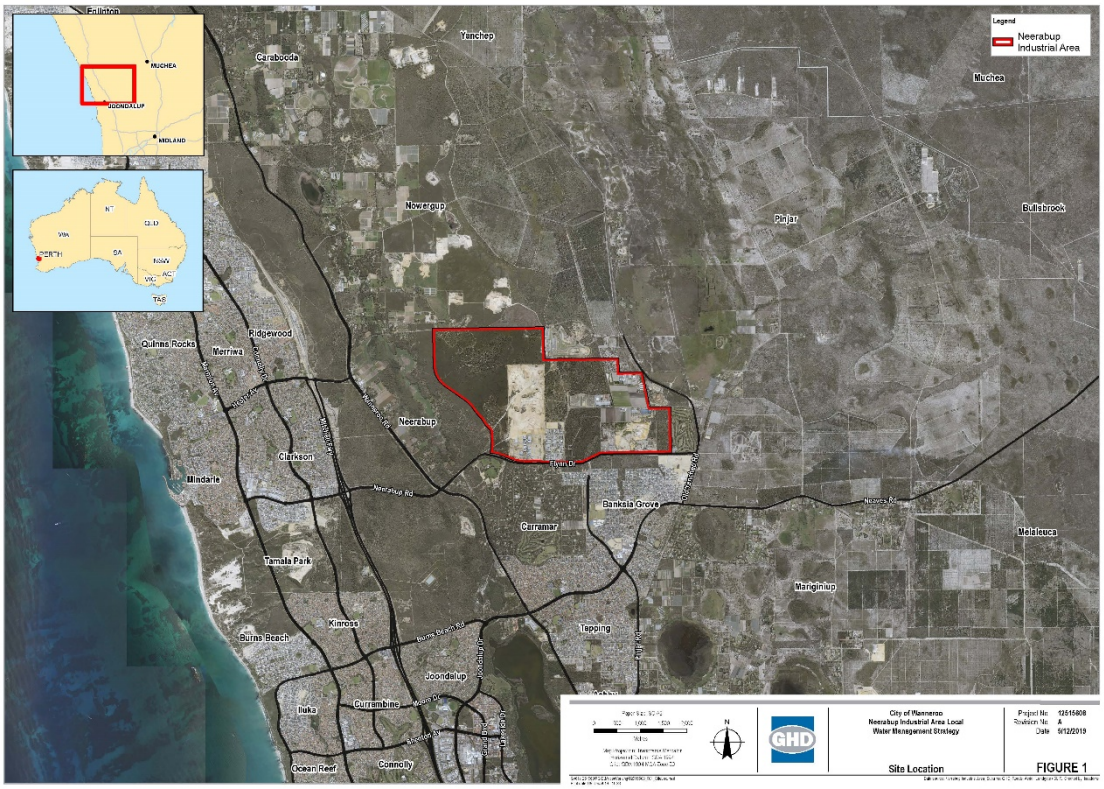



**Figure 1 Site Location Map**

Council first adopted the NIA Agreed Structure Plan 17 (ASP 17) on 11 January 2005. The environmental features of the site were assessed as part of the rezoning of the land for industrial use, to support the development of ASP 17 and continue to be monitored as part of the ongoing development of the site.

This environmental study provides an overview of the environmental features of the site and continued consideration of the environment as the site is developed for industrial use. It will be used to provide the background information for Part 2 of the revised structure plan and inform provisions included in Part 1.

## 1.2 Legislative Framework

### 1.2.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's key piece of environmental legislation, providing a national scheme of environment and heritage protection and biodiversity conservation. The EPBC Act:

- Protects matters of national environmental significance

- Conserves biodiversity
- Provides the national environmental approvals process
- Enhances protection and management of important natural and cultural places
- Controls the international movement of plants and animals (wildlife), wildlife specimens and products made or derived from wildlife
- Promotes ecologically sustainable development
- Recognises the role of Indigenous people in the conservation and ecologically sustainable use of Australia's biodiversity
- Promotes the use of Indigenous peoples' knowledge of biodiversity

The EPBC Act is administered by the Department of the Environment and Energy (DotEE).

Sections 3.1.1 and 3.1.2 provide information on species and ecological communities listed under the EPBC Act.

### 1.2.2 Biodiversity Conservation Act 2016 and Biodiversity Conservation Regulations 2018

On 1 January 2019, the *Biodiversity Conservation Act 2016* (BC Act) and *Biodiversity Conservation Regulations 2018* replaced both the *Wildlife Conservation Act 1950* and the *Sandalwood Act 1929* and their associated regulations. The BC Act and Regulations provide greater protection for the Western Australian biodiversity, particularly threatened species and threatened ecological communities.

Part 2 of the BC Act provides for the listing of Threatened, Extinct and Specially Protected species. Categories of Threatened, Extinct and Specially Protected fauna and flora are:

- Threatened
- Critically endangered
- Endangered
- Vulnerable
- Extinct
- Extinct in the wild
- Migratory
- Species of special conservation interest
- Other specially protected species
- Priority species
    - Priority 1
    - Priority 2
    - Priority 3
    - Priority 4

The BC Act and association Regulations are administered by the Department of Biodiversity Conservation and Attractions (DBCA).

Sections 2.1.1 and 2.1.2 provide information on species and ecological communities listed under the BC Act.

### 1.2.3 Environmental Protection Act 1986

The purpose of the *Environmental Protection Act 1986* (EP Act) is to protect the State's environment. The application of the act must have regard to a number of principles including the principle of the conservation of biological diversity and ecological integrity. Clearing native vegetation is an offence under the EP Act, unless done under a clearing permit or the clearing is for an exempt purpose. The Department of Water and Environmental Regulation (DWER) administers the clearing provisions of the EP Act.

### 1.2.4 Biosecurity and Agriculture Management Act 2007

The *Biosecurity and Agriculture Management Act 2007* (BAM Act) and its regulations prevent new animal and plant pests entering Western Australia, manage the impact and spread of pests already present, safely manage the use of agricultural and veterinary chemicals and control sale of agricultural chemicals containing volatile chemical residues. The City is responsible for controlling declared pests and weeds of national significance on land owned or vested in the City for management.

The BAM Act and associated Regulations are administered by the Department of Primary Industries and Regional Development (DPIRD).

### 1.2.5 Planning and Development Act 2005

The *Planning and Development Act 2005* (PD Act) establishes the Western Australian Planning Commission and provides for an efficient and effective land use planning system which promotes sustainable use and development of land. State Planning Policies are prepared under Part 3 of the PD Act and can have regard to matters such as conservation of natural resources for environmental or ecological purposes.

#### *1.2.5.1 State Planning Policies*

State Planning Policies relevant to environmental matters and the development of the NIA include:

- State Planning Policy 2.0: Environment and natural resources policy
- State Planning Policy 2.4: Basic raw materials
- State Planning Policy 2.8: Bushland Policy for the Perth Metropolitan Region
- State Planning Policy 2.9: Water resources
- State Planning Policy 3.7: Planning in Bushfire Prone Areas.
- State Planning Policy 4.1: State industrial interface
- State Planning Policy 7.0: Design of the Built Environment

### 1.2.6 Local Planning

The *Planning and Development (Local Planning Schemes) Regulations 2015* sets out the procedure for making local planning policies under the Local Planning Scheme. District Planning Scheme No.2 (DPS2) is the local planning scheme for the City of Wanneroo (the City). DPS2 specifies where specific land uses are permitted and sets standards for development.

Local Planning Policies, adopted by Council, provide guidance as to how the provisions within DPS2 are considered. Local Planning Policies relevant to environmental matters and the development of the NIA include:

- Local Planning Policy 1.1: Conservation Reserves
- Local Planning Policy 3.3: Fauna Management

- Local Planning Policy 4.1: Wetlands
- Local Planning Policy 4.3: Public Open Space
- Local Planning Policy 4.4: Urban Water Management
- Local Planning Policy 4.8: Tree Preservation
- Local Planning Policy 4.13: Caves and Karstic Features
- Local Planning Policy 4.18: Earthworks and Sand Drift

In addition to the above, the City has developed a number of strategic documents to guide decision making and Council operations. Documents relevant to environmental matters and the continued development of the NIA include:

- Local Biodiversity Plan
- Local Environmental Strategy
- Conservation Area Management Plan
- Environmental Management Plan guidelines

## 1.3 Scope and limitations

*This report has been prepared by GHD for City of Wanneroo* and *may only be used and relied on by City of Wanneroo for the purpose agreed between GHD and the City of Wanneroo as set out in section 1.1 of this report.*

*GHD otherwise disclaims responsibility to any person other than City of Wanneroo arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.*

*The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.*

*The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.*

*GHD has prepared this report on the basis of information provided by City of Wanneroo and others who provided information to GHD (including Government authorities)], which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.*

# 2. Literature Review

A number of environmental investigations have been undertaken over various parcels of land in the NIA over the years. The documents provided are discussed in more detail below. Figure 2 is provided to help describe which land parcels specific documents relate to.

