Strategic Bushfire Hazard Level Assessment Bushfire Management Plan

East Wanneroo District Structure Plan

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Ref 17-072
Ver C
August 2018

Document Reference

Property Details

Street No	Lot No's	Plan	Street Name	
Locality	East Wanneroo		**State** WA	**Postcode**
Local Government Area	Wanneroo			
Description of the building or works	District Structure Plan			

Report Details

Revision	Date	Job No 17-025
A	20/05/2018	Draft for review
B	23/07/2018	DPHL & DFES Comments
C	08/08/2018	Final

Practitioner Details

BPAD	Level 2 Practitioner	Accreditation No	27682

Disclaimer

The measures contained in this report do not guarantee that a building will not be damaged in a bushfire. The ultimate level of protection will be dependent upon the design and construction of the dwelling and the level of fire preparedness and maintenance under taken by the landowner. The severity of a bushfire will depend upon the vegetation fuel loadings; the prevailing weather conditions and the implementation of appropriate fire management measures.

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1.0 Proposal Details

1.1 Introduction

This bushfire hazard level assessment (BHL) has been prepared to assist in the formulation of the East Wanneroo District Structure Plan and to inform the general pattern for future development in the area through the structure planning process.

The objectives for the bushfire hazard level assessment are:

1) To examine those areas which are identified for development in the proposed District Structure Plan, to determine their suitability for development;
2) To identify areas that require a more detailed analysis before any development / subdivision occurs;
3) To identify any bushfire management issues and any spatial impact of such issues; which should be considered; in the preparation of the District or subsequent Local structure plans; and
4) To document how the recommendations of this bushfire hazard level assessment can be implemented in the relevant planning stages.

The Study Area covers approximately 8000 hectares of land as shown in Figure 1. It is located approximately two kilometres east of the Wanneroo town site extending a further 7kms to the municipal boundary. The southern boundary is along Ocean Reef and Gnangara Road extending north by approximately 14kms past Neaves Road.

All of the Study Area is located within the City of Wanneroo.

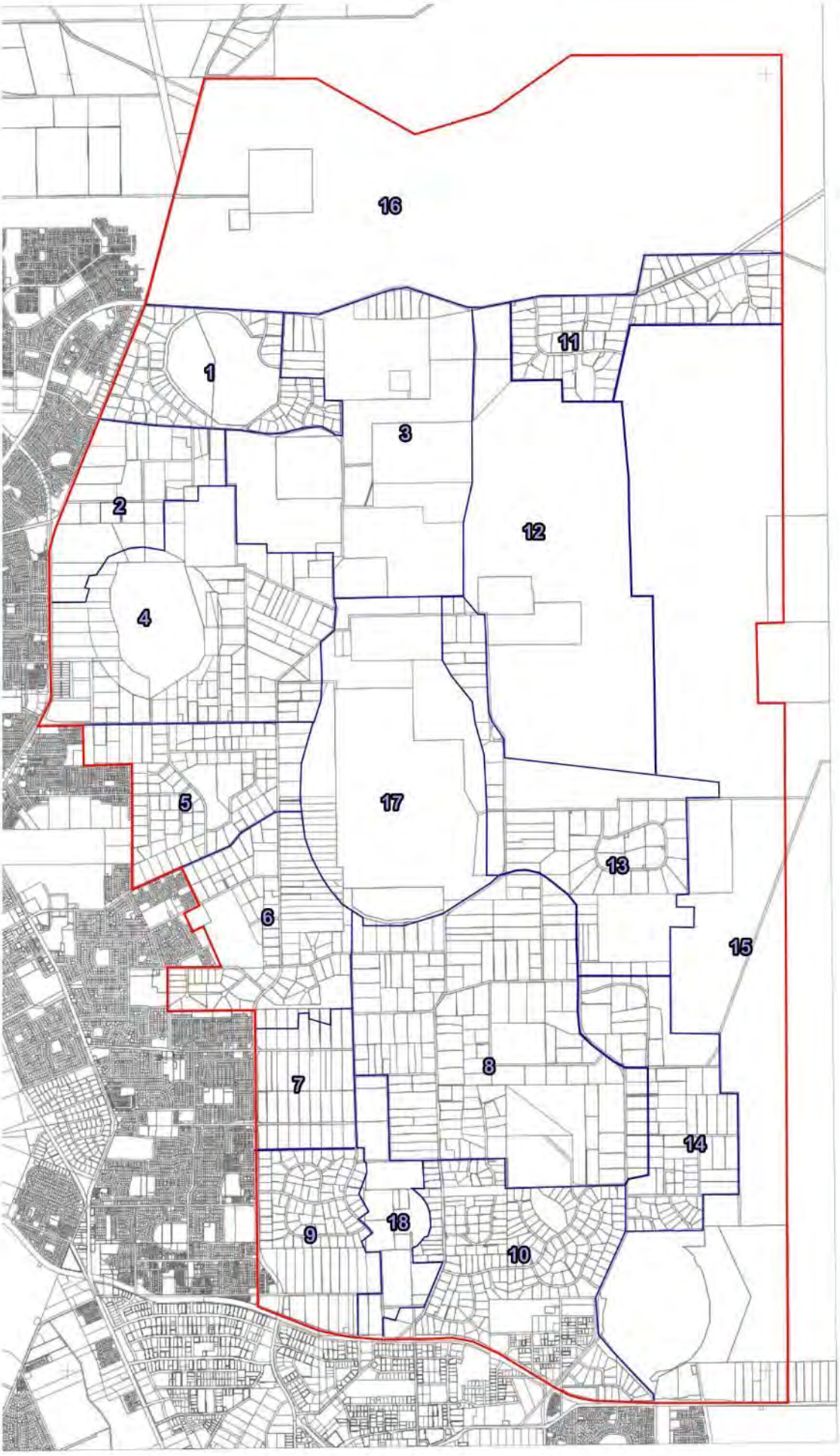
The District Structure Plan builds upon previous planning strategies including the 2015 North-West Sub-regional Planning Framework and the 2011 East Wanneroo Structure Plan.

This strategic bushfire hazard level assessment has been prepared in accordance with the methodology contained in the Guidelines for Planning in Bushfire Prone Areas (1). The level of detail for the assessment reflects the physical size of the Study Area and is more generalised than a local assessment. This is because the focus of the assessment is to identify spatial issues rather than simply mapping the existing conditions.

The Study Area has been divided into eighteen precincts as shown in Figure 1. These are based upon the precincts identified in the East Wanneroo Structure Plan, with four additional precincts covering State Forest and bush forever sites. The precincts are:

01	Mariginiup North Rural	10	Gnangara South
02	Mariginiup North	11	Mariginiup NE Rural
03	Mariginiup Wetlands	12	Mariginiup East
04	Mariginiup South	13	Jandabup
05	Wanneroo North	14	Gnangara East Rural
06	Wanneroo South	15	East
07	Hocking East	16	Northern
08	Jandabup-Gnangara	17	Jandabup Lake
09	Pearsall East	18	Wanneroo Bush Forever

1 DPHL (2016) Guidelines for Planning in Bushfire Prone Areas Version 1.3



LEGEND

STUDY AREA

PRECINCTS

01 Mariginiup North Rural
02 Mariginiup North
03 Mariginiup Wetlands
04 Mariginiup South
05 Wanneroo North
06 Wanneroo South
07 Hocking East
08 Jandabup - Gnangara
09 Pearsall East
10 Gnangara South Rural
11 Mariginiup NE Rural
12 Mariginiup East
13 Jandabup
14 Gnangara East Rural
15 East
16 Northern
17 Jandabup Lake
18 Wanneroo Bush Forever

FIGURE 1
STUDY AREA

N

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The preparation of the assessment has included:

- Site Inspections;
- Reviewing relevant vegetation surveys;
- Reviewing relevant planning strategies and reports;
- Use of aerial photography; and
- Measurement of slopes and distances on site.

It is noted that the consultant did not have any authority to enter private property and all inspections were conducted from public areas. Where an area could not be physically inspected the vegetation type and hazard rating has been assigned on the basis of the surrounding complexes.

1.2 Bushfire Prone Land

The extent of bushfire prone land shown on the Map of Bushfire Prone Areas (2017) is shown in Figure 2. Bushfire prone areas are comprised of (2):

- Bushfire prone vegetation; and
- A 100m wide bushfire prone buffer.

Bushfire prone vegetation includes:

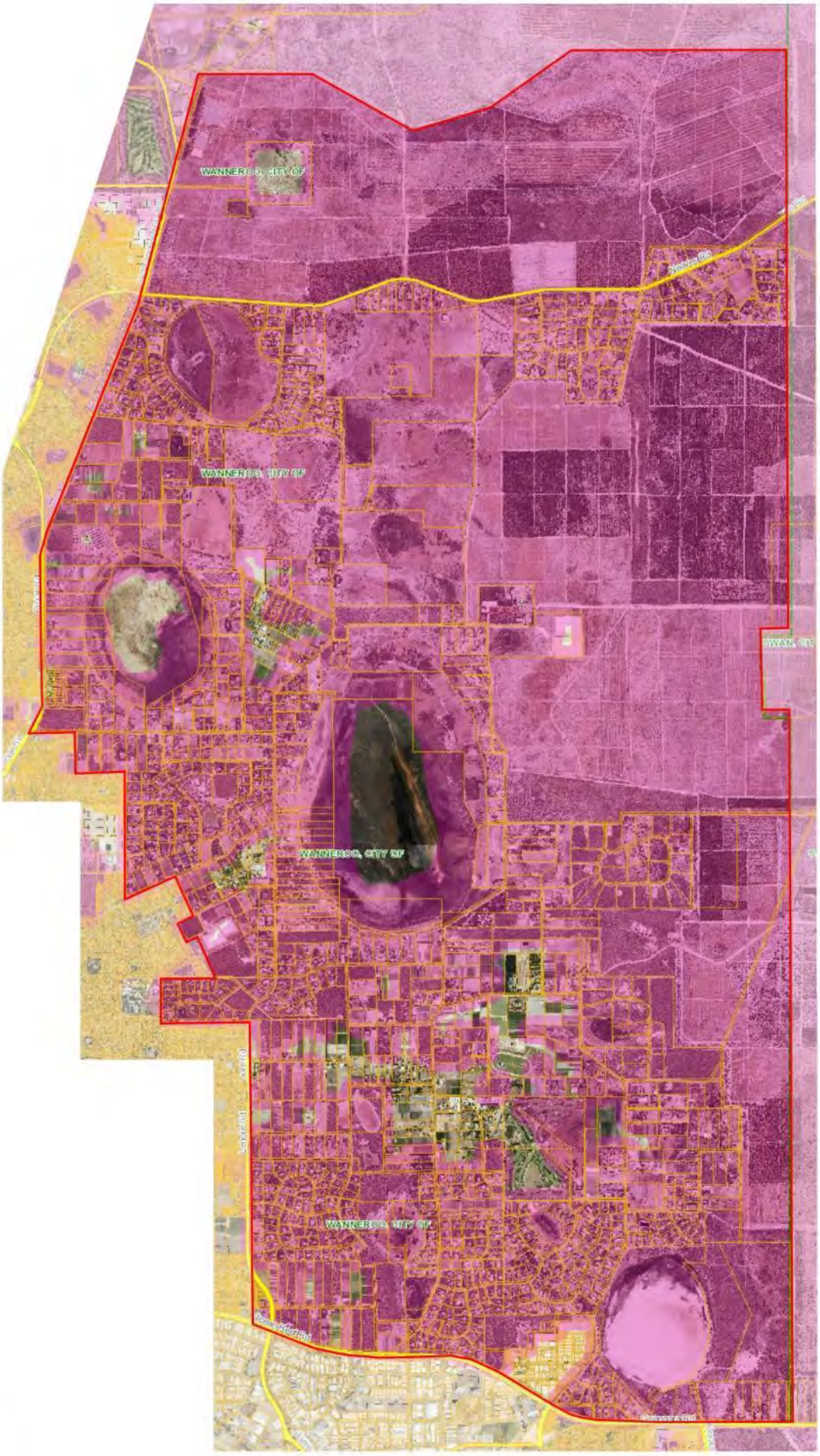
- All parcels of the above vegetation that are greater than 1 hectare in size; and
- Single areas of vegetation that are between 0.25 and 1 hectare in area and are within 100 metres of other parcels of vegetation in the identified communities greater than 1 hectare in size.

The Map of Bushfire Prone Areas is reviewed annually and will change in response to ongoing examination of vegetated areas, land clearing, development and revegetation measures.

State Planning Policy 3.7 Planning in Bushfire Prone Areas promotes that strategic planning documents should include high level consideration of relevant bushfire hazards when identifying or investigating land for future development. It requires that for bushfire prone land that any strategic planning proposal is to be accompanied by:

- ❖ A BHL assessment determining the applicable hazard level(s) across the subject land, in accordance with the methodology set out in the Guidelines;
- ❖ The identification of any bushfire hazard issues arising from the relevant assessment; and
- ❖ Clear demonstration that compliance with the bushfire protection criteria in the Guidelines can be achieved in subsequent planning stages.

2 DFES (2014) Bushfire-Prone Area Mapping Standard Western Australia pages 2 and 7.



LEGEND

SUBJECT LAND

BUSHFIRE PRONE LAND

(Includes a 100m buffer from Bushfire Prone Vegetation)

FIGURE 2
BUSHFIRE PRONE LAND

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1.3 Firebreak Notice

Council's Firebreak Notice stipulates that:

- Property less than 2,000 sqm shall provide a firebreak no less than 2 metres wide by 2 metres high is required around the perimeter and the growth on the firebreak cannot exceed 20mm high.
- Property greater than 2,000 sqm shall provide a firebreak no less than 3 metres wide by 3 metres high is required around the perimeter and the growth on the firebreak cannot exceed 20mm high.
- Buildings shall provide a firebreak not less than 3 metres wide immediately around all external walls of every building must be cleared.

The notice also references special rural and residential land highlighting the to take bush fire prevention measures, while ensuring they do not contravene Town Planning Scheme provisions which control the removal of vegetation in Special Residential and Special Rural Zones.

These special rural zones were created in areas of natural flora, and the Scheme recognises the importance of preserving the natural environment in these areas. Anyone found cutting down, lopping or damaging trees in these areas without City approval may be guilty of an offence. However, bush fire prevention, including the installation of firebreaks, is essential regardless of the zoning of the land.

2.0 Existing Conditions

2.1 Overview

The existing conditions for the overall Study Area are discussed here and shown in Figure 3 and the following photographs. Details of the individual precincts are contained in Section 5.4.

The Study Area is an urban to rural transition zone with existing urban areas on the western fringe, Special Rural lots with a mixture of market gardens, nurseries and other similar land uses. The central area is dominated by a series of wetlands and associated large semi rural lots and activities including a golf course, turf fam, equestrian centres, boarding kennels, and extractive industry.

The largest land use is the Gnangara State Forest Not 65 and plantation which occupies the eastern and northern portions of the Study Area. The southern boundary adjoins service commercial and industrial development. This has extended into the south eastern corner of the Study Area being the Northlink Business Park. The major crown reserves are documented in Table 1. The majority of these are for "recreation" which includes bushland reserves.

The Study Area contains a number of important environmental features which are documented in Section 3.0. Major infrastructure includes:

- The Water Corporation's Gnangara Treatment Plant;
- The Wanneroo water storage facility in Belgrade Road; and
- Western Power substation in Ziatis Road and the associated transmission line.

The Study Area is bounded by regional distributor roads except on the eastern side. Wanneroo Road to the west is a major traffic corridor while east-west connections are provided by Joondalup Drive/Neaves Road and Ocean Reef Road/Gnangara Road.

The elongated shape of the Study Area and the physical barriers created by the wetlands has determined the road access network. This is predominantly in the southern and western portion of the site with Franklin and Lenore Roads being the main south to north access. Caporn Street provides a major east - west linkage. The area north of Jandabup Lake is not connected to Neaves Road and has poor local access.

The Study Area has an elevation of between 50 to 100m AHD with the highest area being on the western boundary along Belgrade Road. The western third of the Study Area generally has higher elevations between 70 - 100m AHD while the central wetlands are generally 50m AHD. The slopes are generally considered to be low, less than 5 degrees when measured over a 100m distance.

The two predominant vegetation types within the Study Area are:

- Banksia woodlands with a variety of defining characteristics relating to height, foliage coverage and understorey vegetation; and
- Pines being comprised of the existing pine plantations; and post-harvest regeneration areas developing as woodlands.

There are areas of Tuart forest and large areas of scrub and grassland. The wetland vegetation can vary from dense Melaleuca forest or scrub to reeds and grassland. The pine plantation post-harvest areas also include grasslands and scrub vegetation.

LEGEND

STUDY AREA

DISTRICT ROADS

FEATURES

01 Neerabup Power Substation
02 Caporn Park
03 Edgar Griffiths Park
04 Water Treatment Plant
05 Extractive Industry
06 Water Supply
07 Equestrian
08 Golf Club
09 Mary Street Reserve
10 Northlink Industrial Park

FIGURE 3
EXISTING CONDITIONS

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Urban residential development on western boundary.

Service commercial industrial development in southern portion of the Study Area.

Rural residential development with scheme water / irrigation

Rural residential development without reticulated water supply.

Market garden.

Irrigated parkland.

Non irrigated parkland.

Local conservation reserve.

Jandabup Lake.

Introduced Eucalypts
(Rose Gum)

Tuart trees.

Pine plantation.

Pine plantation post harvest.

Wetland vegetation mature Melaleucas.

Banksia 'open' woodland with shrubland.

Banksia woodland.

Table 1 Reserves

Reserve	Class	Purpose	Location	Bushland	Area (ha)
7349	C	National Park	Jandabup Lake	Yes	245.0
8399	C	Recreation	Lake Gnangara	Yes	47.8
14328	UCL		Mariginiup Lake	Yes	95.0
19545	C	Recreation	Jambanis Road		3.6
21490	C	Water	Cecil Road		4.0
25489	C	Recreation	Belgrade Road	Yes	4.0
26145	C	Recreation	Franklin Road		8.0
26336	C	Recreation	Damian Road	Yes	6.0
26542	C	Conservation	Caporn Street		8.8
27279	C	Conservation	Sydney Road		143.0
27466	C	Recreation	Golf View Place	Yes	4.2
29527	C	Recreation	Lorian Road	No	2.0
33617	C	Water	Townsend Road		20.6
34616	C	Recreation	Benmuni Road		10.4
36601	C	Recreation	Garden Park Drive		23.0
36860	C	Recreation	Benmuni Road		13.6
36878	C	Recreation	Chicquita Park	Yes	4.8
38656	C	Recreation	Coogee park		3.2
39895	C	Recreation	Mariginiup Lake		8.4
40012	C	Recreation	Benmuni Road		12.07
41999	C	Recreation	Tuscan Way	Yes	3.0
42559	C	Recreation	Lorian Road	Yes	2.0
42745	C	Recreation	Lake Adams	Yes	32.0
43821	C	Conservation	Badgerup Reserve	Yes	78.2
44168	C	Recreation	Mary Street	Yes	5.6

2.2 Precincts

Plans and photographs of the individual precincts are contained in Appendix 1.

P01 Mariginiup North Rural

The precinct is bounded by Neaves Road to the north, Greenvale Place to the west and Coogee Road to the south.

The predominant feature is Lake Adams (R42745) and associated fringing vegetation. The surrounding land has been developed for rural residential purposes and includes Special Rural Zones 4 and 13. The lot sizes are generally between 1 and 2 hectares in size and contain bushfire prone vegetation. Much of this is in the form of boundary windbreaks.

Greenvale Place does not connect through to Neaves Road.

P02 Mariginiup North

The precinct is bounded by Coogee Road to the north, Mornington Drive and Pinjar Road to the west. Mariginiup Lake is located on the southern border and Little Mariginiup Lake on the southern eastern boundary.

The lots are generally 8 hectares in size and contain a variety of land uses including market gardens, nurseries, spa retreat etc. Many of the lots have significant areas of remnant vegetation.

There is no access to the east and Coogee Road only extends for approximately 1km past the precinct boundary.

P03 Mariginiup Wetlands

The precinct is bounded by Neaves Road to the north, Boundary Road to the east and Adams Lake rural residential lots to the west.

There is a group of 2 hectare lots along Neaves Road with mixed rural residential uses including kennels. The balance of the precinct has large rural lots with broad acre grazing and large areas of remnant vegetation.

Access is poor and neither Rouset or Boundary Roads provide any connection to the south.

P04 Mariginiup South

The precinct is situated around Mariginiup Lake and Little Mariginiup Lake. It is bounded by Pinjar Road on the west, Caporn Street to the south and Rouset Road to the east.

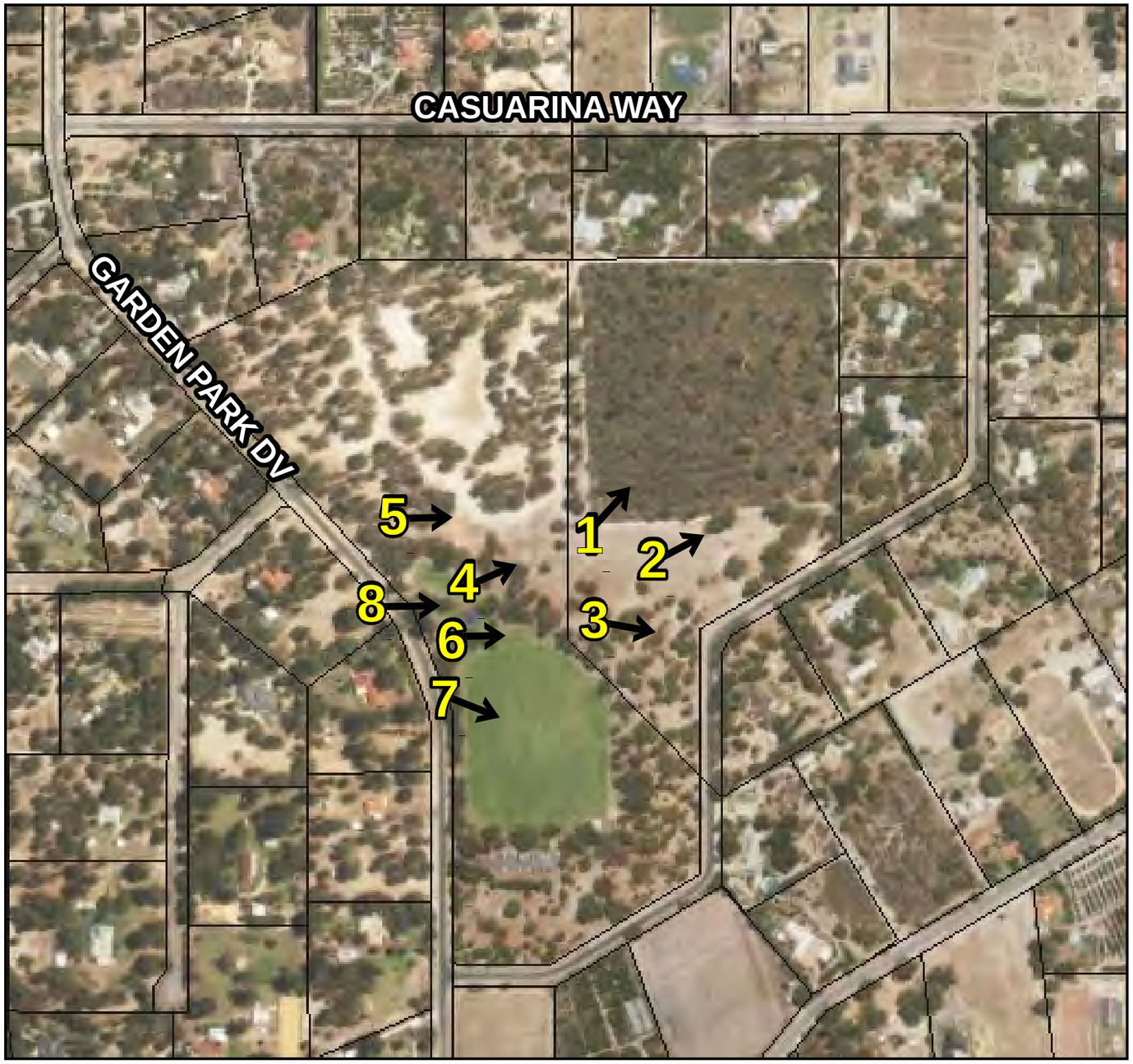
Many of the lots surrounding Mariginiup Lake are more than 4 hectares in size and more than 600m in length extending to the lake foreshore. There are multiple market gardens on both sides of the lake.

The land along Caporn Street has smaller lots and a greater mixture of land uses with nurseries and other commercial businesses.

Lakeview Street and Rouset Road are both dead end roads but Lakeview Street could connect back into Mariginiup Road.

P05 Wanneroo North

The precinct is bounded by Caporn Road to the north, Griffiths Road to the west, Dundebar Road to the south and Franklin Road to the east.



The non irrigated areas contain scattered trees over grass which is kept in minimal fuel condition by regular maintenance and mowing. There is a reasonable likelihood from community expectation that the ongoing management will continue to occur as low threat vegetation.

FIGURE 5
EDGAR GRIFFITH PARK

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The majority of the lots are 1.5 hectares in size and contained in Special Rural Zone 3. These generally contain woodland Eucalyptus vegetation being both remnant vegetation and introduced species.

The lots on the eastern side of Franklin Road extend to the foreshore of Jandabup Lake.

The predominant feature is Edgar Griffith Park in the centre of the precinct. This is reserve 36601 which contains both a conservation park and public open space (active and passive) as shown in Figure 5. The non irrigated areas contain scattered trees over grass which is kept in minimal fuel condition by regular maintenance and mowing. There is a reasonable likelihood from community expectation that the ongoing management will continue to occur as low threat vegetation.

P06 Wanneroo South

The precinct is bounded by Dundebar Road to the north and Jandabup Lake to the north east. Franklin Road runs through the centre of the precinct, with the land on the western side being more elevated. Trichet Road provides access to the east while Aquinata, Chiquita and Bernborough Places are all cul-de-sacs exceeding 200m in length servicing rural residential development.

The Water Corporation storage facility and water tower is a major land use which includes a large area of remnant vegetation extending to High Road. The southern portion of the precinct has rural residential development being Special Rural Zones 2 and 6.

There are a number of other bushland reserves including Belgrade, Franklin, Benmunie and Chicquita Parks.

The East Wanneroo Primary School and Wanneroo Secondary College are located adjacent to the western boundary.

P07 Hocking East

The precinct is bounded by Franklin / Lenore Road to the west and Benmunie Road to the east. Elliot Road provides east west access, extending to Wanneroo Road.

The lots are generally 4 hectares in size and elongated being 400m in length. The land is largely a mixture of market gardens or undeveloped lots with remnant vegetation. The Coptic Orthodox Church is located on Elliot Road.

P08 Jandabup-Gnangara

The precinct is situated to the south east of Jandabup Lake extending to Sydney Road.

The northern portion is predominantly market gardens, nurseries, and other semi rural uses including a turf farm and equestrian centres. The southern portion contains the Lakelands County Club and Leisure Village.

There is less bushfire prone vegetation in this precinct compared to those to the north west.

P09 Pearsall East

The precinct is bounded by Lenore Road to the west, Benmunie Road to the east and Ocean Reef Road to the south.

Special Rural Zone no 7 is located in the northern portion with connecting access between Lenore and Benmunie Roads. There is no access to the south from Benmunie Road.

The southern portion has a mixture of market gardens or undeveloped lots with remnant vegetation. It also includes the Bridgeleigh Reception Centre. Access is from Mary Street which is a dead end road extending for 1km from Lenore Road.

P10 Gnangara South

The precinct is bounded by Badgerup Road to the west, Ocean Reef Road to the south and Sydney Road to the east. Lakelands Drive provides a connection between Badgerup and Sydney Road.

The predominant land use is rural residential development containing Special Rural Zones 5, 9, 16 and 17. The lots are generally 1ha in size with a mixture of bushland and grassland areas.

Lot 9060 is a large undeveloped lot with remnant vegetation which is zoned as 'Rural Community'

The Northlink Business Park is situated on the corner of Ocean Reef and Sydney Roads and is being developed for service commercial purposes. The Land in Leach Way on the eastern side of Sydney Road is contained in Special Rural Zones 14 and 15 with the balance area of many lots containing remnant vegetation.

P11 Mariginiup NE Rural

The precinct is adjacent to Neaves Road and the Gnangara Plantation. It is a rural residential development containing Special Rural Zones 8 and 11.

The lots are generally 2 hectares in size and are generally cleared grazing land with relatively few areas of remnant vegetation. Meadowlands Drive provides access to the Gnangara Plantation via Silver Road.

P12 Mariginiup East

The precinct extends south from Neaves Road to Jandabup Lake. It situated between Boundary Road on the western side and Gnangara Plantation on the eastern side. The whole precinct is crown land and predominantly a water catchment area. The Water Corporation's water plant is situated opposite Townsend Road with two extractive industries to the south of this.

P13 Jandabup

The precinct is bounded by Jandabup Lake and Hawkins Road to the west. It has elongated shape in the north while the southern portion extends further east to the plantation.

The main feature of the precinct is the rural subdivision in Paini Way which is predominantly 4 hectare lots. This land is heavily vegetated and a designated bush forever site, even though it is freehold lots. The properties are protected by restrictive covenant in favour of the City of Wanneroo, with vegetation protection measures.

P14 Gnangara East Rural

The precinct is situated between Sydney Road on the west and the plantation on the est. It extends from Pine Crest Way south to Lake Gnangara.

The lots in Pine Crest Way are also 4 hectares in size and heavily vegetated. The land south of Joyce Road contains more mixed uses with cleared land. At the southern end is Special Rural Zone 5 and Vintage Park.

P15 East Zone

This precinct is crown land predominantly being State Forest extending from Gnangara Road north to Neave Road. The predominant land use is the Gnangara Pine Plantation and large portions of this have now been harvested. As shown in the photographs in Section 4.1 there have been different forms of regeneration within the plantation area from woodland and scrub to grassland.