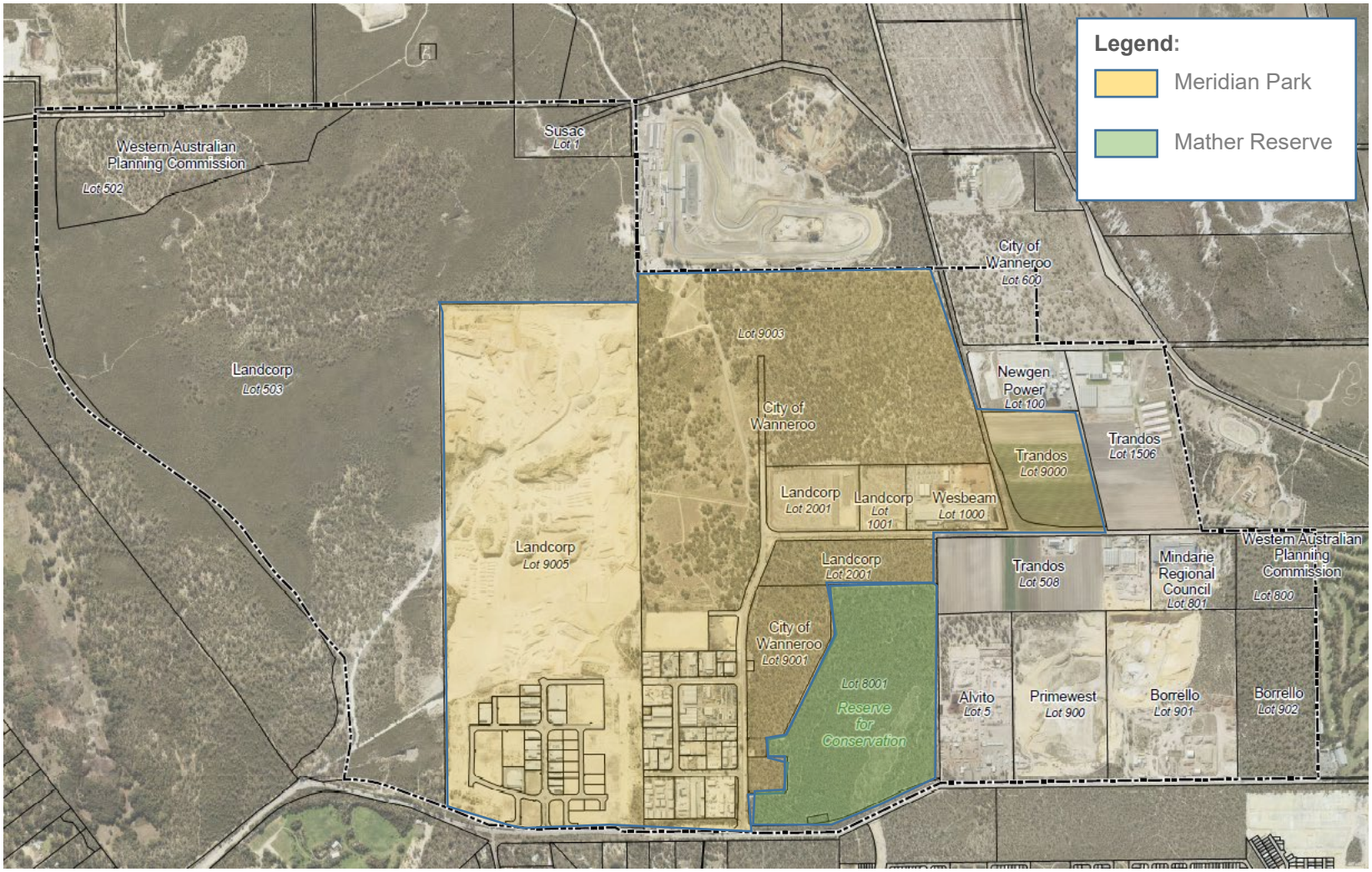



**Figure 2 Land parcels and ownership within the NIA (City of Wanneroo, 2019)**

## 2.1 Flora, Vegetation and Vertebrate Fauna Assessment Lot 4, Part of Lots 1002 and 2692, Neerabup (ATA Environmental, 2007)

A comprehensive Level 2 flora and vegetation survey and Level 2 vertebrate survey were undertaken to support application for clearing permits and progress with the agreed structure plan for the lots specified above. The vegetation survey was undertaken for the lots which are now Lot 9003, Lot 9100, Lot 8001, Lot 2001 and part of Lot 600. The fauna survey also included Lot 5, Lot 900 and Lot 901 (refer to Figure 2).

The purpose of this report was to:

- Accurately describe flora, floristic community types (FCT) and vegetation units and condition
- Confirm the presence or absence of rare and threatened species and communities
- Produce vegetation mapping
- Accurately describe fauna habitat types
- Confirm the presence of specially protected fauna

This study did not locate any threatened or priority flora species, however, did confirm an area of almost 30 hectares of Threatened Ecological Community (FCT 20a) which is now almost entirely contained within Lot 8001 (refer to Figure 2 and Figure 3).

## 2.2 Spring Flora and Vegetation Survey, Part Lot 600 Orchid Road, Neerabup (Coffey Environments, 2008)

A survey, additional to the abovementioned surveys, was subsequently conducted to confirm the vegetation types and conditions on the portion of Lot 600 which was excluded from the initial survey. No vegetation or species of conservation significance was found at this location. The vegetation was recorded as in good or degraded condition.

## 2.3 Ground Truthing of Environmental Values for Lot 4 Flynn Drive, Neerabup (Ecological Australia, 2012)

Ecological Australia was engaged by the City of Wanneroo to confirm the environmental values of its landholdings within the NIA in 2012 (now Lots 8001, 9001, 9003). This report included a verification of vegetation communities, vegetation conditions, a visual dieback assessment and Black Cockatoo habitat potential.

The vegetation descriptions, including the Floristic Community Type 20a, which is a Threatened Ecological Community, were considered largely accurate (Figure 3). Small changes were made relating to species composition where appropriate. In general, vegetation condition remained consistent with previous mapping.

A dieback visual assessment indicated vegetation death may be a result of changes to hydrology and/or declining rainfall rather than dieback, however further sampling and testing was recommended.

The vegetation was confirmed as foraging habitat for Black Cockatoos. An additional 28 potential breeding trees were identified (in addition to the 16 identified in 2007 by ATA Environmental). A further systematic search for potential breeding trees was recommended.

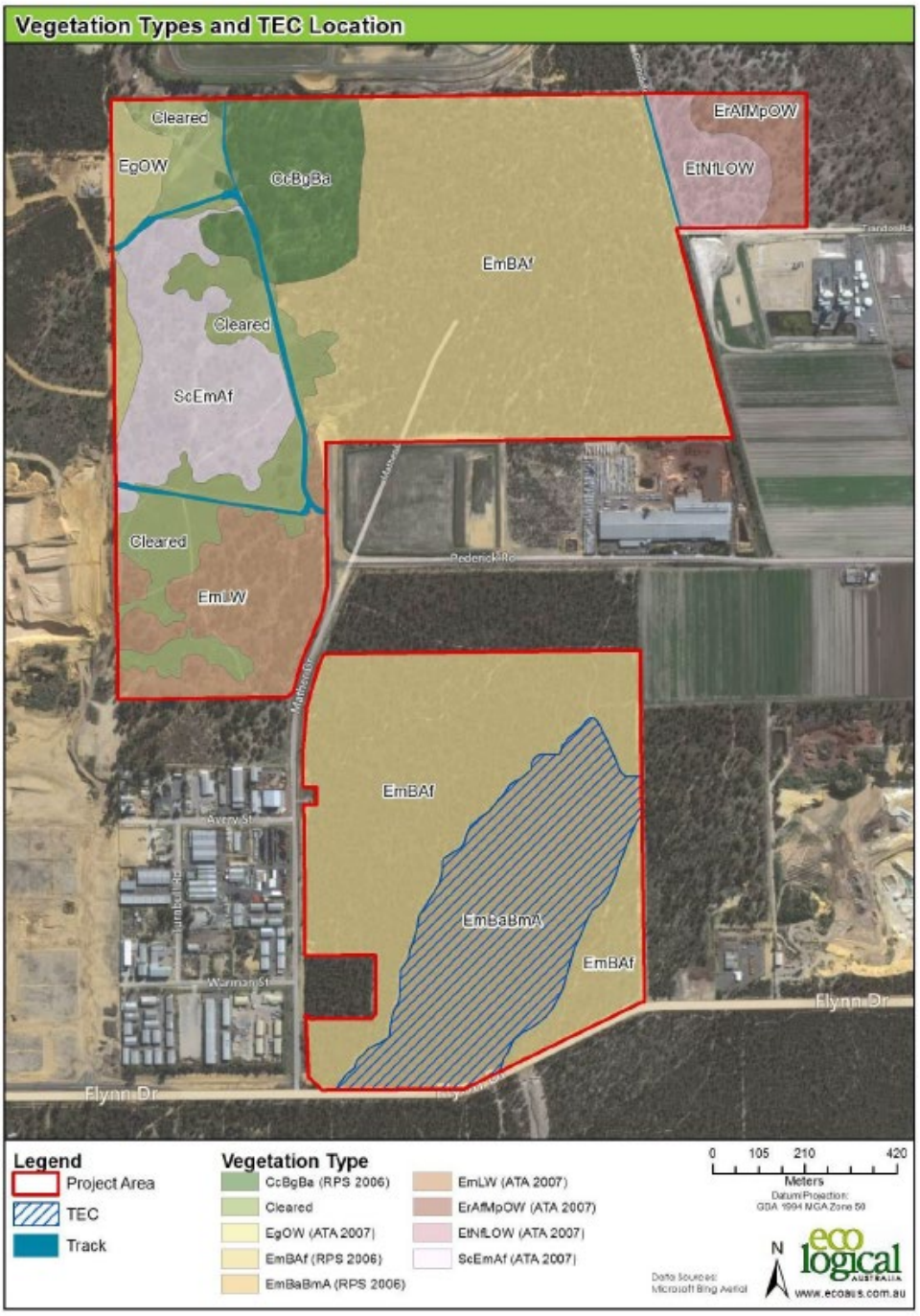



**Figure 3 Vegetation Types within City of Wanneroo landholdings**

## 2.4 Level 2 Flora and Vegetation Assessment of Conservation Offset Areas (Terratree, 2016)

This report includes a Level 2 assessment of Lot 8001 The report confirmed the presence of the Threatened *Banksia attenutata woodlands over species rich dense shrublands* which is protected under State and Federal legislation. No Threatened flora were recorded during the survey, however, two priority species were recorded:

- *Acacia benthamii* (Priority 2)
- *Stylidium maritimum* (Priority 3)

The survey assessed Lot 9000 as containing high value foraging habitat for Black Cockatoo species and identified 157 significant habitat trees, with 23 containing potential breeding hollows.

## 2.5 Mather Reserve Kangaroo Population Survey (Ecoscape 2019)

Lot 8001 Flynn Drive (Mather Reserve) forms part of an offset agreement for the development of the Meridian Business Park (within the NIA). Protection of Mather Reserve included the installation of a perimeter fence, which led to an increase in the population of Western Grey Kangaroos. A subsequent opening in the fence now provides better movement of the species to adjacent natural areas, however, as the NIA develops the availability of these areas to the kangaroos will be reduced until Mather Reserve is an island habitat.

The City recognised the potential impact of increased kangaroo numbers in reducing the other environmental values of Mather Reserve. Accordingly, a subsequent survey was commissioned to identify the carrying capacity of Mather Reserve. The survey recorded 16 Western Grey Kangaroos and one Western Brush Wallaby within Mather Reserve. In the short term, the reserve is considered to be capable of supporting the current kangaroo population. In the medium to long term, kangaroo numbers and vegetation should continue to be monitored to ensure the vegetation is not under unnecessary stress from increased animal numbers.

## 2.6 Flynn Drive – Lot 9000 Neerabup, Fauna Survey (Animal Pest Management Services, 2016)

This report was produced to provide a base level of fauna information for Lot 8001 Flynn Drive, Neerabup. The results of the survey indicate the presence of kangaroo, foxes and bandicoots. The report recommended the control of foxes at the site.

## 2.7 Comprehensive Phytophthora Dieback Assessment of Conservation and Development Areas-Neerabup Project (Terratree, 2016)

Terratree were engaged to conduct a comprehensive dieback survey for the City of Wanneroo undeveloped landholdings and conservation offset areas associated with the NIA. The objective of this report is to manage spread of the disease during development and prevent spread into conservation areas.

Some of the areas included in the area were categorised as not yet resolved due to unfavourable soil temperatures, however, a follow-up visit indicates that dieback is not currently present within the City of Wanneroo landholdings or conservation areas.

Rubbish dumping, which can act as a disease vector was noted at the site. This is a risk to the introduction of disease and should be managed.

## 2.8 Black Cockatoo Habitat Survey (Terrestrial Ecosystems, 2018)

A Black Cockatoo habitat survey was completed for the City of Wanneroo landholdings and offset site within the NIA in 2018 by Terrestrial Ecosystems. The report identified 28 trees containing hollows that may be suitable for Black Cockatoos within the NIA and Mather Reserve. However, Terrestrial Ecosystems recommended the installation of Cockatubes in bushland reserves as a preference to salvaging these trees. This is due to a number of considerations, including:

- Often selected by Cockatoos as a preference
- Cheaper to erect
- Often last longer than salvaged hollows.