P16 Northern Industrial

The precinct is situated north of Neaves Road and is predominantly State Forest being both the Gnangara Plantation and also large areas of Banksia woodland. The other notable land use is the Neerabup sub station near Old Yanchep Road on the western boundary. Associated with this is a major transmission line.

P17 Jandabup Lake

The precinct contains Jandabup Lake and the adjacent fringe areas and it extends to Townsend Road in the north. Jandabup Lake is largely contained in Reserve 7349 which is a National Park. The fringe areas contain private land which is typically the rear of lots which back onto the lake.

There is limited public access to the lake.

P18 Wanneroo Bush Forever

The precinct is focussed around Lake Badgerup and Little Badgerup Swamp extending from Jambanis Road in the north to Ocean Reef Road in the south. In the north is Nanovich Park which contains the Wanneroo Trotting and Training Club facilities. To the south of this is the Waneroo Horse and Pony Club grounds.

In addition to the bushland reserves (43821) around the lakes the precinct also includes the Mary Street reserve on the southern boundary.

The precinct as a whole, forms a major obstacle to east west access.

3.0 Environmental Considerations

3.1 General

The environmental factors being considered in this report are those with a specific reference to vegetation management including for habitat protection. The relevant measures and regulations apply at Federal, State and local levels. The overall range of environmental issues relative to the Study Area are documented in the Draft Environmental Assessment Study East Wanneroo District prepared by Emerge Associates (2018).

The relevant environmental factors are documented below and shown in Figure 6.

There are overlapping responsibilities relating to the protection of remnant vegetation in the Study Area. The general control of the clearing of vegetation is contained in Part V Division 2 of the Environmental Protection Act 1986 and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004.

3.2 Bush Forever

There are twenty Bush Forever sites within the Study Area as detailed in Table 2. The majority of these sites are crown land reserves with the exception of portions of Site 326 being Paini Way and Pine Crescent Way.

Bush Forever sites are subject to State Planning Policy SPP 2.8 Bushland Policy for the Perth Metropolitan Region. The purpose of SPP 2.8 is to promote bushland protection and management issues are addressed and integrated with broader land use planning and decision-making processes. There is a general presumption against the clearing of, or other degrading activities to regionally significant bushland. Proposals within or adjacent to Bush Forever areas need to ensure that all reasonable steps have been taken to avoid, minimise or offset any likely adverse impacts on regionally significant bushland, consistent with the requirements of the policy.

It is assumed that any designated Bush Forever sites are likely to be rehabilitated and have bushfire prone vegetation extending to their boundaries.

3.3 Conservation Reserves

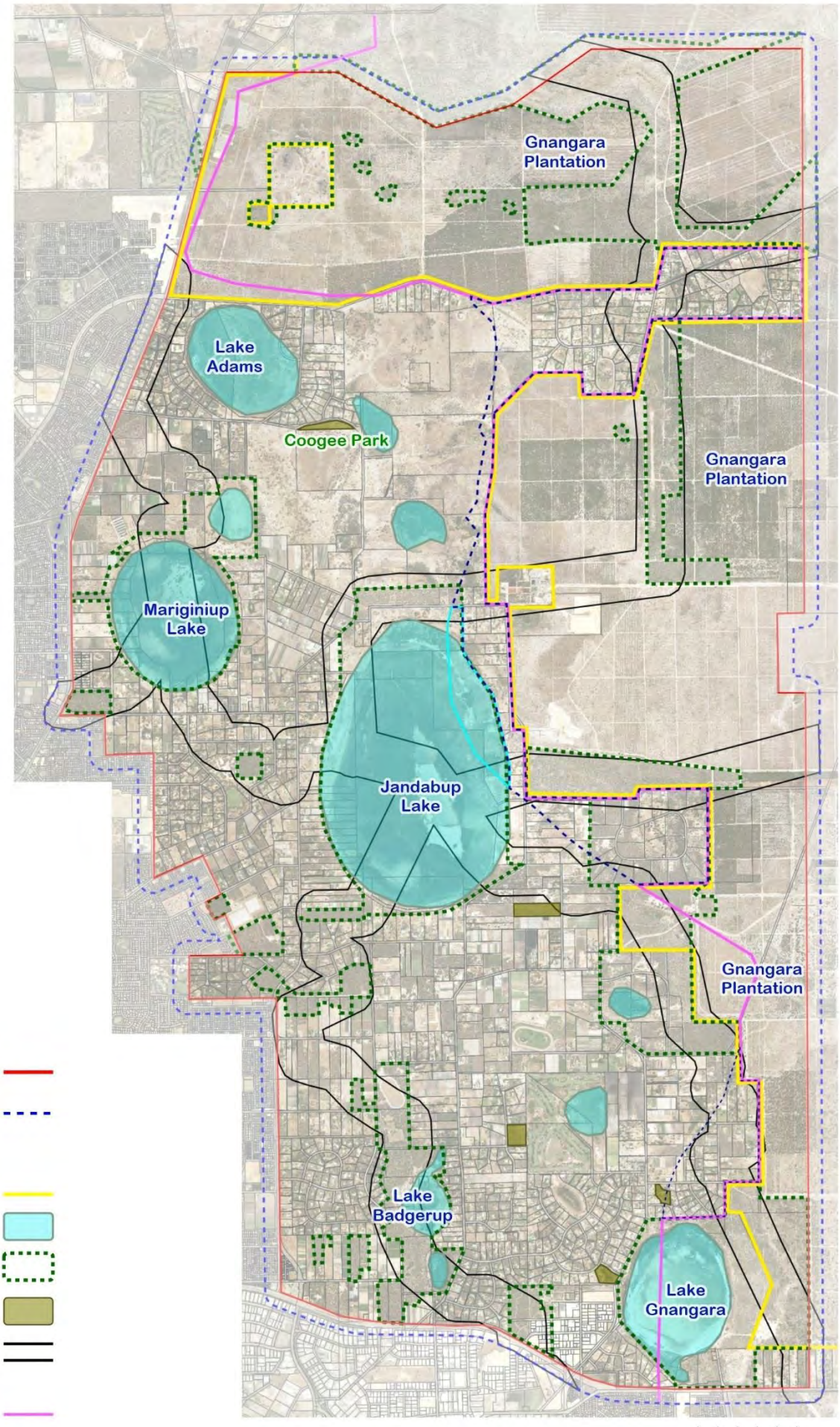
There are a number of different types of "conservation reserves" within the Study Area including:

- Crown reserves which maybe either 'A' or 'C' class and specifically vested for the purpose of flora conservation including National Parks and State Forest;
- Local Public Open Space reserves managed for conservation purposes; or
- Land zoned as 'Conservation reserve' under Town Planning Scheme No. 2.

Town Planning Scheme No. 2 contains a Conservation Reserve which affects a number of sites within the Study Area as shown in Figure 5.

The most notable reserves are documented in Table 2.

Council is also currently advertising Local Planning Policy 1.1: Conservation Reserves. The purpose of this is to provide guidance on the classification of Public Open Space (POS) as 'Conservation' under Town Planning Scheme No. 2. It requires that local structure plans identify proposed reserves where there is a minimum vegetated area of 1.0 hectare with a minimum width of 50 metres.



LEGEND

- STUDY AREA
- VEGETATION ASSESSMENT AREA (150m from the study area boundary)
- STATE FOREST
- WETLAND
- BUSH FOREVER SITE
- LOCAL CONSERVATION RESERVE (TPS No 2)
- ECOLOGICAL CORRIDOR
- PDWSA
  - PRIORITY 1
  - PRIORITY 2

SCALE 0m 1000m

FIGURE 6
ENVIRONMENTAL FEATURES

N

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Table 2 Bush Forever Sites

Site No	Site Name / Location
104, 105, 106, 107, 108, 433, 441	State Forest 65 - Gnangara Plantation
141, 146	Numbat Road (P16)
147	Mariginiup Lake
193	Gnangara Lake
196	Gnangara Road
324	Jandabup Lake
326	Hawkins Road (P12/13)
327	Badgerup Lake
398	Chitty Road (P16 north of boundary)
399	Melaleuca Park
443	Little Coogee Flat
463	Starlight Grove (P10)
469	Caporn Street
470	Garden Park
471	High Road (P6)
Source: Emerge Associates (2018) Draft Environmental Assessment Study East Wanneroo District Structure Plan Table 10.	

3.4 Wetlands

There are a large number of wetlands within the Study Area which have different conservation categories. The majority of the wetlands have either a central water body or swampy area with reeds and sedges. These are then typically have a vegetation fringe which may consist of scrub or larger vegetation.

Conservation category wetlands will normally have a buffer area which is often 50m wide. This area can be required to be revegetated and this vegetation can in itself become a significant bushfire hazard.

3.5 Water Catchments

The Study Area contains Public Drinking Water Source Areas (PDWSA) being the Gnangara groundwater mound. This is protected by:

- State Planning Policy SPP 2.2 (2005) Gnangara Groundwater Protection: and
- State Planning Policy SPP 2.7 (2003) Public Drinking Water Source Policy.

The Priority 1 (P1) designation applies to crown land and State Forest. Priority 1 source protection areas are defined and managed to ensure there is no degradation of the water resource in these areas.

The Priority 2 (P2) designation applies to the rural zoned land. Priority 2 source protection areas are defined to ensure that there is no increased risk of pollution to the water source. These areas are declared over land where low-risk development already exists. Protection of Both areas have development and vegetation clearing restrictions.

The Priority 3 (P3) source protection areas are defined to manage the risk of pollution to the water source. These areas are declared over land where water supply sources need to co-exist with other land uses such as residential, commercial and light industrial developments.

3.6 Ecological Linkages

The Perth Biodiversity Project has identified and mapped regional ecological linkages within the Perth Metropolitan Area. This includes linkages within the Study Area which connect larger areas of remnant vegetation and especially those in crown reserves and bush forever sites.

The linkages shown in Figure 6 are approximately 500m wide.

The ecological linkages are not to be confused with biodiversity or wildlife, corridors. They are axis lines which have been specifically designed to be used as a basis for recognising the ecological value of spatial relationships between patches of remnant vegetation when planning and managing biodiversity at both patch and landscape scales.

3.7 Native Vegetation Modification and Clearing

Areas of specific native vegetation have been identified for retention as shown in Figure 7.

These are areas of district importance and it is noted that other vegetation may also be retained. The plantation vegetation includes both areas of existing Pine plantation and also the post harvest areas which may contain different vegetation classes.

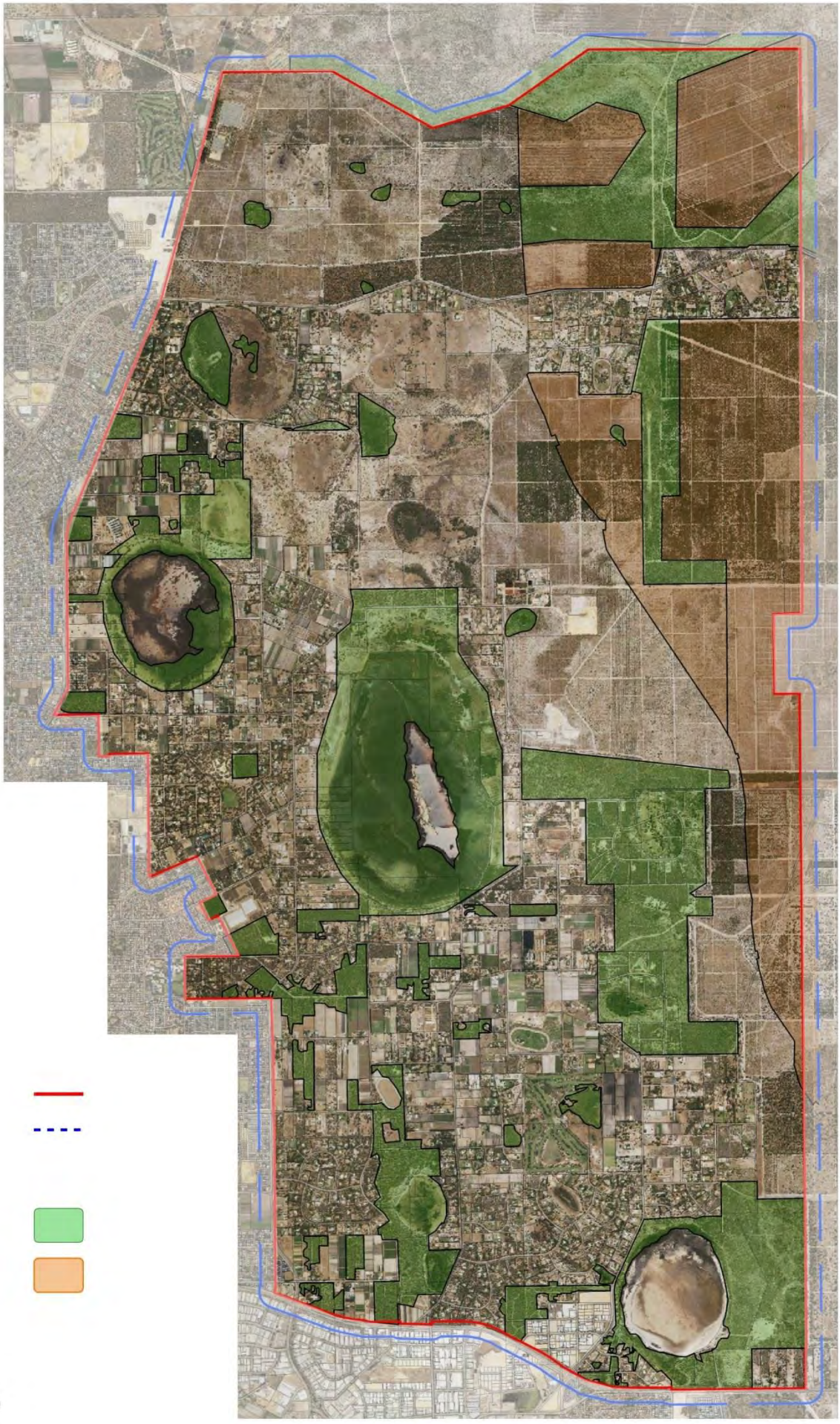
For the purpose of this strategic assessment it is then assumed that the urban development (residential, commercial, industrial, community facilities etc) of the defined precincts will result in the removal of any existing vegetation for that development. In practice it is acknowledged that any local structure plan may be likely to retain smaller areas of vegetation which may or may not be classified as being bushfire prone.

3.8 Re-vegetation / Landscape Plans

For the purpose of this strategic assessment it is assumed that:

- Bush Forever areas may be revegetated up to their boundary;
- Any prescribed buffer to a wetland will be revegetated for the full width of the buffer ie 50m;
- The harvested areas of the Gnangara Plantation will regenerate over time into either scrub or woodland vegetation; and
- The ecological corridors are not intended to be vegetation corridors precluding other development. They connect fragmented sites to one another to assist in the retention of habitat for significant fauna dispersal and migration. At this time there are no known specification for land use or revegetation within the ecological corridors.