It is also recommended that Cockatubes be installed at known breeding sites rather than within the NIA as this is more likely to improve breeding success.

The recommendations of this report also include targeted feral animal control. A control program should target foxes, cats and rabbits.

## 2.9 Weed Mapping Report, Lot 9000 Flynn Drive (Natural Area Consulting, 2017)

Natural Area Consulting Management Services was engaged by the City of Wanneroo to undertake targeted weed mapping of Lot 80 Flynn Drive in 2017. This area has largely become Mather Reserve (Lot 8001). The report mapped the four target weed species, provided a weed treatment program for targeted species and described presence of low priority weeds (with no mapping). It is important to undertake weed control in the area to protect the conservation values of Mather Reserve.

## 2.10 Memorandum: Neerabup Industrial Area – Environmental Input to City of Wanneroo Review of NIA ASP17 (Ecological Australia, 2019)

Ecological Australia provided a review of the environmental inputs relating to the development of Lot 503 Flynn Drive, which is owned by DevelopmentWA. A number of flora, vegetation and fauna surveys have been undertaken historically for this site to support development.

Vegetation contained within Lot 503 is broadly described as Banksia dominated woodlands and Jarrah (*Eucalyptus marginata*) dominated woodlands. The Limestone Ridges Threatened Ecological Community (TEC) was also previously mapped in the area. Vegetation condition ranged from Completely Degraded to Excellent. The area was also considered to provide habitat for Carnaby's Cockatoo (*Calyptorhynchus latirostris*), listed as Endangered under the EPBC Act.

Previous negotiations relating to environmental approvals, earmarked an area in the northwest corner of the site as a potential offset, and it was shown in ASP17 as a 'proposed conservation area'. There is no formal protection of this area, however, DevelopmentWA has no current plans for its development. Further environmental and clearing of native vegetation approvals will require further flora surveys.

# 3. Environmental Assessment

## 3.1 Vegetation

Native vegetation covers approximately 600 hectares of the area identified for industrial development within the NIA. Native vegetation is an important part of local biodiversity including providing food, shelter and habitat to native fauna and microorganisms.

### 3.1.1 Vegetation complexes

The City of Wanneroo is located on the Swan Coastal Plain, which comprises fifteen vegetation complexes as mapped by Heddle *et al* in 1980. Of these 15 vegetation complexes, two are mapped within the NIA:

- Cottesloe Complex-Central and South
- Karrakatta Complex-Central and South

The State Government acknowledges that 30 percent representation of the original pre-European extent of each vegetation type is regarded as the threshold level below which species loss appears to accelerate exponentially at an ecosystem level, and 10 percent representation of the original extent of each vegetation type is regarded as the level representing 'endangered' (WAPC, 2011).

The City's Local Biodiversity Plan 2018/19-2023/24 (LBP) identifies that the Cottesloe Complex-Central and South vegetation currently remains within the City at 32.4 percent of the original pre-European extent across the City, with 17.5 percent considered to be protected. This vegetation is a medium priority for increased protection.

The City's LBP identifies that the Karrakatta Complex-Central and South currently remains within the City at 10.9 percent of the original pre-European extent across the City, with 5.6 percent considered to be protected. This vegetation complex is a critical priority for increased protection.

The LBP identifies goals for increased protection of vegetation complexes remaining within the City, including:

> *"Protect all Critical and High-Critical vegetation complexes remaining within the City of Wanneroo as far as reasonably practicable"*

Local Natural Areas within the NIA are not included as part of the City's priority for protection, however, where increased protection is possible, should be supported. The protection of Mather Reserve will contribute to the achievement of the City's biodiversity protection goals.

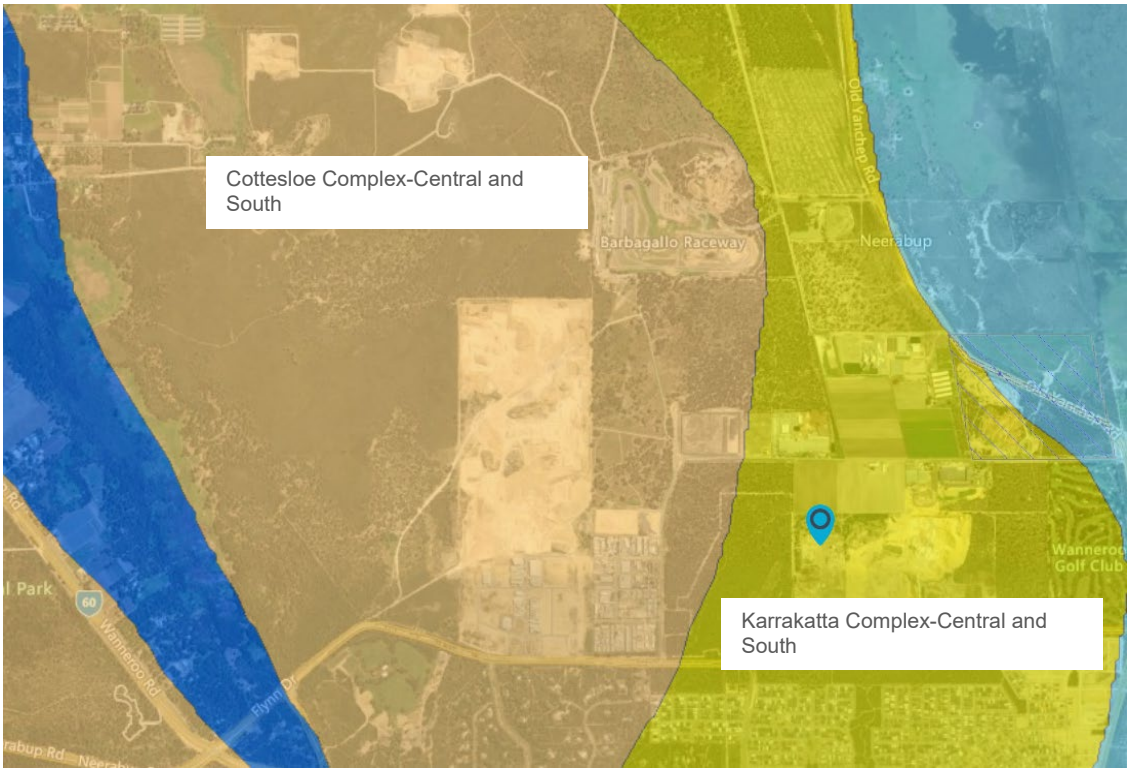



**Figure 4 Vegetation complexes (DBCA-046)**

### 3.1.2 Approved clearing of native vegetation

As shown in Figure 5, two clearing permits within the NIA have been issued by the Department of Water and Environmental Regulation:

- 2515/2
- 6359/1

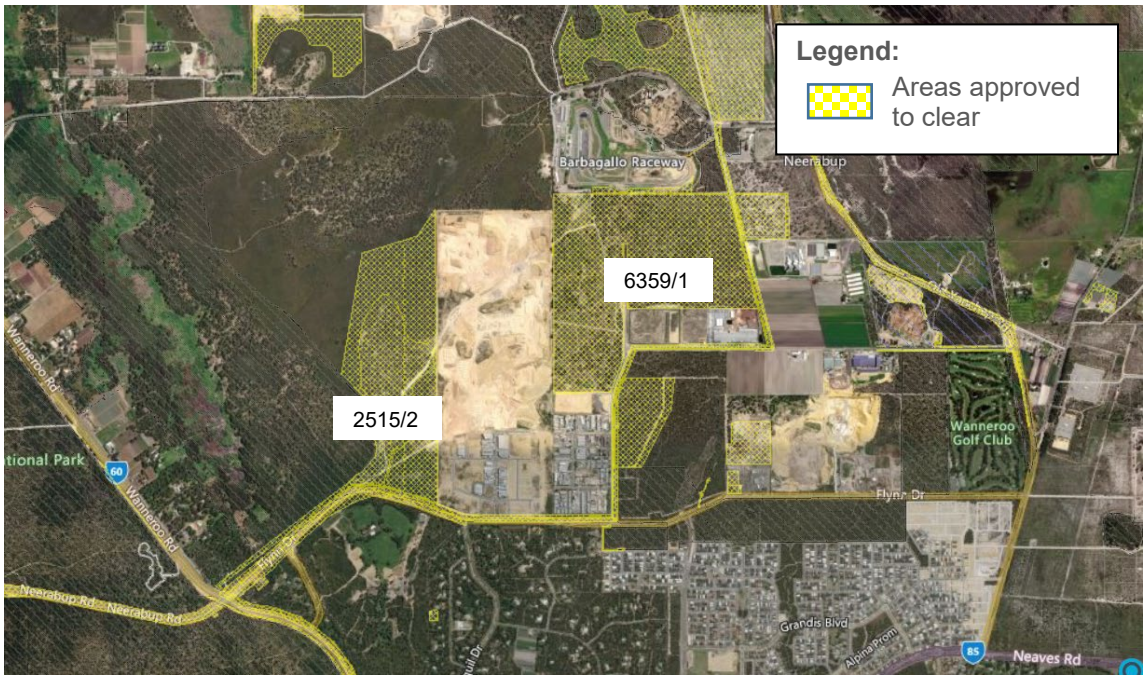



**Figure 5 Clearing Instruments Activities (Areas Approved to Clear) (DWER-076)**

DWER records indicate that other permits to clear native vegetation have been applied for, however have either been refused or withdrawn. One area (Mather Reserve) within the NIA (encompassing 50 hectares) is included as an offset to obtain a clearing permit and its retention and management is required in perpetuity (Figure 6). There is an additional site adjacent to the northern boundary of the NIA that is also protected as part of clearing permit conditions (Figure 6).


**Figure 6 Clearing Instruments Conditions (Areas subject to Conditions) (DWER-075)**

The clearing of native vegetation outside of the permitted areas will require further approval as resources are extracted and/or the NIA is developed for industrial purposes. Further studies will be required to support this development to confirm the vegetation types and presence of rare and threatened species. The protection of additional conservations areas may be required to obtain further approvals. The structure plan should be updated to reflect current conservation areas and any additional areas if/as they are required.

### 3.1.3 Bush Forever

Bush Forever sites were originally identified by the Government of Western Australia in 2000. These sites are a key component of the environmental infrastructure within the Perth Metropolitan Area and are a key element in moving towards achieving an ecologically sustainable city. Bush Forever sites 295 and 293 are located within the NIA with additional Bush Forever sites adjacent (Figure 7).

State Planning Policy 2.8: Bushland Policy for the Perth Metropolitan Region provides policy measures relating to areas identified as Bush Forever. Regionally significant vegetation should be protected where possible when balancing requirements for resource extraction and release of industrial land.

Bush Forever sites are classified as Environmentally Sensitive Areas under Regulation 5 of the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* and therefore there

are no exemptions to clearing permits requirements. Clearing permits should be obtained prior to removal of vegetation in Bush Forever Areas.

Retention and protection of the Bush Forever sites (or alternative regionally significant vegetation) should be considered as part of the ongoing planning and development for the NIA. Part of Bush Forever Site 295 within the NIA is protected through the conditions of clearing instrument 6359/1. The reservation of this area (now Mather Reserve) should be updated as part of the structure planning process and any subsequent amendment to the local planning scheme (currently zoned Industrial under the Metropolitan Region Scheme and Industrial development under District Planning Scheme No.2).

Bush Forever Site 295 also includes Lot 902. The retention and protection Lot 800 was negotiated as part of previous subdivision approvals. Further protection and reservation of this site is part of an ongoing negotiated planning solution between the owner and the WAPC. Updates should be reflected though the planning process where possible and may ultimately require an amendment to the local planning scheme, however, as negotiations have not concluded, it is unlikely that it will form part of the review of ASP 17.

The portion of Bush Forever Site 293 located in the northwest corner of the NIA on Lot 502, is owned by WAPC. Given the Bush Forever status of this lot, it should be reserved as part of the structure planning process and any subsequent amendment to the local planning scheme (currently zoned Industrial under the Metropolitan Region Scheme and Industrial Development under District Planning Scheme No.2). The ongoing management of this lot should also be determined.

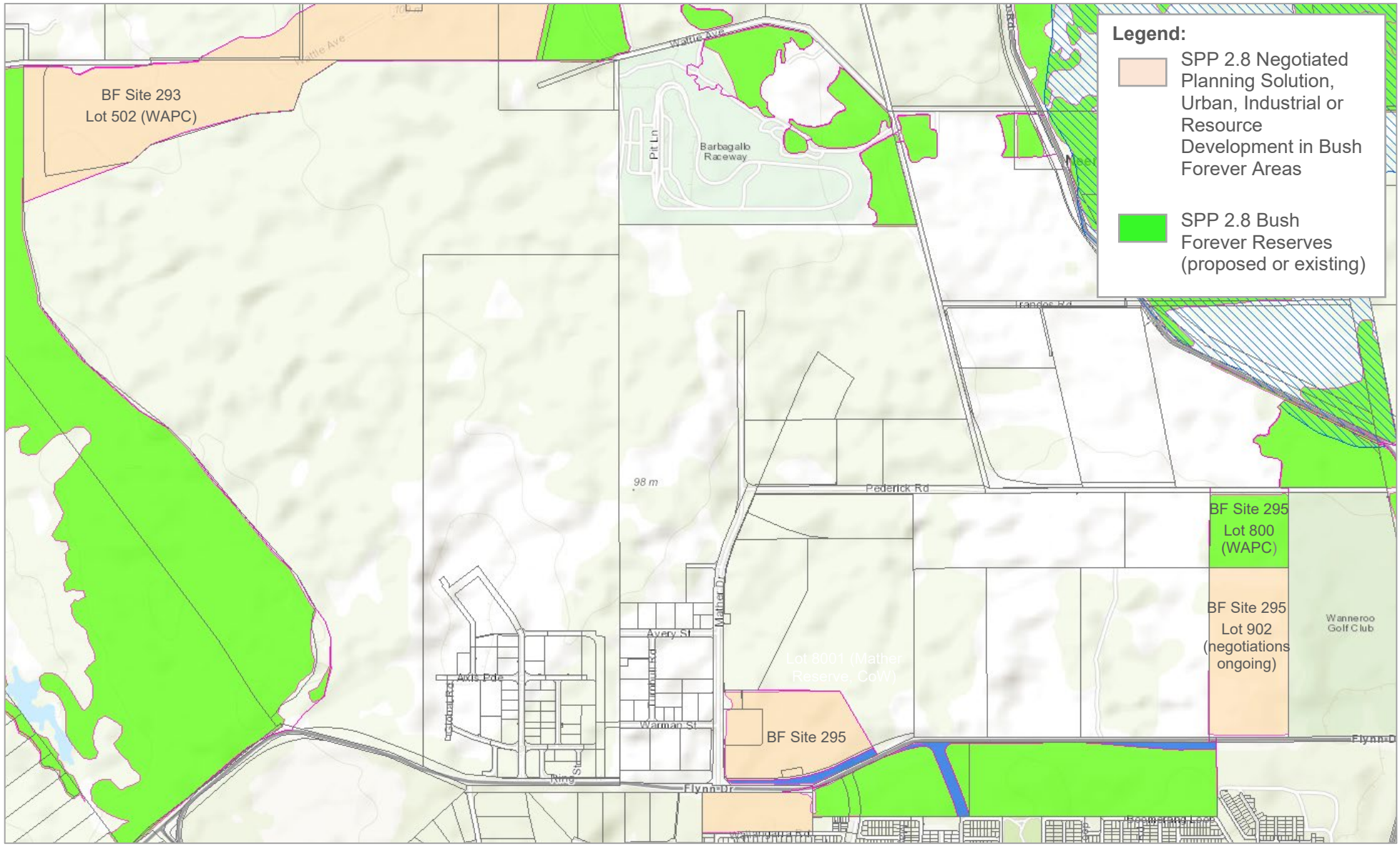



**Figure 7 Bush Forever Sites (PlanWA)**

### 3.1.4 Threatened species habitat

The vegetation within the NIA is known to contain foraging habitat for the Carnaby's and Forest Red-tailed Black Cockatoos (Terrestrial Ecosystems, 2018 and Ecological Australia, 2019). Both species are protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Biodiversity Conservation Act 2016* (BC Act). The City's Conservation Area Management Plan also suggests there are trees with the potential to provide breeding habitat for the Black Cockatoos due to the presence of hollows.

Bush Forever Site 295 is also known to contain habitat for the rare bee *Hyalaeus globuliferus* (ASP 17, Part 2).

### 3.1.5 Threatened and priority ecological communities

The vegetation within the NIA is known to contain areas of Banksia Woodlands of the Swan Coastal Plan which is listed as endangered under the EPBC Act. This includes an area retained for conservation as part of the clearing permit approval 6359/2 which is also largely identified as Threatened Ecological Community (TEC) 20a under the BC Act. A survey conducted by ATA Environmental in 2007 within the City of Wanneroo owned portion of the NIA also identified Floristic Community Types 21c and 24. These floristic community types have been classified as Priority 3 under the BC Act.

Lot 503 Flynn Drive has also previously been mapped as containing areas of TEC. This and other sites to be developed as part of the NIA, where clearing permits are yet to be issued are likely to be required to confirm the presence or absence of threatened and priority ecological communities prior to obtaining approval to clear native vegetation.

### 3.1.6 Flora

A search of the DBCA NatureMap database indicates the presence of 84 plant species within the NIA (including native and invasive species). The search indicated the following conservation significant flora species within the NIA:

- Two threatened species:
    - *Eucalyptus argutifolia* (listed as Vulnerable under EPBC Act and BC Act)
    - *Melaleuca sp.* Wanneroo (listed as Endangered under the BC Act)
- Three priority species:
    - *Stylidium maritimum* (Priority 3)
    - *Jacksonia sericea* (Priority 4)
    - *Templetonia retusa* (Priority 4)

These species have not been located as part of the flora surveys conducted within the City of Wanneroo owned land parcels within the NIA. These species may be present within other areas of the NIA; this should be investigated as part of ongoing environmental and development approvals.

The NatureMap Species Report and Map are provided in Appendix A (NatureMap, October 2019).

## 3.2 Fauna

A search of the DBCA NatureMap suggests there are 78 fauna species in the NIA (including native and non-native species).

A survey conducted by ATA Environmental in 2007 confirmed the presence of:

- 25 vertebrate fauna species through trapping, including:
  - 20 reptiles species
  - 3 amphibious species, and
  - 2 mammal species.
- 42 bird species through direct observation
- Other species such as feral cats, foxes, Western Grey Kangaroos and bats through observation and/or scats and tracks or audio recordings.

The ATA Survey information only relates to the City of Wanneroo managed land parcels but, due to the mobile nature of fauna species, can be assumed to be indicative of the entire NIA.

The Black Cockatoo Habitat Survey conducted by Terrestrial Ecosystems in 2018 indicates the presence of Quenda within the NIA.

The presence of the rare bee species *Hylaeus globuliferus* is confirmed by the NatureMap search results. Habitat for *Hylaeus globuliferus* has been protected within Mather Reserve.

The NatureMap Species Report and Map are provided in Appendix A (NatureMap, October 2019).

#### *3.2.1.1 Conservation significant fauna*

As mentioned in Section 3.1.4, Carnaby's and Forest Red-tailed Black Cockatoos are known to forage within the NIA. The Carnaby's Black Cockatoo is listed as endangered under both the Federal EPBC Act and the State BC Act. The Forest Red-tailed Black Cockatoo is listed as vulnerable under both the Federal EPBC Act and the State BC Act. These cockatoo species are dependent on vegetation on the Swan Coastal Plain and reduced habitat is a significant threat that requires management across the Perth Metropolitan Region.

Also known to the site is the Peregrine Falcon which listed as other specially protected fauna under the BC Act. This species while uncommon, is widespread across Australia and clearing within the NIA is unlikely to significantly impact this species (ATA, 2007).

A small population of the Southwestern Brown Bandicoot (Quenda) is known to occur in the NIA. This species is listed as a Priority 4 species under the BC Act as it is considered to be near threatened (having been adequately surveyed and being close to qualifying for vulnerable but not listed as Conservation Dependent).

A search of the DBCA NatureMap also indicates the presence of the Western Brush Wallaby (Priority 4) and Graceful Sun Moth (Priority 4). The presence of the Western Brush Wallaby is confirmed by the Mather Reserve Kangaroo Population Survey undertaken in 2018. The 2007 Flora and Fauna survey suggests that direction from the State Government on the potential presence of the Western Brush Possum be sought from the State Government (ATA, 2007).

The City of Wanneroo has in the past conducted surveys to confirm the presence of the Graceful Sun Moth. Surveys conducted did not locate this species within the NIA. It has also been delisted from the EPBC Act following extensive surveys across the southwest of WA and increases in known populations. It remains as a Priority 4 species and is considered to be near threatened. Impacts on this species should continue to be considered as part of the environmental and development approvals process.

Part 2 of ASP 17 indicates the presence of the native bee *Hylaeus globuliferus*, and its presence is also indicated by the NatureMap search results. *Hylaeus globuliferus* is a Priority 3

species. Priority 3 species are not considered to be under imminent threat, however, are in need of further survey.

Development of the NIA will result in loss of habitat for all conservation significant species. Removal of Black Cockatoo habitat is likely to require assessment and approval under the EPBC Act and can be managed through that process. Removal of habitat for the remaining species is unlikely to trigger environmental approval requirements, although species categorisation may change before the entire NIA is developed.

## 3.3 Pests and diseases

#### 3.3.1.1 Weeds

Twenty two weed species were identified in Mather Reserve in 2018 as part of the Level 2 Flora and Vegetation Assessment conducted by Terratree, representing 15.5% of total floristic diversity. Commonly represented were species of the Asteraceae, Fabaceae and Poaceae families.

No Weeds of National Significance were identified within the survey area. However, **Watsonia meriana var. bulbillifera* has been nominated for inclusion, and therefore may be listed in the future.

No Declared Pests for the City of Wanneroo local government area, in accordance with the BAM Act 2007, were identified within the survey area (Terratree, 2018).

Weed species occurred at low densities throughout the majority of Lot 9000, generally consisting of nonaggressive species such as *Briza maxima and *Gladiolus caryophyllaceus. The aggressive weed species *Arctotheca calendula (Cape Weed) was observed to be emerging from introduced soil dumps, but was not considered by Terratree to have spread beyond these areas. *Leptospermum laevigatum (Victorian Tea Tree) was not observed within the survey area, but occurs in roadside vegetation adjacent to the survey area.