The areas of retained vegetation are shown on Figure 7 and these areas are predominantly on public land. There is some vegetation located on private land that the Environmental Report has identified for consideration.



LEGEND

STUDY AREA

VEGETATION ASSESSMENT AREA (150m from the study area boundary)

REMNANT VEGETATION

PLANTATION AND POST HARVEST AREAS

NOTE
Only major areas of district importance are shown. Oth vegetation may be retained the local structure planning process.

SCALE 0m 1000m

FIGURE 7
RETAINED VEGETATION

N

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A	Preliminary	13/03/2018
B	Revised Veg	23/07/2018

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4.0 Bushfire Assessment Results

4.1 Assessment Inputs - Vegetation Classifications

The vegetation classifications for the Study Area are shown in Figure 8.

The classification is based upon AS3959 Construction of Buildings in Bushfire Prone Areas. AS3959 classifies vegetation into seven types based on tree height and the percentage of canopy cover as follows and documented in Table 3:

A. Forest
B. Woodland
C. Shrubland
D. Scrub
E. Mallee/mulga
F. Rainforest
G. Grassland.

The classification also takes into account:

- The Visual Guide for Bushfire Risk Assessment in Western Australia (WAPC 2016); and
- Any applicable Fire Protection Australia BPAD Practice Notes.

Of specific relevance to the vegetation within the Study Area it is noted that:

a) Vegetation is to be classified on its expected mature state and structure.

b) When assessing the likely contribution to potential fire behaviour, it is often more important to consider vegetation structure rather than just the canopy cover. This is underpinned by the mathematical modelling of radiant heat flux used in AS 3959.

c) Due to its structural form vegetation may be classified as a different type of vegetation to what it would otherwise be commonly classified under environmental classification systems due to its fire behaviour characteristics.

d) It can be difficult to clearly distinguish between areas with a moderate or extreme hazard rating; especially in coastal environments i.e. scrub and shrubland. Shrubland is assigned a fuel loads of 15/t/ha understorey with 15t/ha total fuel load. Scrub is assigned a fuel loads of 25/t/ha understorey with 25t/ha total fuel load.

e) The Visual Guide for Bushfire Risk Assessment uses a 2m height to distinguish between shrubland and scrub. While a number of vegetation plots have heights of 1.5m they have been classified as scrub due to its structure and fuel loads.

f) Plantations are classified as Class A Forest.

g) Note 2 of Table 2.3 of AS3959 stipulates that Open Woodlands and Open Shrubland should be classified on the basis of its understorey vegetation.

Table 3 Vegetation Classification

Life form / height class	Foliage Cover (percentage)			
	70 - 100%	30 - 70%	10 - 30%	<10%
Trees >30m	Tall Closed Forest	Tall Open Forest	Tall Woodland	
Trees 10 -30m	Closed Forest	Open Forest	Woodland	Open Woodland
Trees <10m	Low Closed Forest	Low Open Forest	Low Woodland	Low Open Woodland
Shrubs <4m	Closed Scrub	Open Scrub	Tall Shrubland	Open Shrubland
Shrubs <2m	Closed Heath	Open Heath	Low Shrubland	Low Open Shrubland
Grassland				

A - FOREST	B - WOODLAND	C - SHRUBLAND	D - SCRUB	E - MALLEE
F - RAINFOREST	G - GRASSLAND			

The classification of the vegetation in semi urban/rural areas becomes more complicated as this vegetation is often not consistent or homogenous.

The models used to quantify bushfire behaviour in Australian Standard AS3959 are based on fire behaviour in contiguous vegetation that is more than 1 hectares in size and over distances greater than 100m. This can be a problem when classifying the vegetation and hence the bushfire hazard level and /or Bushfire Attack Level (BAL) rating.

In these semi urban/rural areas where there is a semi wooded landscape character, then a classification of Class B Woodland has been used. Where the lots are predominantly grass or pasture the level of maintenance will vary and the distinction between low threat vegetation and classified vegetation is simply if the grass is more than 100mm in height. Generally, a Class G Grassland has been used unless the overall impression is of a well-maintained neighbourhood. This may also be a reflection of whether there is a reticulated water supply.

The Gnangara Pine Plantation contains harvested and non-harvested areas. The harvested areas have different characteristics as shown in the following photographs. These are areas with:

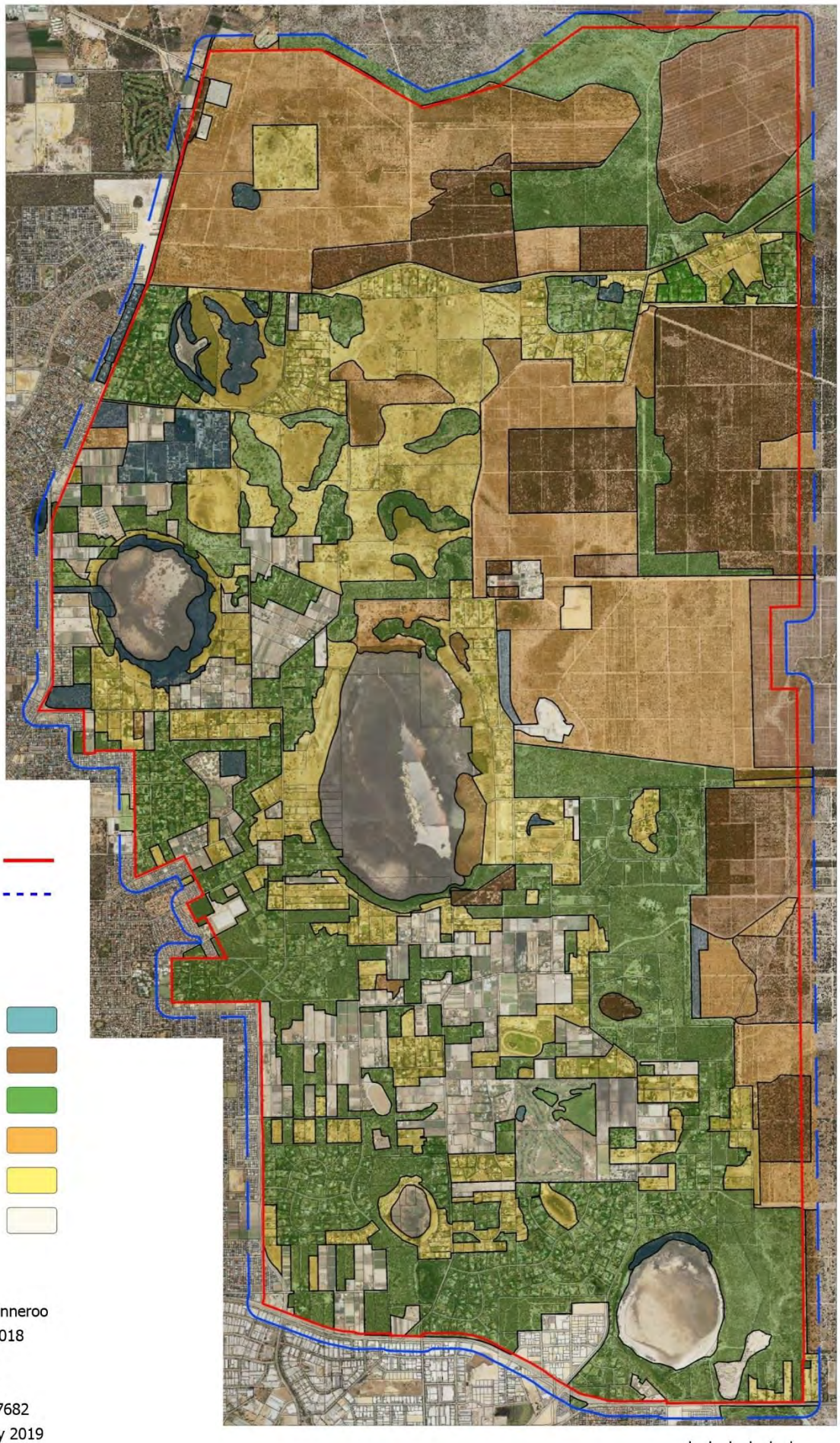
- Some pine regeneration which could be classified as Class B Woodland;
- Areas with native regeneration and few pines remaining. These could be classified as Class D Scrub depending upon the nature of the vegetation;
- Open areas which are predominantly grassland; and
- Area specifically planted with native species.

Post harvest low density pine regeneration with grassland.

Scrub regeneration with areas of Woolly Bush *(Adenanthos sericeus)* which are expected to be at least 2m high when mature.

Post harvest open grassland areas which could develop as shrubland.

Regeneration area planted with Eucalypts and other species. Will have a Forest classification to reflect mature condition.



LEGEND

STUDY AREA

ASSESSMENT AREA
(150m from the boundary of the study area).

VEGETATION CLASS

- A FOREST
- A PINES
- B WOODLAND
- C SCRUB
- E GRASSLAND
- LOW THREAT VEGETATION

Location Details:	East Wanneroo
Assessment Date:	22/02/2018
Prepared by:	G Lush
Accreditation Level:	Level 2
Accreditation Number:	BPAD 27682
Accreditation Expiry Date:	February 2019

SCALE 0m 1000m

FIGURE 8
VEGETATION CLASSIFICATION

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4.2 Assessment Outputs - Bushfire Hazard Levels

The bushfire hazard primarily relates to the vegetation on the site, the type and extent (area) of vegetation and its characteristics. The methodology for determining the bushfire hazard level is contained in the Guidelines for Planning in Bushfire Prone Areas (Section 4.1 and Appendix 2).

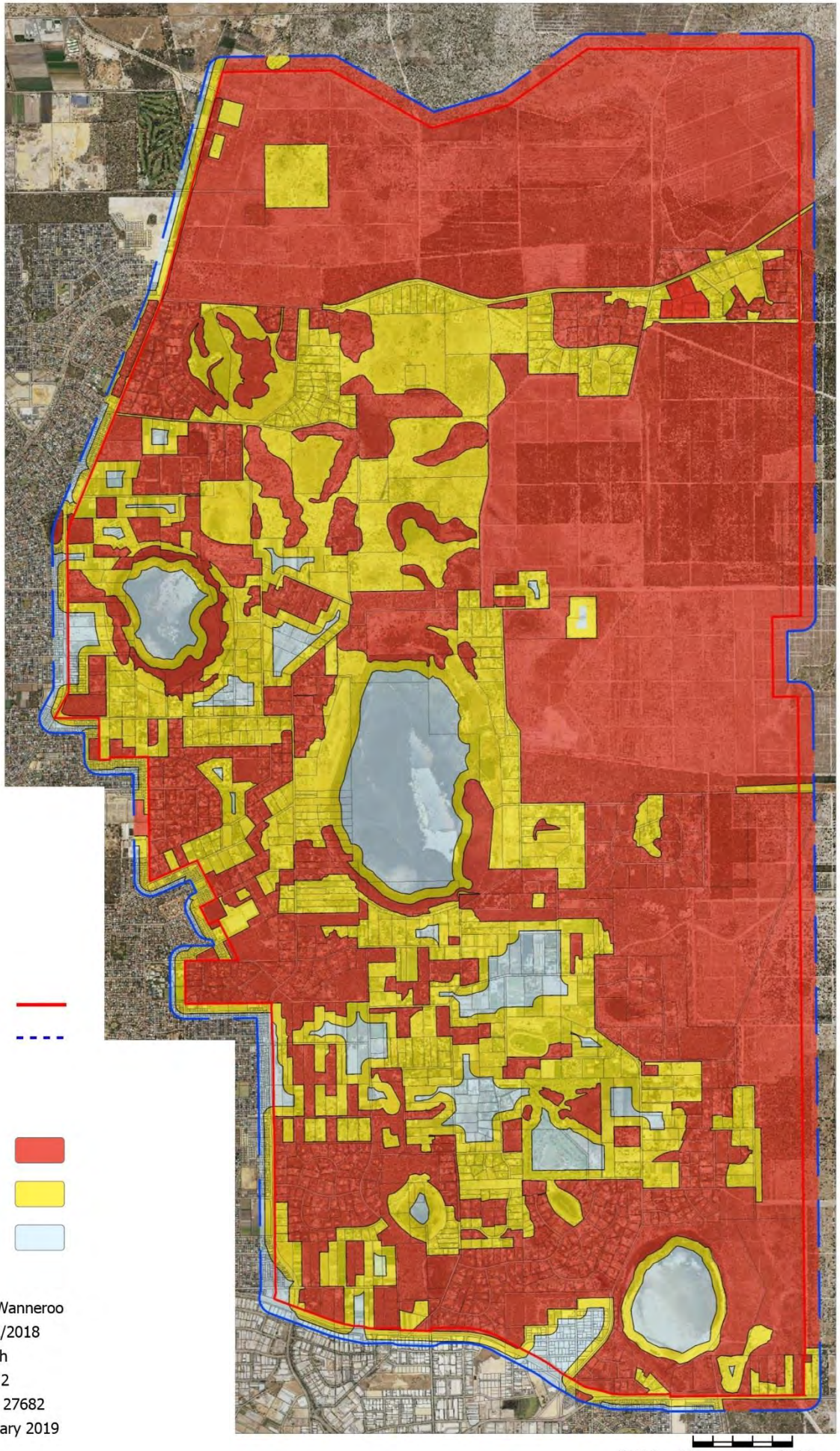
The classifications are as follows:

Extreme Hazard	• Class A Forest • Class B Woodland (05) • Class D Scrub • Any classified vegetation with a greater than 10 degree slope
Moderate Hazard	• Class B Open Woodland (06), Low Woodland (07) Low Open Woodland (08) Open Shrubland (09) * • Class C Shrubland • Class E Mallee/Mulga • Class G Grassland including sown pasture and crops • Vegetation that has a low hazard level but is within 100 metres of vegetation of vegetation classified as a moderate or extreme hazard.
Low Hazard	• Low threat vegetation, may include the following: areas of maintained lawns, gold courses, public recreation reserves and parklands, vineyards, orchards; cultivated gardens, commercial nurseries, nature strips and windbreaks. • Managed grassland in a minimal fuel condition meaning that there is insufficient fuel available to significantly increase the severity of the bushfire attack, for example short cropped grass to a nominal height of 100mm. • Non vegetated areas including waterways; roads; footpaths; buildings or rock outcrops.

* As per AS3959 Table 2.3 Note 2 - Overstoreys of open woodland, low open woodland, tall open shrubland should be classified to the vegetation type on the basis of their understoreys; others to be classified on the basis of their overstoreys.

The bushfire hazard levels for the existing site conditions are shown in Figure 9.

Appendix 2 of the Guidelines for Planning in Bushfire Prone Areas (2015) also stipulates that any cleared areas which would otherwise have a low hazard rating; but are within 100m of the areas with an extreme hazard rating, are to be assigned a moderate hazard rating to reflect the increased level of risk. Grassland areas including sown pasture and crops are classified as having a moderate hazard rating.



LEGEND

STUDY AREA

ASSESSMENT AREA
(150m from the boundary of the study area).

HAZARD LEVEL

EXTREME

MODERATE

LOW

Location Details:	East Wanneroo
Assessment Date:	22/02/2018
Prepared by:	G Lush
Accreditation Level:	Level 2
Accreditation Number:	BPAD 27682
Accreditation Expiry Date:	February 2019

SCALE 0m 1000m

FIGURE 9
BUSHFIRE HAZARD LEVELS
(EXISTING CONDITIONS)

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5.0 Proposed Development

The proposed development within the Study Area is contained in the North-West Sub-regional Planning Framework (2018) which aims to establish a long-term, integrated planning framework for land use and infrastructure to guide future growth across the sub-region.

The planning framework / land use designations are shown in Figure 10.

A large portion of the Study Area is designated for urban expansion which may potentially comprise lower urban densities and the retention of existing vegetation and landscape where possible.

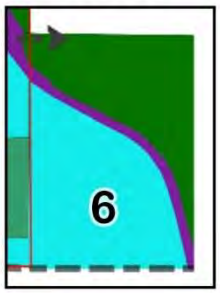
A number of investigation areas are identified in the Framework being for urban, planning and industry. These are identified in Figure 10 and key considerations are documented in Appendix 2.

The proposed road network includes:

- The proposed Whiteman-Yanchep Highway is a new north-south primary distributor road that will connect the North-West sub-region to the North-East and Central sub-regions and broader regional road network.
- Neaves Road–Flynn Drive will be upgraded to a primary distributor to provide an important east–west link to the North-East sub-region, particularly the potential Bullsbrook intermodal terminal.
- New regional roads include Lenore Road, Badgerup Road, Sydney Road, Elliot Road and Ranch Road.

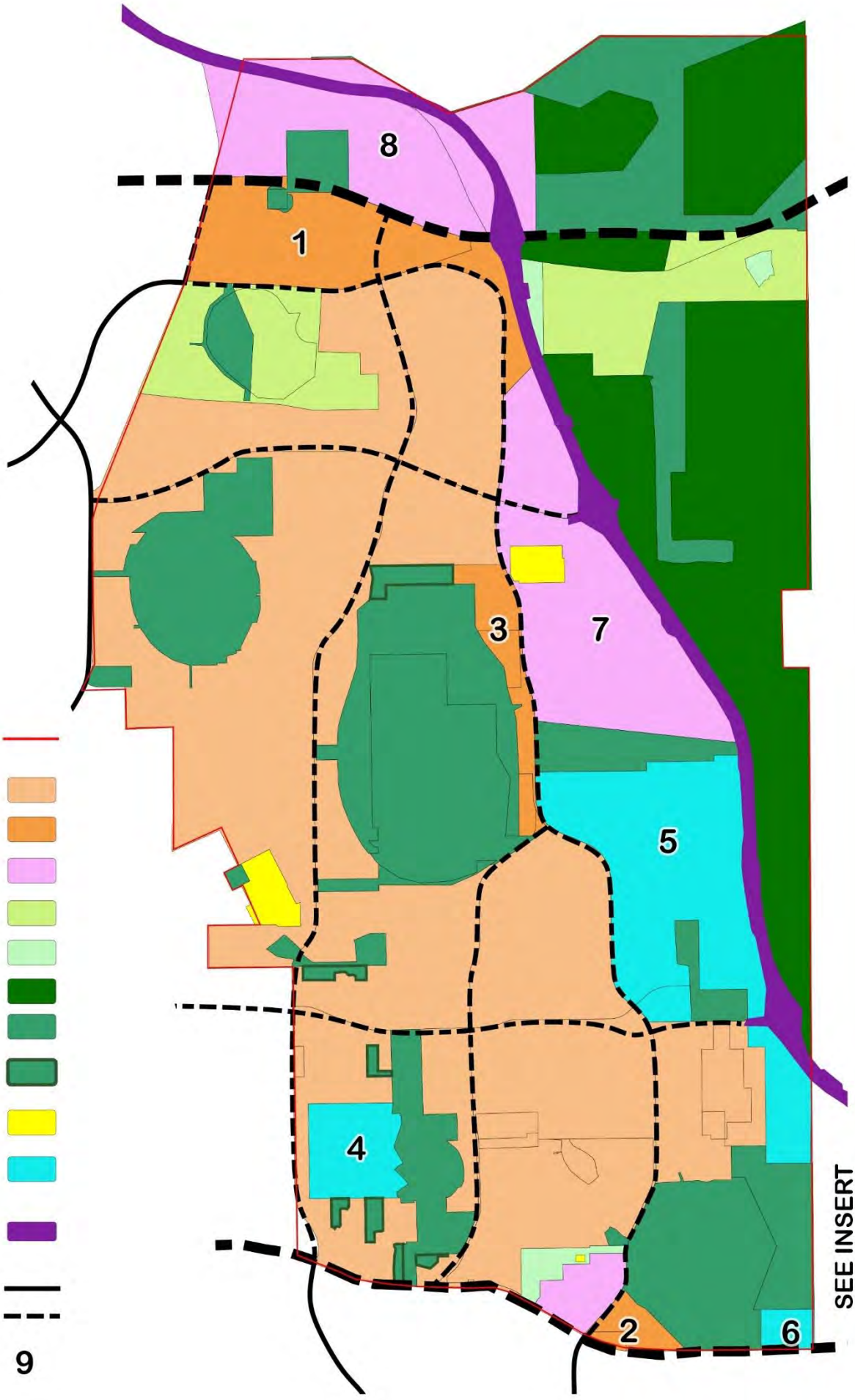
The Framework also notes that approximately 50 hectares will need to be identified within the East Wanneroo locality to accommodate a regional sporting facility.

INSERT



SOURCE
North-West Sub-Regional Planning Framework.

Some colours of the land uses have been altered to provide clarity.



LEGEND

- STUDY AREA
- URBAN & URBAN DEFERRED
- URBAN INVESTIGATION
- INDUSTRY
- RURAL RESIDENTIAL
- RURAL
- STATE FOREST
- OPEN SPACE
- OPEN SPACE INVESTIGATION
- PUBLIC PURPOSE
- PLANNING INVESTIGATION
- WHITEMAN - YANCEP HWY
- REGIONAL ROADS
  - EXISTING
  - PROPOSED
- INVESTIGATION AREA (Refer to Appendix 2 for details) — 9

FIGURE 10
PROPOSED DEVELOPMENT

N

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Rev	Description	Date
A	Preliminary	01/05/2018
B	Insert	12/07/2018

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6.0 Identification of Bushfire Hazard Issues

6.1 Spatial Issues

The relationship of the Study Area to the surrounding district is shown in Figure 11.

The Study Area is situated on the eastern side of the north western metropolitan urban corridor. It is subject to development and infra structure pressures primarily in the north - south axis with secondary east - west pressures.

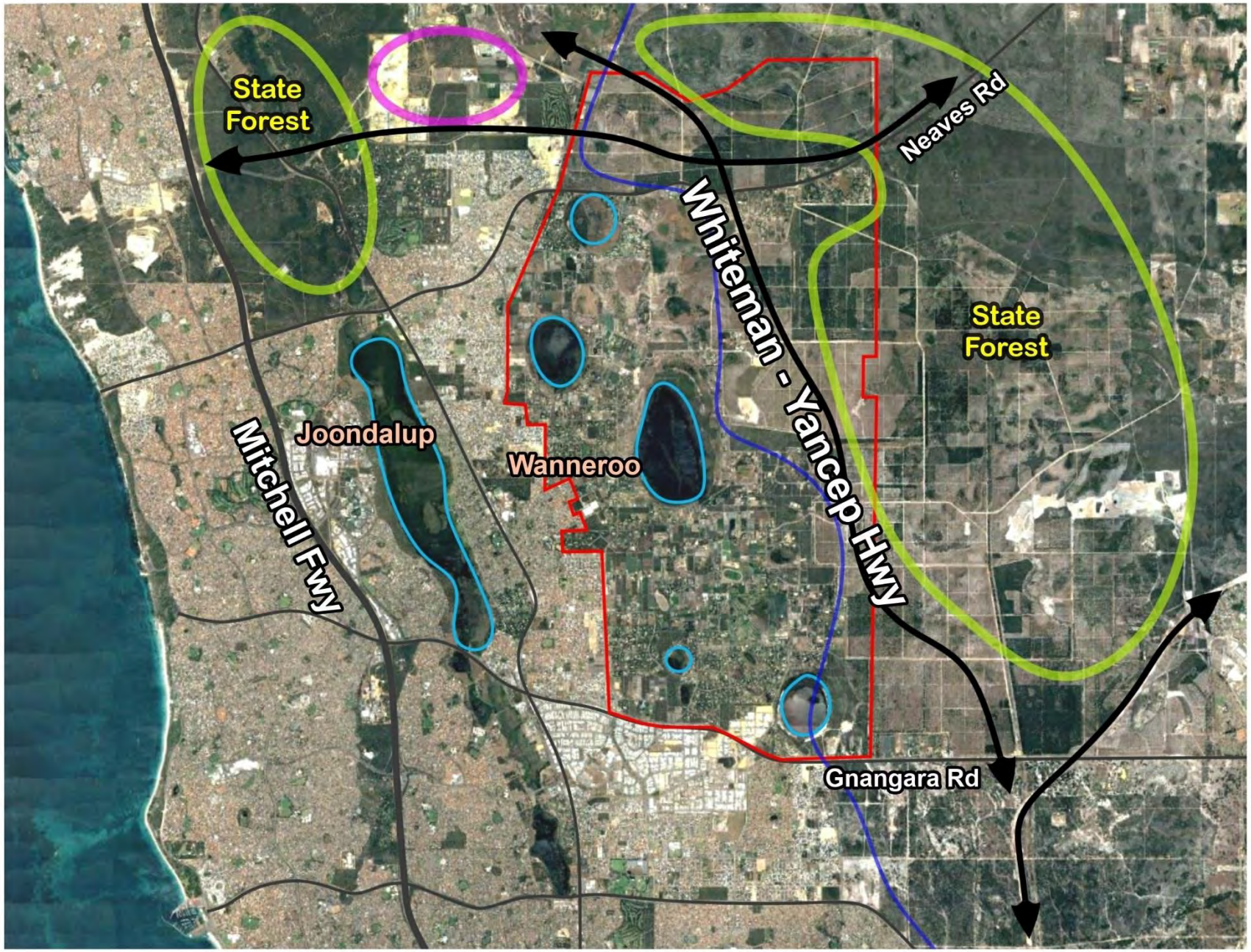
The most significant feature is the boundary between the proposed urban development areas and the State Forest to the east and north of the Study Area. One of the major factors which will determine this boundary is the final alignment of the proposed Whiteman to Yanchep Highway. This will be a physical feature which makes it suitable for a major land use boundary and especially for the demarcation between development and vegetation areas with an extreme bushfire hazard rating.

The spatial issues within the Study Area are shown in Figure 12 and summarised in Table 4. The issues associated with selected areas are shown on enlargement plans (Figures 13 - 17).

At the scale of the Study Area the most apparent spatial issues are:

- The extent of the conservation areas reflected by the crown reserves and bush forever sites; and
- The need for multiple local access connections.

This then creates secondary issues relating to boundary interface with these areas and where the hazard vegetation is located on multip0le sides of the development site. Generalised development issues are discussed in detail in Section 6.2.



LEGEND

- STUDY AREA
- DISTRICT ROADS
- MAJOR LAKES
- PDWSA CATCHMENT
- STATE FOREST
- INDUSTRY
- PROPOSED REGIONAL ROAD

FIGURE 11
DISTRICT CONTEXT

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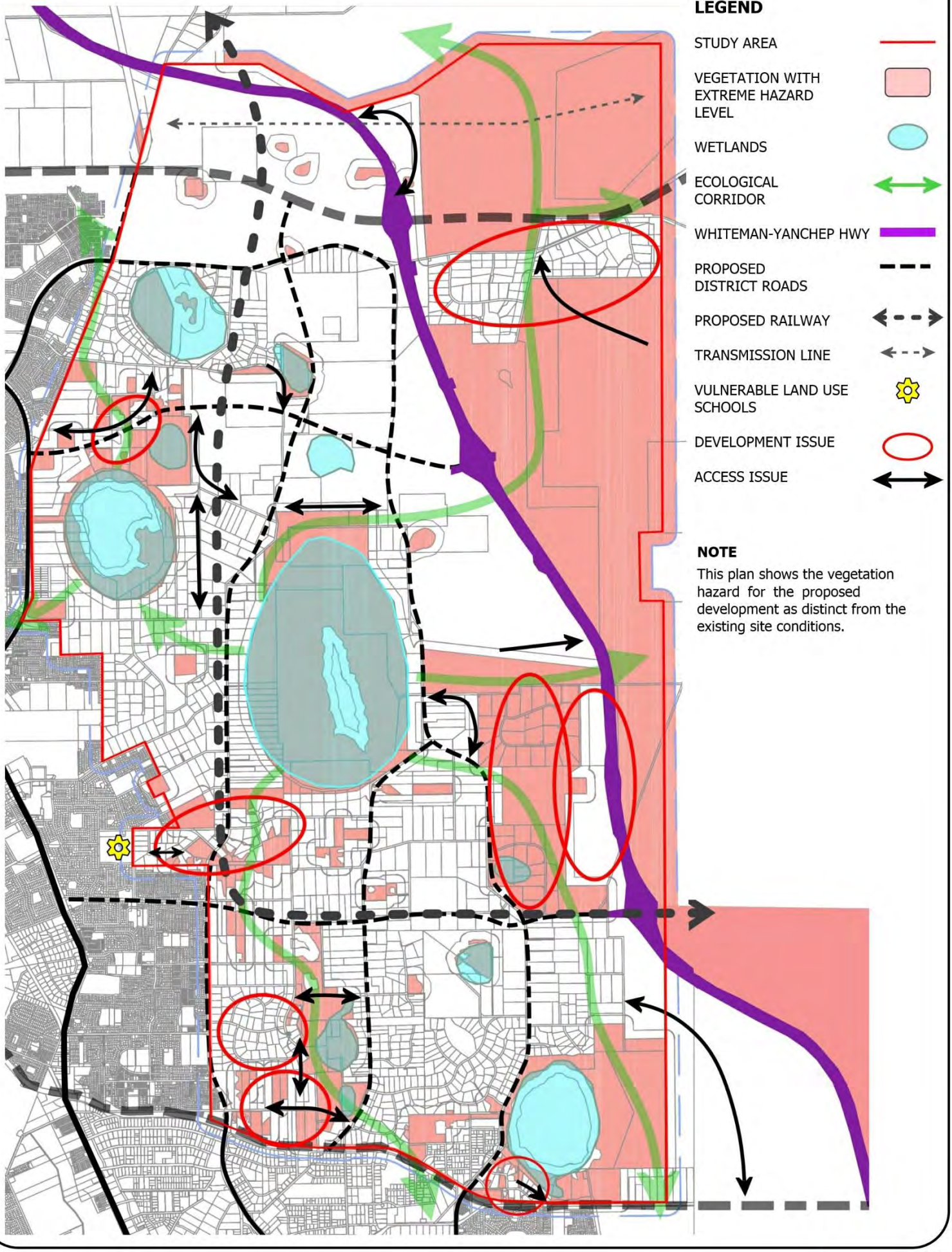