#### 3.3.1.2 Feral animals

A number of introduced feral animals are known to occur within the NIA, including:

- Mice
- Cats
- Foxes
- Rabbits

(NatureMap search, Department of Biodiversity, Conservation and Attractions, October 2019).

Feral animals can compete with and/or predate upon native animals. To ensure the success of conservation areas within the NIA, it will be important to manage the presence of feral animals.

#### 3.3.1.3 Dieback

The City of Wanneroo landholdings have been categorised as uninfested by *Phytophtora* Dieback disease (Terraree, 2017). Given the presence of Excellent condition vegetation, TECs and Black Cockatoo foraging habitat protected in a conservation reserve, it is important to ensure that dieback is not introduced to the area.

The presence of dieback in the remaining NIA is unknown.

Canker infestation was also found within the Neerabup conservation area. This in combination with prolonged drought is a threat to the conservation area.

## 3.4 Wetlands

There are two wetlands mapped within the vicinity of the NIA, Lake Neerabup and Lake Pinjar. Wetlands on the Swan Coastal Plain are classified as either conservation category, resource enhancement or multiple use (Figure 8).

Lake Neerabup is classified as Resource Enhancement. Lake Pinjar is classified as both Conservation Category and Multiple Use. State Planning Policy 2.9: Water Resources (SPP 2.9) includes policy measures to protect the environmental attributes, functions and values of conservation category wetlands and manage, conserve and where possible restore ecological function of resource enhancement wetlands.

The nearby wetlands are largely protected within the Parks and Recreation reservation under the Metropolitan Region Scheme, however, it is important that development within the NIA is managed to ensure there are no impacts on these wetlands (guided by SPP 2.9). This is done through the preparation of a Local Water Management Strategy (to be developed as part of the structure planning) and subsequent Urban Water Management Plans (prepared through the subdivision and development approvals process).

This is especially important to Lake Neerabup, which is maintained by groundwater flow and will be sensitive receptor to works effecting groundwater infiltration in the vicinity of the NIA (Strategen 2008).

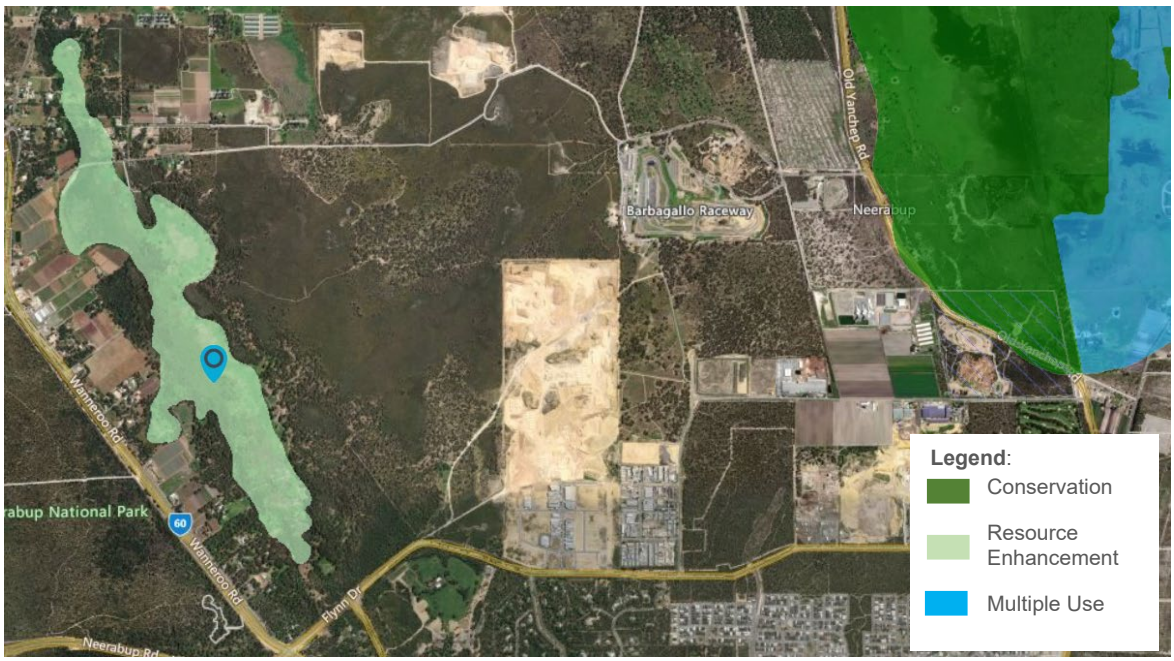



**Figure 8 Geomorphic wetland classifications**

## 3.5 Hydrology and hydrogeology

### 3.5.1 Surface water

The NIA is located within the Swan Avon, Lower Swan Catchment within the Swan Coastal river basin. However, due to the high transmissivity of the soils there are no defined surface water drainage features.

### 3.5.2 Groundwater

The NIA is located within the Gnangara Groundwater System, and locally within the Wanneroo groundwater subarea.

Groundwater within the area is managed in accordance with the *Gnangara groundwater areas allocation plan* (DoW 2009a). The plan is currently being revised including setting of new aquifer allocation limits to ensure sustainable groundwater supply and management of environmental values, however, current allocation limits have been reached for all groundwater sources in the Neerabup area.

The availability of water should be considered if industries are proposing to utilise groundwater as part of proposed activities, however, the provision of groundwater licences and water trading is managed by the Department of Water.

#### *Groundwater levels and flow*

The predominant regional groundwater flow direction is generally considered to be westerly beneath the NIA.

The proposed change in land use, including removal of vegetation and development of industrial land, is predicted to result in localised increase in groundwater recharge, and potential groundwater level rise (Peritas 2018).

#### *Groundwater quality*

Local groundwater investigations have identified elevated concentrations of contaminants in the vicinity of the NIA. These include the leachate plume associated with the former landfill site to the north-east of the NIA. Coffey Environments Australia completed a groundwater delineation investigation of the former Pinjar Landfill site (Coffey 2016), the results of which indicated elevated nutrients and metals beneath the former landfill site, however a significant decline in down-gradient bores towards the NIA boundary (Section 3.8).

Significantly elevated nitrate concentrations have also been reported in the Lake Neerabup area (maximum nitrate concentration of 280 mg/L), which have been attributed to the intensive irrigated horticultural area along the western boundary of the wetland (Yesertener 2010).

It is considered that in parts of the NIA the change in land use from horticulture to industrial, business and service has the potential to reduce leaching of nutrients and other agricultural chemicals (e.g. herbicides and pesticides) to groundwater and water dependent ecosystems.

## 3.6 Caves and Karsts

The City is known to contain significant cave and karstic features, with the most well-known being located in Yanchep National Park. The area associated with Lake Neerabup is mapped as high risk of karst, and there is a medium risk that spreads from Lake Neerabup into western parts of the NIA (Figure 9). The remainder of the NIA is considered to be low risk (Local Planning Policy 4.13: Caves and Karstic Features, City of Wanneroo)

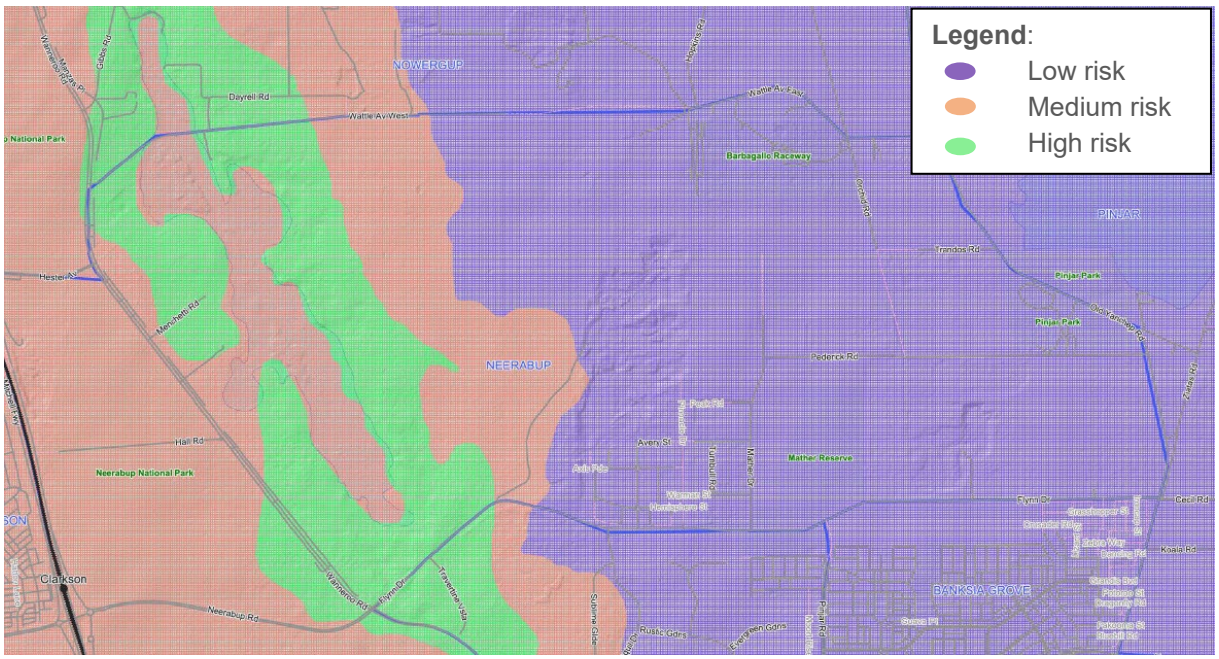



**Figure 9 Cave and karst risk, City of Wanneroo**

During investigations for a mining licence application at Lot 503 Flynn Drive, the Peritas Civil Pty Ltd (Peritas 2018) identified no signs of karstic features in existing excavations undertaken in the limestone quarry (owned by WA Limestone to the east in Lot 9005). The investigation also noted there was no evidence of karst features in the limestone exposed on the faces of the existing quarry (in Lot 9005).

Groundwater dependent ecosystems (GDE) are often associated with karstic environments as aquatic and terrestrial ecosystems can form from subterranean cave systems. There are no aquatic GDE's in the NIA with the closest being Lake Pinjar to the north east and Neerabup Lake to the west.

The policy provisions 2.5 and 2.6 of the City of Wanneroo's Local Planning Policy 4.13: Caves and Karstic Features (LPP 4.13) state respectively: *"Where there are two or more different karst risk levels across a subject site, the highest risk level will apply."* and *"Where a property is located within 400 metres of a higher karst risk level, the higher risk level will be used when determining the requirements for karst assessment."*

Table 1 in LPP 4.13 details the requirements of each phase of planning (Local Structure Plan, Subdivision and Development Application) depending on the karstic risk of the area. During the local structure planning stage it is stated a "Desktop Karst Survey" shall be prepared. The outcomes of this desktop assessment will determine whether a "Geotechnical Report" and/or "Karstic Features Management Plan" is required as a condition of subdivision (COW LPP 4.13).