FIGURE 12
SPATIAL ISSUES

N

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A	Preliminary	13/03/2018
B	Revised Veg	23/07/2018

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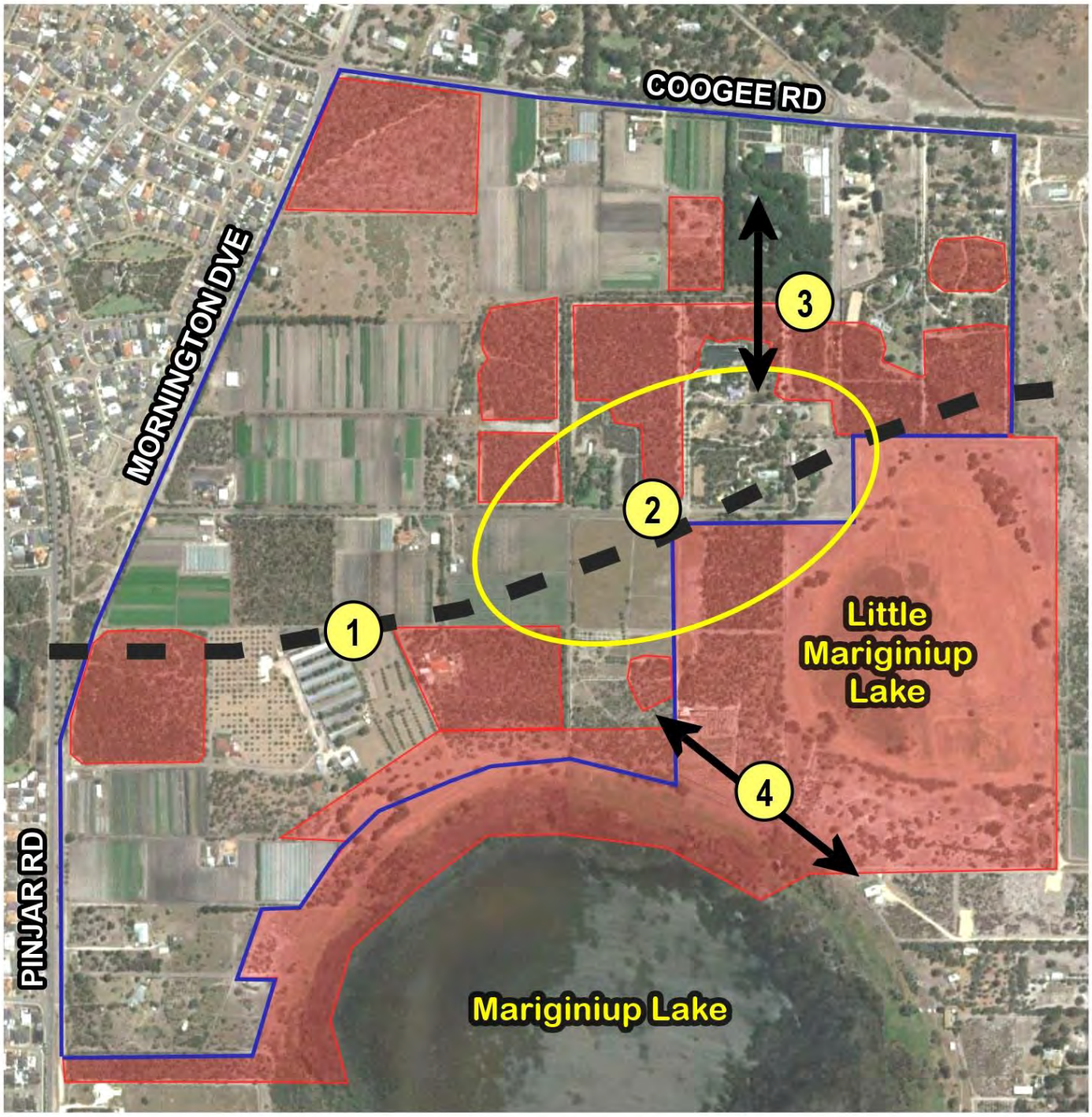
Table 4 Issues Summary

Precinct	Name	Proposed Land Use	Issues
P01	Mariginiup North Rural	Rural Residential	• Proposed lot sizes sufficient to retain vegetation and asset protection zone. • Interface with Adams Lake foreshore. • Avoiding battle axe legs as a means of subdivision. • Need for access connection to the south east via Rouset Road. • Progressive development may be difficult when adjoining land still contains bushfire prone vegetation.
P02	Mariginiup North (see Figure 13)	Urban	• Little Mariginiup Lake prevents east west access connection which will be addressed by the proposed district road. • Retention of vegetation between Ranch and Coogee Roads will make development strategically difficult due to having surrounding bushland. The separation between bushland cells is approximately 200m. Potential fire run of more than 100m length. • Potential boundary road along the foreshore of Mariginiup Lake providing connections to Pinjar and Ranch Roads.
P03	Mariginiup Wetlands	Urban	• Proposed district roads provide multiple access routes. • Connection to Coogee Road. • Potential boundary road along the foreshore of Little Mariginiup Lake providing connection to Lakeview Street.
P04	Mariginiup South	Urban Open Space	• Mariginiup Lakes divide the precinct creating access issues. • Potential boundary road along the foreshore of Mariginiup Lake. • Predominance of long narrow lots and the need to avoid battle axe legs as a means of subdivision.
P05	Wanneroo North	Urban	• Proposed lot sizes sufficient to retain vegetation and asset protection zone. • Progressive development may be difficult when adjoining land still contains bushfire prone vegetation. • Extension of Griffiths Road access. • Existing cul-de-sacs are non compliant and potentially need extending to Dundebar Road. • Casuarina Way is a loop road and potentially needs a connection east to Franklin Road.

Precinct	Name	Proposed Land Use	Issues
			• Avoiding battle axe legs as a means of subdivision for lots east of Franklin Road. • Wetland buffer and boundary access around Jandabup Lake.
P06	Wanneroo South	Urban Public Purpose Open Space	• Proposed lot sizes sufficient to retain vegetation and asset protection zone. • Aquinata and Chiquita Places exceed 200m in length and require connection. • Significant clearing of vegetation is required for lots in Aquinata, Chiquita and Bernborough Places reduce extreme hazard level otherwise intensification of development may not be supported. • Adjacent vulnerable land use East Wanneroo Primary School. • Retention of the vegetation in the Water Corporation land may require additional setback distances greater than BAL-29. • Bernborough Place requires emergency access way connection to Lenore Road. • Avoiding battle axe legs as a means of subdivision for lots east of Franklin Road. • Wetland buffer revegetation and boundary access around Jandabup Lake.
P07	Hocking East	Urban Open Space Investigation	• Elongated lots which are more susceptible to hazards on side boundaries. • Avoiding battle axe legs as a means of subdivision. • Existing vegetated lots not being retained but will still influence development of adjacent land until such time as they are developed.
P08	Jandabup-Gnangara	Urban	• Few constraints or issues. • Some existing vegetated lots not being retained but will still influence development of adjacent land until such time as they are developed. • Wetland buffer revegetation and boundary access around Jandabup Lake.
P09	Pearsall East	Urban Planning Investigation Open Space	• Bebich Drive investigation area with significant environmental values including high value Cockatoo habitat. • Significant clearing of vegetation is required for lots in the Bebich Drive investigation area to reduce extreme hazard level otherwise intensification of development may not be supported. • No available access to the south from Bebich Drive subdivision or extension of Benmuni Road to Mary Street.

Precinct	Name	Proposed Land Use	Issues
			• Existing vegetated lots will still influence development of adjacent land until such time as they are developed. • Mary Street connection to Badgerup Road required but likely to be difficult to achieve.
P10	Gnangara South	Urban Urban Investigation Industry Rural	• Proposed lot sizes sufficient to retain vegetation and asset protection zone. • Progressive development or existing rural residential lots may be difficult when adjoining land still contains bushfire prone vegetation. • Lot 9060 is identified as Rural and is a large undeveloped lot with remnant vegetation which is zoned as 'Rural Community'. Development of the land may be difficult unless the legacy issues are accepted. • Leach Way investigation area only has a single access and significant areas of remnant vegetation making further subdivision difficult.
P11	Mariginiup NE Rural	Rural Residential	• Has large areas of State Forest and remnant vegetation on the surrounding land and Neaves Road provides good district access in two directions. • Conductor Retreat and Timely Hostess Mews far exceed 200m in length. • Further subdivision, intensification of land uses and vulnerable land uses including tourist accommodation, should be avoided.
P12	Mariginiup East	Urban Investigation State Forest Industry Public Purpose	• Divided by the Whiteman - Yanchep Highway. • Additional access to highway required in the south eastern corner of the precinct.
P13	Jandabup	Planning Investigation Open Space	• Large bushland areas being retained. • Narrow corridor of land between Hawkins Road (new district road) and Jandabup Lake • Lots in Paini Way have protected vegetation with an extreme hazard. No further subdivision, intensification of land uses or vulnerable land uses including tourist accommodation, should be allowed.
P14	Gnangara East Rural	Urban Planning Investigation Open Space	• Pine Crest Way has vegetated lots with an extreme hazard. No further subdivision, intensification of land uses or vulnerable land uses including tourist accommodation, should be allowed. • Heritage Tce exceeds 200m in length with no secondary access available. No further subdivision, intensification of land uses or vulnerable land uses including tourist accommodation, should be allowed.

Precinct	Name	Proposed Land Use	Issues
			• Connecting road required to forma loop between Joyce and Lorian Roads. • Land east of Boundary Road suitable for development if cleared.
P15	East	State Forest Open Space Planning Investigation	• Assumed that all crown land will regenerate as hazard vegetation even if not replanted as pines. • Planning investigation area has long narrow lots with some vegetation. Significant clearing of vegetation is required for development. • Maintain existing access connections. • Adjoining subdivision and development will require additional setback distances.
P16	Northern	State Forest Open Space Planning Investigation Urban Investigation	• Portion for industry on the eastern side of the highway is isolated with potential bushland on three sides and limited access. • Urban investigation area suitable for development in accordance with the Guidelines.
P17	Jandabup Lake	Open Space	• Not proposed for development. • Confirmation of wetland buffer and revegetation requirements. • Provision of boundary access around the foreshore.
P18	Wanneroo Bush Forever	Open Space Open Space Investigation	• Major wetland and bush reserves not proposed for development. • Estrel Road connection required for development of adjoining precincts. • Mary Street - Badgerup Road connection required for development of adjoining precincts.



LEGEND

PRECINCT BOUNDARY

RETAINED VEGETATION

PROPOSED DISTRICT ROAD

ISSUE NUMBER 1

ISSUES

1) Proposed district road is expected to have restrictions on local access and therefore creates a barrier to movement perpendicular to the road.
2) Land which will be surrounded by retained vegetation with an extreme hazard level. It may only have a single access from the west which potentially won't comply with the bushfire protection criteria.
3) Secondary access to Coogee Road required.
4) Fire service access route potentially required around the foreshore, linking to the south east.

FIGURE 13
MARIGINIUP NORTH ISSUES

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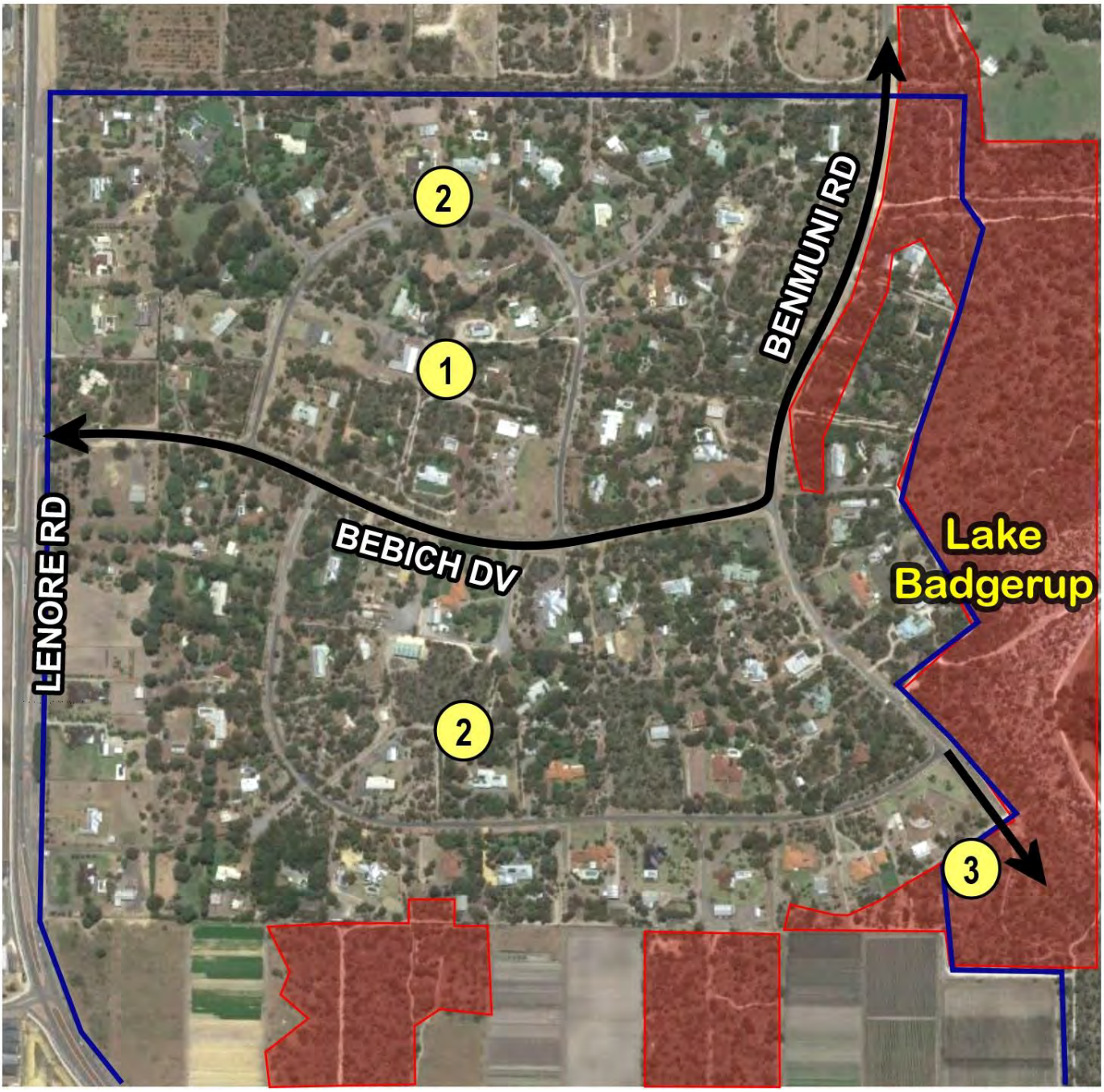

LEGEND

PRECINCT BOUNDARY

RETAINED VEGETATION

ISSUE NUMBER 1

ISSUES

1) Bebich Drive investigation area with significant environmental values including high value Cockatoo habitat. Potentially difficult to retain vegetation with subdivision into smaller lots. Single access via Bebich Dv and Benmuni Rd.
2) Access to the south and north of Bebich Dv is a loop subdivision road with no available external access.
3) Lake Badgerup creates a physical barrier to the east and there is no access connection to the south.

FIGURE 14
BEBICH DV ISSUES

N

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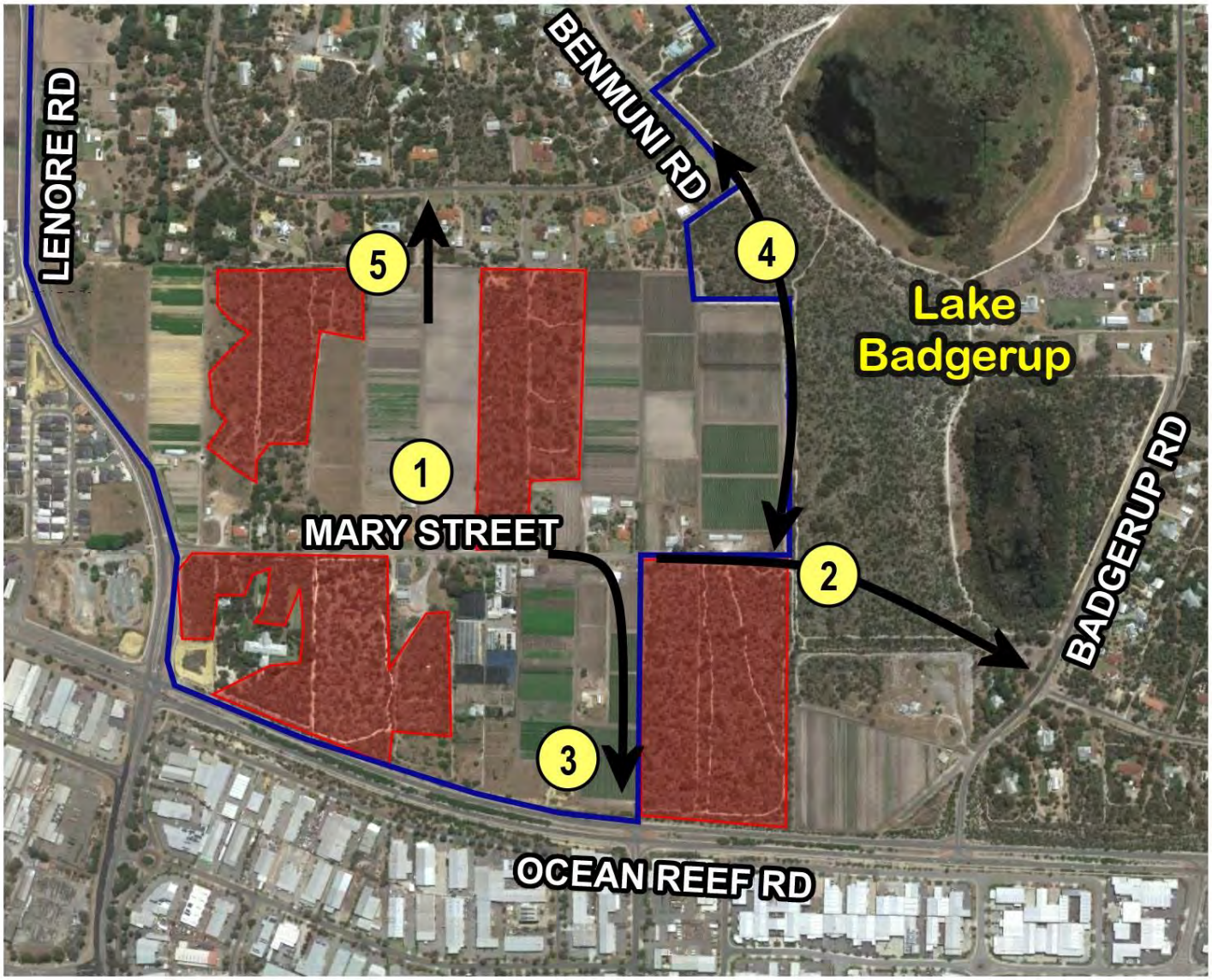

LEGEND

PRECINCT BOUNDARY

RETAINED VEGETATION

ISSUE NUMBER 1

ISSUES

1) Mary Street is approximately 990m in length with hazard vegetation on both sides of the road.
2) Access to the east through Lake Badgerup is not possible.
3) Access connection to Ocean Reef Road ppotentially required.
4) Access connection, even as an emerhency access way, north to Benmuni Road is desirable.
5) Development in conjunction with Bebich Dv area may provide the opportunity for improving access connections.

FIGURE 15
MARY STREET ISSUES

N

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LEGEND

PRECINCT BOUNDARY

RETAINED VEGETATION

ISSUE NUMBER 1

ISSUES

1) Leach Way is approximately 700m in length with hazard vegetation on both sides of the road.
2) Access connection to Ocean Reef Road is highly unlikely.
3) Lake Gnangara foreshore vegetation hazard adjacent to the site.

FIGURE 16
LEACH WAY ISSUES

N

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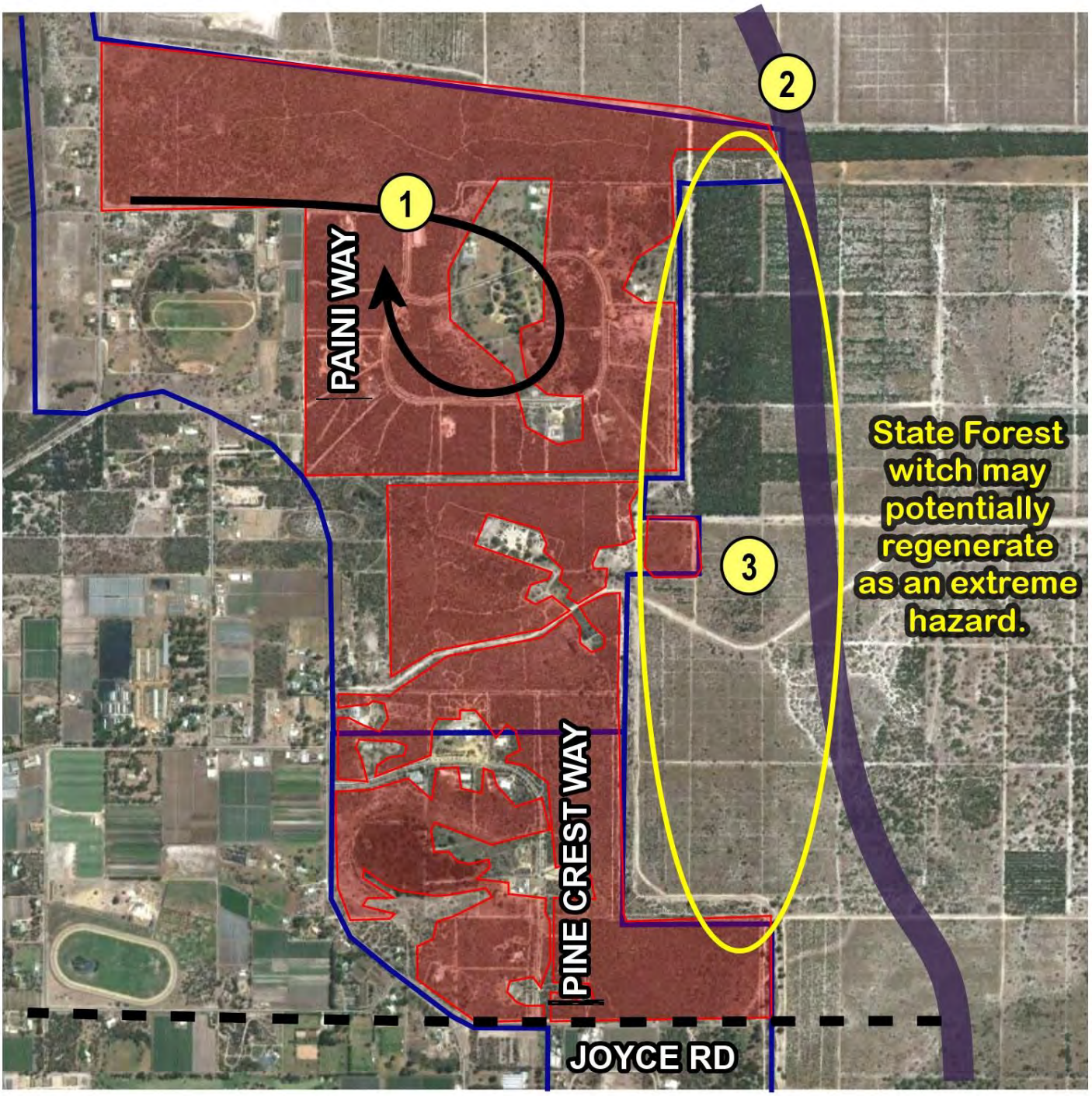

LEGEND

PRECINCT BOUNDARY

RETAINED VEGETATION

PROPOSED DISTRICT ROAD

YANCHEP - WHITEMAN HIGHWAY ALIGNMENT

ISSUE NUMBER 1

ISSUES

1) Piani Way only has a single access with conservation vegetation on lots with an extreme hazard rating.
2) The Yanchep - Whiteman Highway will form a barrier to access and a natural demarcation to the edge of the State Forest.
3) This area is a long narrow plot and it has restricted access opportunities with hazard vegetation surrounding it .

FIGURE 17
JANDABUP ISSUES

N

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6.2 General Issues

6.2.1 Development Hazard Interface

On the urban fringe, the combination of embers and radiation caused by urban fuel combustion (adjacent structures, fences, stored material etc) has been identified as a predominant source of ignition (3). Provision of a clear separation zone between the vegetation and development areas will provide the simplest form of fire management. The maintenance of the separation zone as fuel reduction area can play a significant role in reducing fire intensity at the interface.

The promotion of landscape and vegetation protection measures to create a desirable semi residential character means that the interface between urban development and bushland areas is becoming less clear. Consequently, there is a need to adopt more sophisticated approaches to vegetation and landscape management in relation to subdivision design and fire management.

The distinction between these two approaches is shown in the following photographs.

3 Handmer J & Haynes K (2008) – Community Bushfire Safety CSIRO Publishing Melbourne Pages 77 & 81.

These show existing subdivisions on opposite sides of the same Regional Open Space (ROS).

The first photograph shows urban lots adjoining the ROS with a clearer demarcation/ hazard separation which may be the safest bushfire option but may not meet landscape or amenity objectives. The second photograph shows 2,000 sq.m lots which retains some vegetation and also acts as a transition between the ROS and urban lots.

The level of the bushfire hazard is directly proportional to the distance / setback from the areas of high fuel loadings. The overarching policy intent for Planning in Bushfire Prone Areas is for development to have a Bushfire Attack Level (BAL) of 29 or below (4). The setback requirements for BAL-29 are shown in Table 5. Figure 18 shows the options to be considered in relation to the development/hazard interface with the following options:

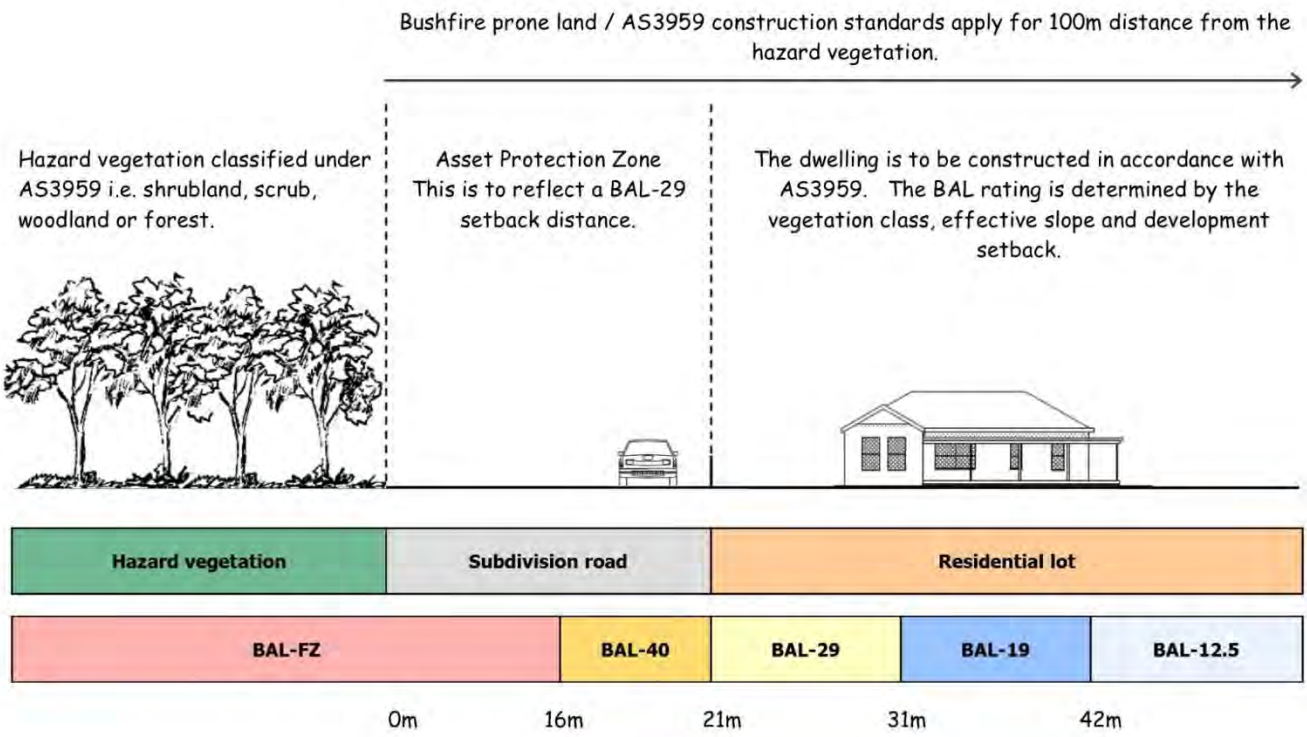
1. The preferred option is to always have a physical barrier such as a subdivision road separating the development from the hazard areas. Where there are residential lots (R20) with an average size of less than 500sqm then it is also necessary to ensure that no portion of the lot has a BAL-40 or BAL-FZ rating. When the hazard is classified as forest vegetation then this will require the peripheral subdivision road to be at least 21m wide.
2. Using a standard width subdivision road ie 15 or 18m the balance of the APZ is provided as Local Public Open Space. This will require a management agreement with the relevant agency which is normally the Local Government. This can be useful especially adjacent to Regional Open Space reserves as it marks a clear management difference and tenure.
3. The BAL-29 setback distance encroaches into a residential lot. There must be a statutory mechanism to ensure that the development setback is maintained. The Residential Design Codes cannot be used as they allow for averaging and setback reductions. This issue can be problematic especially as any garages, carports etc located within 6m of the dwelling determine the BAL rating for the dwelling.
4. In situations where it is not possible to have a separating road it may be necessary for lots to back onto the hazard area. This is common especially with wetland areas and land subject to inundation. There must be a statutory mechanism to ensure that the minimum development setback is maintained from the rear boundary. In many instances it would also be desirable to have a Fire Service Access Route or strategic firebreak at the rear of the lots.