Schedule 1 in the LPP 4.13 outlines the minimum requirements of Desktop Karst Surveys, Geotechnical Reports and Karstic Feature Management Plans which may be required prior to development application.

Based on the location of the NIA in relation to the karst risk zones (low to medium risk, east to west) further investigation should be considered prior to subdivision in the western section of the NIA. If Provision 2.5 of the LPP 4.13 is to be followed, the entire NIA should be considered for further investigation. Initial geotechnical investigations should be considered prior to a geophysical survey once surface material has been removed. A ground penetrating radar (GPR) assessment should be considered following the removal of surface material to maximise its effectiveness due to the limitations associated with GPR and the depth of potential karsts.

The structure plan should specify the requirements relating to karst investigation and when more detailed investigations are required. A review of the LPP 4.13 may also be beneficial in improving clarity and future application of the policy.

## 3.7 Acid Sulfate Soils

Department of Water and Environmental and Regulation (DWER) Acid Sulphate Soil (ASS) risk mapping indicates no known risk of ASS within the NIA. The soils of Lake Neerabup and Lake Pinjar, located to the west and north-east respectively, are classified as a high to moderate risk of ASS.

## 3.8 Contaminated Sites

A search of the DWER Contaminated Sites Database identifies the former landfill site located at 1851 Old Yanchep Road (Lots 501 and Lot 502), Pinjar, is classified as *Contaminated – restricted use.*

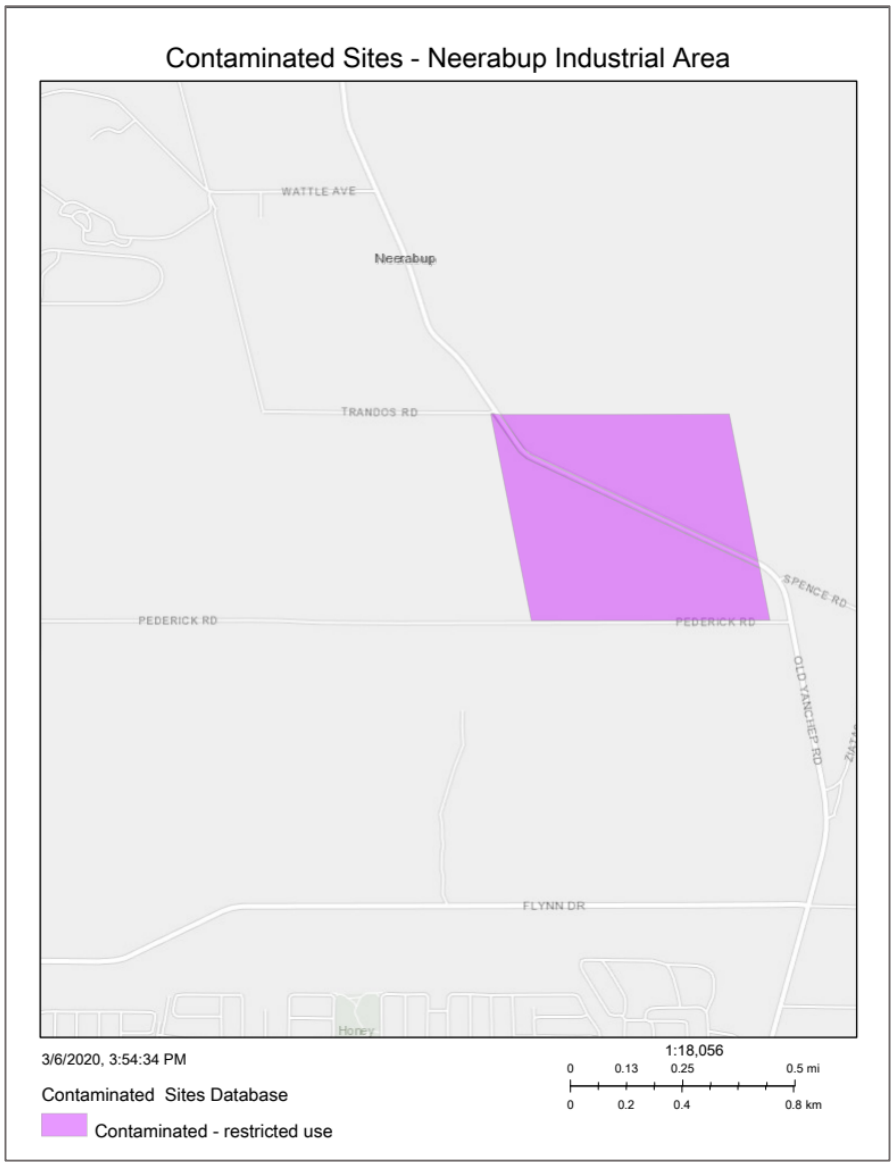



**Figure 10 Contaminated sites within the NIA (Contaminated Sites Database, DWER)**

The Basic Summary of Records Search Response for the site notes the following:

*The groundwater impact is present as a leachate plume that extends at least 60m west off-site and 270m south-west off-site beneath 100 Pederick Road, Neerabup, which has been classified separately under the Act.*

With respect to the former landfill site the NIA ASP 17 (TBB *et al.* 2017) identifies the following:

> *There is an abandoned putrescible landfill site located immediately east of Pinjar Road below which a plume of leachate is spreading west towards the NIA (City of Wanneroo, pers. comm.). The landfill was previously operated by the City of Wanneroo and has been closed since the mid-eighties. Sampling of groundwater quality has been undertaken, and it is estimated that the leachate plume may extend as far west as Orchid Road (City of Wanneroo, pers. comm.). The presence of the plume should not prevent most industries from operating within the NIA, as the estate should be serviced with reticulated water, however it does present an issue of future liability for the future industries. This liability will need to be fully disclosed between the industries, landowners/developers and the City of Wanneroo.*

A groundwater delineation investigation was conducted by Coffey Environments Australia for the City of Wanneroo at the former Pinjar Landfill site (Coffey 2016). Results indicated heavy metals and nutrients present within the groundwater beneath the former landfill site and to the western boundary of the site where present in elevated concentrations. Monitoring locations down gradient of the source presented a half order decrease in the magnitude of the measurable concentrations of nutrients. Given the down gradient concentrations, Coffey stated that it would be unlikely that the nutrient rich water would extend beyond sample locations that are located down gradient (Coffey 2016).

It is unclear from the investigation whether the heavy metals found to be present are attenuated and also decrease in concentration.

The ASP 17 notes that land identified as being affected by the Pinjar Tip Site shall have conditions imposed on any development approval, and recommended on any subdivision application to ensure prospective purchasers of land or development are appropriately informed of the potential impacts of the plume.

It is important the prospective purchasers are informed of the plume and this requirement should continue. When assessing development proposals, the assessment should consider the contamination on a case-by-case basis to determine appropriate conditions. For example, consideration of the leachate plume would be important if groundwater affected by the plume is proposed to be used as part of any industrial development.

# 4. Environmental Management

Following analysis of the existing available environmental reports and data, it is recognised that it is important to manage the ongoing impact to the environment from the industrial development.

## 4.1 Flora and Vegetation Management

The NIA is known to contain large areas of conservation significant vegetation. The City of Wanneroo has comprehensively assessed these values within its own landholdings and agreed offset, management and rehabilitation measures that will allow development to proceed (in the areas included within clearing instrument 6359/1.

The City of Wanneroo is unlikely to require further flora and vegetation studies to proceed with development on its landholdings (where development is permitted). The City should ensure that DPS2 is updated to reflect Mather Reserve as a local reserve for conservation.

It is also important that the City manage development within the NIA to minimise impact on the conservation values of Mather Reserve and any other conservation reserves created as development proceeds. It is also important that if dieback is suspected, it is not spread outside the area. Measures could include:

- Development/subdivision conditions requiring:
    - Dieback management plans (to assess the likelihood that dieback is present in the development area, limit spread of disease and reduce likelihood of introduction). Exact requirements such as utilisation of clean materials, vehicle containment and hygiene practices should be included in the plan and can be adjusted depending on the likelihood that dieback is present and the objective of the management plan (protection of existing vegetation/limiting the spread of disease within and outside the NIA).
    - Fauna management plans (to determine how impacts on fauna will be managed prior to clearing
    - Dust management (to limit spread of disease)
    - Weed control following earthworks and construction activities to limit the spread of weeds into conservation areas
    - Construction management plan (which may include elements from above)
    - Landscaping plans (require species that occur in the reserve and/or will not introduce weeds)
- Ongoing management of Mather Reserve to address:
    - Rubbish dumping
    - Weed control
    - Feral and pest animal control
    - Fire management
    - Fencing
    - (if required) Revegetation/rehabilitation
- Ongoing monitoring of Mather Reserve, to ensure vegetation condition and composition is maintained

Other landholdings where the vegetation is less well known and/or clearing permits are yet to be obtained, will require up to date flora and vegetation surveys (likely to be Level 2 flora surveys required) to confirm the presence of flora species and describe the vegetation, prior to subdivision and/or development. This information will be used to support environmental approvals and ongoing development. Ongoing updates to the structure plan should reflect any additional conservation areas.

Weed management on road verges may be required to prevent encroachment into Mather Reserve and will be required if species if Weeds of National Significance are identified.

## 4.2 Fauna Management

There are a number of fauna species known to occur within the NIA. These species will utilise natural areas and the habitat they provide until development occurs. Level 2 Fauna Surveys are likely to be required to obtain environmental approvals to develop the area for industrial use. When development occurs, it is important that clearing occurs in a sensitive manner in accordance with LPP 3.3.

Species such as the Black Cockatoos that currently utilise the NIA for foraging are also known to use roadside trees as food sources. A requirement for landscaping plans that utilise species known to be use by the Black Cockatoos could be considered to help support these birds. To obtain environmental approvals, it may also be appropriate to require Cockatube installations in known breeding sites nearby to counter the loss of hollow bearing trees within the NIA and it is likely that this will form part of ongoing assessment to obtain environmental approvals.

Mather Reserve is known to contain Western Grey Kangaroos, Quenda and Western Brush Wallaby's. As the reserve becomes more isolated, management plans specifically developed to support these species will be required. Management plans should be developed in accordance with LPP 3.3 and as a condition of development approval or subdivision. Management plans should consider containment, options for trapping and relocation, population control and staged/directional clearing (for smaller fauna only) (City of Wanneroo, 2018). Opportunities to relocate populations will be dependent on finding suitable relocation sites – the City may wish to consider which, if any, of its own conservation reserves may be suitable and what other actions may be required to make potential relocations successful, such as pest animal control.

To protect native species within the NIA, especially as it develops and conservation areas become important fauna refuges, it will be important to control feral animals to decrease predation and competition for diminishing resources. This should form part of the management strategies in Vegetation and Fauna Management Plans required as part of development and subdivision approvals (in accordance with LPP 3.3).

Management plans should also include monitoring requirements.

Ongoing negotiations for the remaining area of Bush Forever site 295 should consider *Hylaeus globuliferus* and whether the habitat protected within Mather Reserve is adequate for the ongoing persistence of this species.

## 4.3 Wetland Management

Wetlands are located to the north east and west of the NIA. It is important that industrial development be managed to ensure the impacts of development do not reduce the environmental values and functions of these wetlands.

This can be managed through the development of a Local Water Management Strategy as part of the revised Local Structure Plan and through the development of Urban Water Management Plans as a condition of subdivision. Nutrient Irrigation Management Plans may also be

beneficial depending on the type of industry proposed and should be considered on a case-by-case basis.

## 4.4 Groundwater

Groundwater within the area is managed in accordance with the *Gnangara groundwater areas allocation plan* (DoW 2009a). The availability of water should be considered as part of the assessment of development proposals that propose the utilisation of groundwater. The allocation of groundwater, licensing and water trading is managed by the Department of Water, affected development proposals may therefore need to be referred for agency comment or a note added to the approval advising of requirements.

## 4.5 Caves and Karst

The revised structure plan should detail the requirements relating to karst investigation. This will ensure consistent consideration of LPP 4.13, not unduly burden development and protect development from karst risk.

## 4.6 Contaminated Sites

There is known contamination at the former landfill site located at Lot 501 and 502 Old Yanchep Road, Pinjar, which affects part of the NIA. It is important that this is considered in the assessment of impacted development proposals. This is especially important where affected groundwater is proposed to be utilised as part of industrial development. Industries that use significant volumes of water include metal, paper and plastics processing, such as recycling.

# 5. References


ATA Environmental (2007) Flora, Vegetation and Vertebrate Fauna Assessment Lot 4, Part of Lots 1002 and 2692, Neerabup, prepared for the City of Wanneroo and Landcorp

Stratagen (2008), Lot 22 Flynn Drive, Neerabup Drainage, Nutrient and Water Management Plan

Coffey Environments (2008) Spring Flora and Vegetation Survey, Part Lot 600 Orchid Road, Neerabup, prepared for the City of Wanneroo

Ecological Australia (2012) Ground Truthing of Environmental Values for Lot 4 Flynn Drive, Neerabup prepared for the City of Wanneroo

Terratree (2016) Level 2 Flora and Vegetation Assessment of Conservation Offset Areas prepared for the City of Wanneroo

Ecoscape (2019) Mather Reserve Kangaroo Population Survey (2019) prepared for the City of Wanneroo

Animal Pest Management Services (2016) Flynn Drive – Lot 9000 Neerabup, Fauna Survey prepared for the City of Wanneroo

Terratree (2016) Comprehensive Phytophthora Dieback Assessment of Conservation and Development Areas-Neerabup Project prepared for the City of Wanneroo

Terrestrial Ecosystems (2018) Black Cockatoo Habitat Survey prepared for the City of Wanneroo

Natural Area Consulting (2017) Weed Mapping Report, Lot 9000 Flynn Drive prepared for the City of Wanneroo

Ecological Australia (2019) Memorandum: Neerabup Industrial Area – Environmental Input to City of Wanneroo Review of NIA ASP17 prepared for the City of Wanneroo

City of Wanneroo (2018) Environmental Management Plan Guidelines

360 Environmental (2018) Local Biodiversity Plan prepared for the City of Wanneroo

City of Wanneroo (2018) Local Planning Policy 3.3: Fauna Management

City of Wanneroo (2018) Local Planning Policy 4.13: Caves and Karstic Features

# Appendices

# **Appendix A** - NatureMap Species Report and Map

NatureMap
Mapping Western Australia's biodiversity

# NatureMap Species Report

*Created By Guest user on 30/10/2019*

**Current Names Only** Yes
**Core Datasets Only** Yes
**Method** 'By Circle'
**Centre** 115° 46' 57" E,31° 40' 19" S
**Buffer** 3km

| | Name ID | Species Name | Naturalised | Conservation Code | [1]Endemic To Query Area |
|---|---|---|---|---|---|
| 1. | 3409 | *Acacia lasiocarpa (Panjang)* | | | |
| 2. | 30032 | *Acacia saligna subsp. saligna* | | | |
| 3. | 24261 | *Acanthiza chrysorrhoa (Yellow-rumped Thornbill)* | | | |
| 4. | 24560 | *Acanthorhynchus superciliosus (Western Spinebill)* | | | |
| 5. | 24282 | *Accipiter fasciatus subsp. fasciatus (Brown Goshawk)* | | | |
| 6. | 184 | *Aira caryophyllea (Silvery Hairgrass)* | Y | | |
| 7. | 1728 | *Allocasuarina fraseriana (Sheoak, Kondil)* | | | |
| 8. | 6311 | *Andersonia heterophylla* | | | |
| 9. | 24561 | *Anthochaera carunculata (Red Wattlebird)* | | | |
| 10. | 24562 | *Anthochaera lunulata (Western Little Wattlebird)* | | | |
| 11. | 6331 | *Astroloma microcalyx (Native Cranberry)* | | | |
| 12. | | *Austracantha minax* | | | |
| 13. | 231 | *Avellinia michelii* | Y | | |
| 14. | | *Barnardius zonarius* | | | |
| 15. | 7046 | *Bellardia trixago (Bellardia)* | Y | | |
| 16. | 3710 | *Bossiaea eriocarpa (Common Brown Pea)* | | | |
| 17. | 42381 | *Brachyurophis semifasciatus (Southern Shovel-nosed Snake)* | | | |
| 18. | 244 | *Briza maxima (Blowfly Grass)* | Y | | |
| 19. | 25715 | *Cacatua roseicapilla (Galah)* | | | |
| 20. | 24727 | *Cacatua sanguinea subsp. westralensis (Little Corella)* | | | |
| 21. | 11038 | *Caladenia bicalliata* | | | |
| 22. | 1595 | *Caladenia hirta (Sugar Candy Orchid)* | | | |
| 23. | 24734 | *Calyptorhynchus latirostris (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)* | | T | |
| 24. | 2957 | *Cassytha racemosa (Dodder Laurel)* | | | |
| 25. | 2889 | *Cerastium glomeratum (Mouse Ear Chickweed)* | Y | | |
| 26. | 24980 | *Christinus marmoratus (Marbled Gecko)* | | | |
| 27. | 25675 | *Colluricincla harmonica (Grey Shrike-thrush)* | | | |
| 28. | 24613 | *Colluricincla harmonica subsp. rufiventris (Grey Shrike-thrush)* | | | |
| 29. | 4552 | *Comesperma confertum* | | | |
| 30. | 1885 | *Conospermum triplinervium (Tree Smokebush)* | | | |
| 31. | 1418 | *Conostylis aculeata (Prickly Conostylis)* | | | |
| 32. | 11826 | *Conostylis aculeata subsp. aculeata* | | | |
| 33. | 25568 | *Coracina novaehollandiae (Black-faced Cuckoo-shrike)* | | | |
| 34. | 25592 | *Corvus coronoides (Australian Raven)* | | | |
| 35. | 24417 | *Corvus coronoides subsp. perplexus (Australian Raven)* | | | |
| 36. | 17104 | *Corymbia calophylla (Marri)* | | | |
| 37. | 25595 | *Cracticus tibicen (Australian Magpie)* | | | |
| 38. | 24422 | *Cracticus tibicen subsp. dorsalis (White-backed Magpie)* | | | |
| 39. | 25596 | *Cracticus torquatus (Grey Butcherbird)* | | | |
| 40. | 24424 | *Cracticus torquatus subsp. torquatus (Grey Butcherbird)* | | | |
| 41. | 24918 | *Crenadactylus ocellatus subsp. ocellatus (Clawless Gecko)* | | | |
| 42. | 30893 | *Cryptoblepharus buchananii* | | | |
| 43. | 30899 | *Ctenophorus adelaidensis (Southern Heath Dragon, Western Heath Dragon)* | | | |
| 44. | 25027 | *Ctenotus australis* | | | |
| 45. | 25039 | *Ctenotus fallens* | | | |
| 46. | 10916 | *Cyrtostylis huegelii* | | | |
| 47. | 30901 | *Dacelo novaeguineae (Laughing Kookaburra)* | Y | | |
| 48. | 6218 | *Daucus glochidiatus (Australian Carrot)* | | | |
| 49. | 24999 | *Delma grayii* | | | |
| 50. | 25296 | *Demansia psammophis subsp. reticulata (Yellow-faced Whipsnake)* | | | |
| 51. | 4746 | *Diplopeltis huegelii* | | | |
| 52. | 3095 | *Drosera erythrorhiza (Red Ink Sundew)* | | | |

| | Name ID | Species Name | Naturalised | Conservation Code | [1]Endemic To Query Area |
|---|---|---|---|---|---|
| 53. | 3118 | *Drosera pallida (Pale Rainbow)* | | | |
| 54. | | *Eolophus roseicapillus* | | | |
| 55. | 1646 | *Eriochilus dilatatus (White Bunny Orchid)* | | | |
| 56. | 13091 | *Eucalyptus argutifolia (Wabling Hill Mallee)* | | T | |
| 57. | 5615 | *Eucalyptus decipiens (Limestone Marlock, Moit)* | | | |
| 58. | 20808 | *Eucalyptus petiolaris* | Y | | |
| 59. | 13541 | *Eucalyptus petrensis* | | | |
| 60. | 24368 | *Eurostopodus argus (Spotted Nightjar)* | | | |
| 61. | 25623 | *Falco longipennis (Australian Hobby)* | | | |
| 62. | 24041 | *Felis catus (Cat)* | Y | | |
| 63. | 7323 | *Galium murale (Small Goosegrass)* | Y | | |
| 64. | 25530 | *Gerygone fusca (Western Gerygone)* | | | |
| 65. | 1520 | *Gladiolus caryophyllaceus (Wild Gladiolus)* | Y | | |
| 66. | 6143 | *Glischrocaryon aureum (Common Popflower)* | | | |
| 67. | 24443 | *Grallina cyanoleuca (Magpie-lark)* | | | |
| 68. | 2175 | *Hakea lissocarpha (Honey Bush)* | | | |
| 69. | 2214 | *Hakea trifurcata (Two-leaf Hakea)* | | | |
| 70. | 3961 | *Hardenbergia comptoniana (Native Wisteria)* | | | |
| 71. | 25410 | *Heleioporus eyrei (Moaning Frog)* | | | |
| 72. | 3016 | *Heliophila pusilla* | Y | | |
| 73. | 25119 | *Hemiergis quadrilineata* | | | |
| 74. | 5135 | *Hibbertia hypericoides (Yellow Buttercups)* | | | |
| 75. | 45534 | *Hibbertia hypericoides subsp. hypericoides* | | | |
| 76. | 5162 | *Hibbertia racemosa (Stalked Guinea Flower)* | | | |
| 77. | 24491 | *Hirundo neoxena (Welcome Swallow)* | | | |
| 78. | 6222 | *Homalosciadium homalocarpum* | | | |
| 79. | 12859 | *Hovea trisperma var. trisperma* | | | |
| 80. | 6232 | *Hydrocotyle hispidula* | | | |
| 81. | 33977 | *Hylaeus globuliferus (woolybush bee)* | | P3 | |
| 82. | 8086 | *Hypochaeris glabra (Smooth Catsear)* | Y | | |
| 83. | 48588 | *Isoodon fusciventer (Quenda, southwestern brown bandicoot)* | | P4 | |
| 84. | 4027 | *Jacksonia sericea (Waldjumi)* | | P4 | |
| 85. | 4044 | *Kennedia prostrata (Scarlet Runner)* | | | |
| 86. | 467 | *Lagurus ovatus (Hare's Tail Grass)* | Y | | |
| 87. | 925 | *Lepidosperma angustatum* | | | |
| 88. | 945 | *Lepidosperma squamatum* | | | |
| 89. | 5850 | *Leptospermum laevigatum (Coast Teatree)* | Y | | |
| 90. | 25133 | *Lerista elegans* | | | |
| 91. | 25165 | *Lerista praepedita* | | | |
| 92. | 6427 | *Leucopogon parviflorus (Coast Beard-heath)* | | | |
| 93. | 25005 | *Lialis burtonis* | | | |
| 94. | 25661 | *Lichmera indistincta (Brown Honeyeater)* | | | |
| 95. | 25415 | *Limnodynastes dorsalis (Western Banjo Frog)* | | | |
| 96. | 1228 | *Lomandra hermaphrodita* | | | |
| 97. | 1231 | *Lomandra maritima* | | | |
| 98. | 6456 | *Lysinema ciliatum (Curry Flower)* | | | |
| 99. | 24132 | *Macropus fuliginosus (Western Grey Kangaroo)* | | | |
| 100. | 25654 | *Malurus splendens (Splendid Fairy-wren)* | | | |
| 101. | 24552 | *Malurus splendens subsp. splendens (Splendid Fairy-wren)* | | | |
| 102. | 24583 | *Manorina flavigula (Yellow-throated Miner)* | | | |
| 103. | 5920 | *Melaleuca huegelii (Chenille Honeymyrtle)* | | | |
| 104. | 33022 | *Melaleuca sp. Wanneroo (G.J. Keighery 16705)* | | T | |
| 105. | 18598 | *Melaleuca systena* | | | |
| 106. | 25663 | *Melithreptus brevirostris (Brown-headed Honeyeater)* | | | |
| 107. | 25184 | *Menetia greyii* | | | |
| 108. | 24598 | *Merops ornatus (Rainbow Bee-eater)* | | | |
| 109. | 8106 | *Millotia tenuifolia (Soft Millotia)* | | | |
| 110. | 25192 | *Morethia obscura* | | | |
| 111. | 24223 | *Mus musculus (House Mouse)* | Y | | |
| 112. | 25420 | *Myobatrachus gouldii (Turtle Frog)* | | | |
| 113. | 48022 | *Notamacropus irma (Western Brush Wallaby)* | | P4 | |
| 114. | | *Ommatoiulus moreletii* | | | |
| 115. | | *Oratemnus curtus* | | | |
| 116. | 24085 | *Oryctolagus cuniculus (Rabbit)* | Y | | |
| 117. | 24624 | *Pachycephala rufiventris subsp. rufiventris (Rufous Whistler)* | | | |
| 118. | 25682 | *Pardalotus striatus (Striated Pardalote)* | | | |
| 119. | 2309 | *Petrophile serruriae* | | | |
| 120. | 24409 | *Phaps chalcoptera (Common Bronzewing)* | | | |
| 121. | 24596 | *Phylidonyris novaehollandiae (New Holland Honeyeater)* | | | |
| 122. | 4675 | *Phyllanthus calycinus (False Boronia)* | | | |

| | Name ID | Species Name | Naturalised | Conservation Code | [1]Endemic To Query Area |
|---|---|---|---|---|---|
| 123. | | *Phytophthora cinnamomi* | | | |
| 124. | 5243 | *Pimelea ferruginea* | | | |
| 125. | 25720 | *Platycercus icterotis (Western Rosella)* | | | |
| 126. | 24750 | *Platycercus zonarius subsp. semitorquatus (Twenty-eight Parrot)* | | | |
| 127. | 8177 | *Podolepis lessonii* | | | |
| 128. | 25511 | *Pseudonaja affinis (Dugite)* | | | |
| 129. | 25259 | *Pseudonaja affinis subsp. affinis (Dugite)* | | | |
| 130. | | *Pterostylis aff. nana* | | | |
| 131. | 17267 | *Pterostylis brevisepala* | | | |
| 132. | 12217 | *Pterostylis sanguinea* | | | |
| 133. | | *Purpureicephalus spurius* | | | |
| 134. | 25008 | *Pygopus lepidopodus (Common Scaly Foot)* | | | |
| 135. | 48096 | *Rhipidura albiscapa (Grey Fantail)* | | | |
| 136. | 25614 | *Rhipidura leucophrys (Willie Wagtail)* | | | |
| 137. | 1556 | *Romulea rosea (Guildford Grass)* | Y | | |
| 138. | 982 | *Schoenus clandestinus* | | | |
| 139. | 992 | *Schoenus grandiflorus (Large Flowered Bogrush)* | | | |
| 140. | 30948 | *Smicrornis brevirostris (Weebill)* | | | |
| 141. | 8231 | *Sonchus oleraceus (Common Sowthistle)* | Y | | |
| 142. | 4207 | *Sphaerolobium medium* | | | |
| 143. | 4733 | *Stackhousia monogyna* | | | |
| 144. | 2918 | *Stellaria media (Chickweed)* | Y | | |
| 145. | 25589 | *Streptopelia chinensis (Spotted Turtle-Dove)* | Y | | |
| 146. | 24943 | *Strophurus spinigerus subsp. inornatus* | | | |
| 147. | 7745 | *Stylidium junceum (Reed Triggerplant)* | | | |
| 148. | 13127 | *Stylidium maritimum* | | P3 | |
| 149. | 33992 | *Synemon gratiosa (Graceful Sunmoth)* | | P4 | |
| 150. | 4256 | *Templetonia retusa (Cockies Tongues)* | | | |
| 151. | 1036 | *Tetraria octandra* | | | |
| 152. | 5105 | *Thomasia triphylla* | | | |
| 153. | 1338 | *Thysanotus manglesianus (Fringed Lily)* | | | |
| 154. | 25207 | *Tiliqua rugosa subsp. rugosa* | | | |
| 155. | 6280 | *Trachymene pilosa (Native Parsnip)* | | | |
| 156. | 25723 | *Trichoglossus haematodus (Rainbow Lorikeet)* | | | |
| 157. | 1361 | *Tricoryne elatior (Yellow Autumn Lily)* | | | |
| 158. | 4292 | *Trifolium campestre (Hop Clover)* | Y | | |
| 159. | 8254 | *Urospermum picroides (False Hawkbit)* | Y | | |
| 160. | 8255 | *Ursinia anthemoides (Ursinia)* | Y | | |
| 161. | 724 | *Vulpia myuros (Rat's Tail Fescue)* | Y | | |
| 162. | 1256 | *Xanthorrhoea preissii (Grass tree, Palga)* | | | |
| 163. | 25765 | *Zosterops lateralis (Grey-breasted White-eye, Silvereye)* | | | |

**Conservation Codes**
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

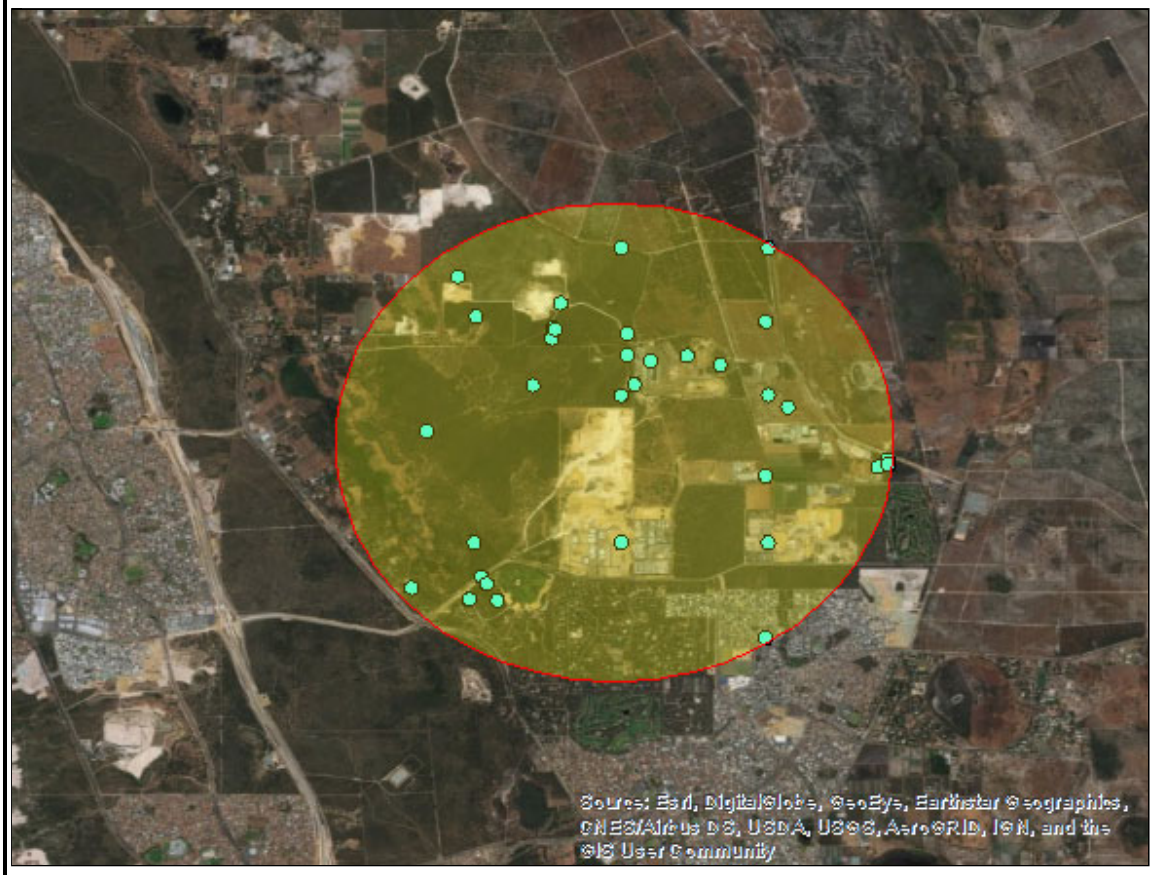
[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

NatureMap
Mapping Western Australia's biodiversity

# Neerabup Industrial Area - Nature Map Search Area

Printed by Guest user on 30/10/2019

**Query details :** Current Names Only=Yes; Core Datasets Only=Yes; Method='By Circle'; Centre=115° 46' 57" E,31° 40' 19" S; Buffer=3km;




**Search Results**

Selected

Selected Species

All Results

Default

Confirmed

Corrected

Reported

**Reference Layers**

Major WA Towns

Major WA Towns

Major WA Towns

State Borders

Department of Biodiversity, Conservation and Attractions

WESTERN AUSTRALIAN MUSEUM

NatureMap is a collaborative project of the Department of Biodiversity, Conservation and Attractions, Western Australia, and the Western Australian Museum.

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Document Status

| Revision | Author | Reviewer | | Approved for Issue | | |
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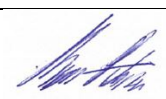
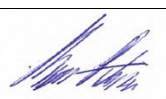
| | | Name | Signature | Name | Signature | Date |
| A | N Hoey | K Petani | On file | K Petani | On file | 21 November 2019 |
| B | N Hoey | K Petani | On file | K Petani | On file | |
| 0 | N Hoey | K Petani |  | K Petani |  | 24 April 2020 |