While a BAL-29 setback is considered to be the minimum separation distance there can be situations where an additional development setback is justified. In particular where there is a major reserve with mature forest of woodland vegetation and especially if that vegetation height is similar to the BAL-29 setback ie 21m on flat land.

Table 5 BAL-29 Setbacks

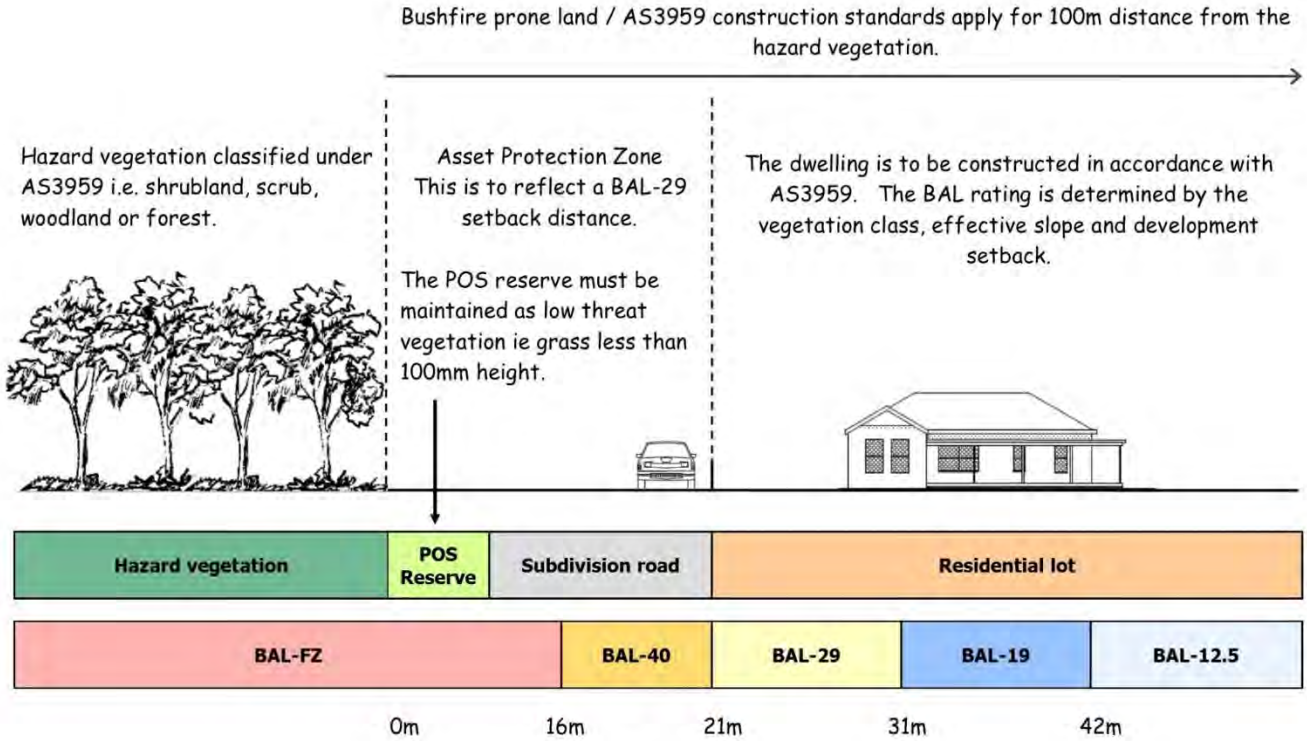
Vegetation Class	Minimum Setbacks (m) – BAL29				
	Upslopes & Flat Land	Downslope (degrees)			
		>0 - 5	>5 - 10	>10 - 15	>15 - 20
A Forest	21m	27m	33m	42m	52m
B Woodland	14m	17m	22m	28m	35m
C Shrubland	9m	10m	11m	13m	15m
D Scrub	13m	15m	17m	19m	21m
G Grassland	8m	9m	10m	12m	14m

4 WAPC (2016) Planning Bulletin 111 Planning in Bushfire Prone Areas.



Class A Forest on flat land

1 - Preferred option is for a road separating development from the hazard



Class A Forest on flat land

2 - The Asset Protection Zone can include local POS where there is a management agreement

FIGURE 18
DEVELOPMENT INTERFACE OPTIONS
SHEET 1

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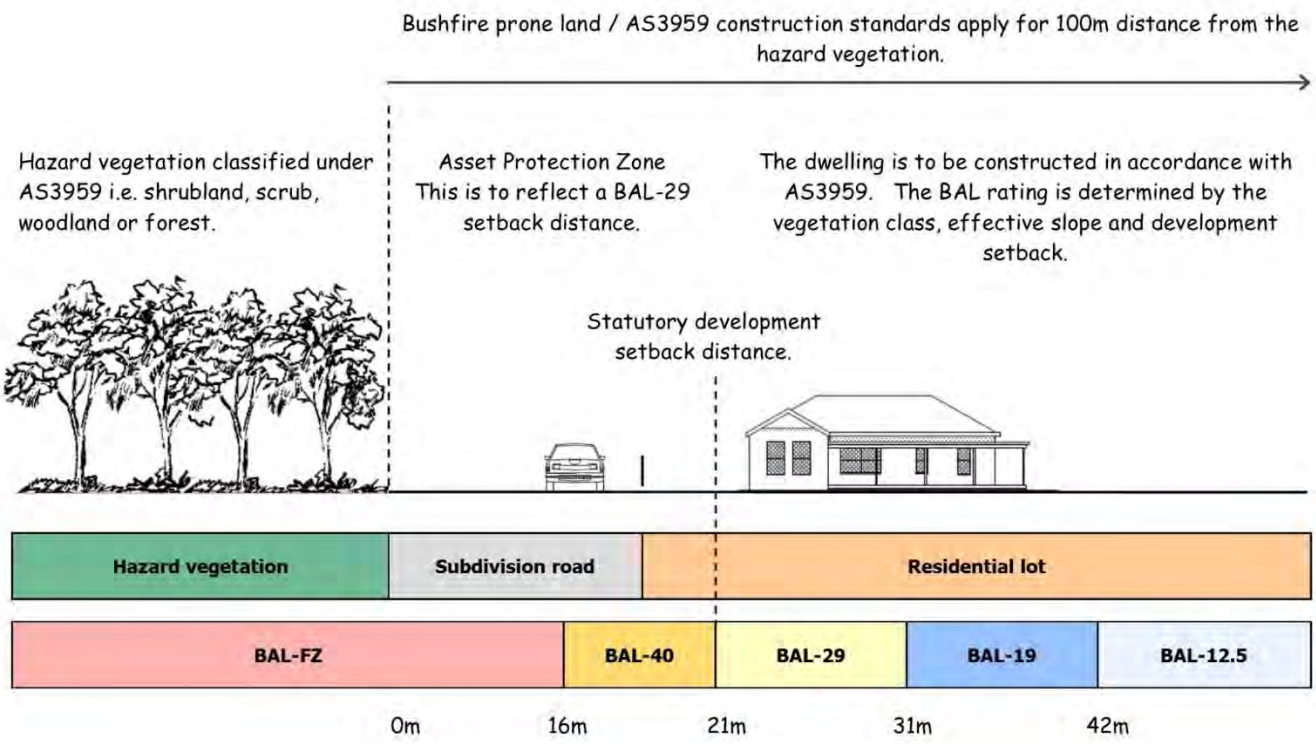
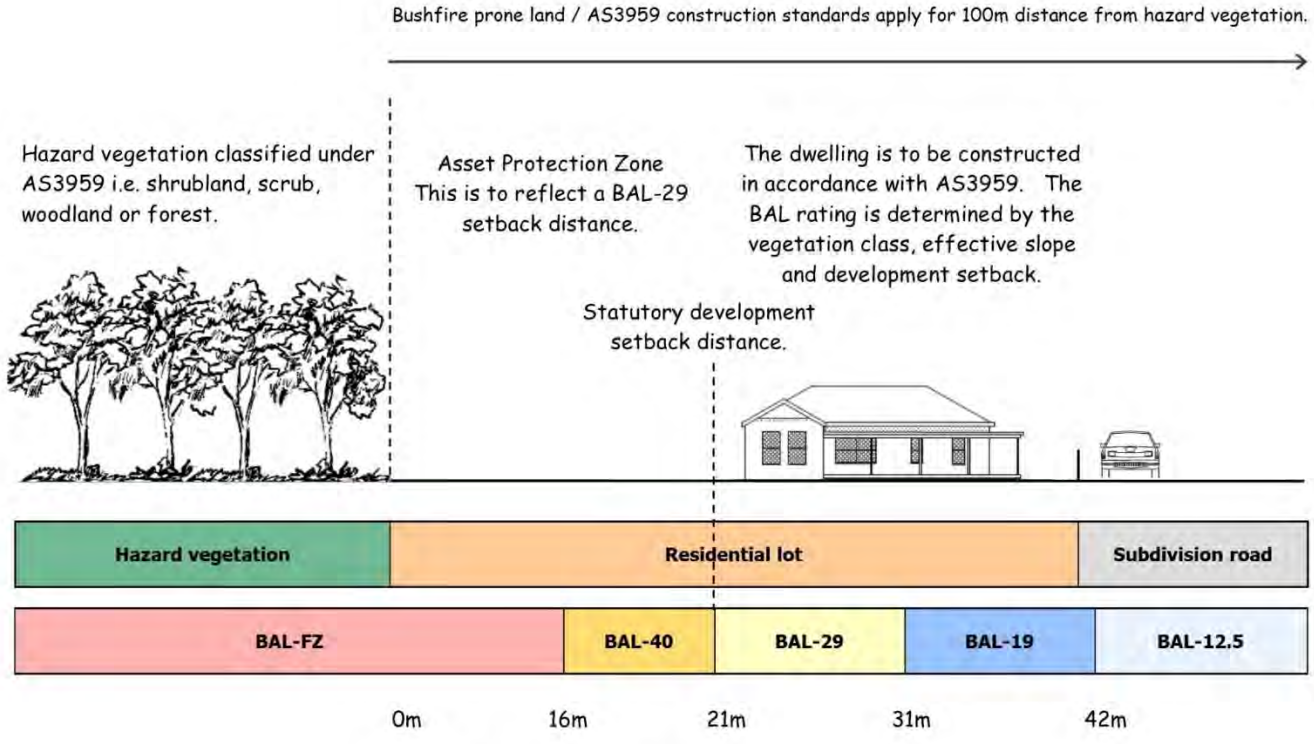


Class A Forest on flat land

3 - The Asset Protection Zone can encroach into larger lots provided that there is a statutory control to ensure the BAL-29 setback distance.



Class A Forest on flat land

4 - Large residential lot which backs onto the hazard area. The Asset Protection Zone can encroach where there is a statutory control to ensure the BAL-29 setback.

FIGURE 18
DEVELOPMENT INTERFACE OPTIONS
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Development Interface - street view

Development Interface - aerial view

FIGURE 18
DEVELOPMENT INTERFACE OPTIONS
SHEET 3

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6.2.2 State Forest / Plantation Setbacks

Reliance on the BAL-29 setback adjacent to major vegetation areas is not desirable as it only offers the absolute minimum protection and very little defendable space. Often a development setback of at least 50m is also sought by the management agency for environmental reasons. In addition, an increased setback is also required in situations where trees may fall over and this is normally a minimum of the tree height plus an additional fifty percent.

Plantation are required to have a 30m wide external firebreak under the plantation guidelines and local firebreak notices. Where this is combined with a subdivision road then there is a significant setback distance which provides protection for nearby dwellings.

Existing 30m firebreak on the outer boundary of the Gnangara Plantation

For planning purposes any adjacent development should be designed on the assumption that post-harvest revegetation can occur to the cadastral boundary of the State Forest reserve.

6.2.3 Wetland Buffers

There is often an environmental requirement to provide a revegetated buffer to the wetlands. For a conservation category wetland this is often 50m wide. The actual size of this will be determined as a wetland buffer study prepared as part of any Local Water Management Strategy or Urban Water Management Plan.

This revegetated buffer will then become part of the hazard vegetation with any associated bushfire setbacks being measured from the outer boundary. Consequently, any development setbacks that are required for bushfire management, including for BAL ratings, are measured from the outside edge of the wetland buffer.

6.2.4 Non Homogenous Vegetation

Much of the study area is characterised by large residential lots and/or small rural holdings which often have a wide variety of vegetation types. This can include a mixture of native and introduced species with an equally varied understorey and management practices.

The classification of this non-homogenous vegetation can be difficult under AS3959 especially if areas with more than 30 percent foliage coverage is classified as forest vegetation.

Bushfire behaviour and the models used to quantify bushfire behaviour in Australian Standard AS3959 are empirical models based on fire behaviour burning in contiguous vegetation for over

more than 100m distance and 1 hectare in size. This can become a problem when development is proposed on a site that does not represent a homogenous landscape or vegetation conditions. Taking a conservative approach can result in higher Bushfire Attack Levels leading to excessive building costs and in some cases refusal of development approval.

Conversely undertaking a Method 2 BAL Assessment is not always convenient for the land owner.

6.2.5 Access

One of the most significant design issues to be considered in the subdivision and development of land is the need for multiple access in different directions.

Element 3 of the Bushfire Protection Criteria has an objective to ensure that the vehicular access serving a subdivision/development is safe in the event of a bush fire occurring. The performance criteria seek to ensure that the subdivision design allows emergency and other vehicles to move through the development easily and safely at all times.

The acceptable solution is to provide two different vehicular access routes, both of which connect to the public road network, and which are available to all residents/the public at all times. By providing two access options, residents can evacuate and fire services can enter even when one access route is blocked by fire.

Residents may wish to evacuate before a fire as they don't feel confident in staying and defending their homes. This might include those with young children, the elderly, or people with disabilities. It can be particular issue on the urban fringe where there is a higher likelihood of suburbs where the primary income earner is working some distance away from the home.

Evacuation of residents from an approaching bushfire is one strategy that is employed by emergency managers to mitigate potential injury or loss of life. However, the database of Australian bushfire fatalities highlights that the most significant cause of deaths from bushfires occurs as a result of late evacuation (5). Late evacuation is a dangerous response to bushfires and any decision to evacuate an area must be made as early as possible.

The above highlights the need for multiple access routes, both externally to any development site and also internally between development areas.

6.2.6 Lot Size

As indicated in Section 5.0 a large portion of the Study Area is designated for urban expansion which may potentially comprise lower urban densities to allow for the retention of existing vegetation. The larger that the lot is the more likely it is that remnant vegetation can be retained.

Where this occurs, it is necessary to ensure that a minimum BAL-29 development setback can be achieved. This setback is also the minimum distance required for the asset protection zone in accordance with Acceptable Solution A2.1 of the Bushfire Protection Criteria. This also states that the asset protection zone should be located within the boundaries of each lot.

The width of the asset protection zone will vary depending upon the vegetation classification and the slope. This is documented in Table 6 and shown in Figure 19 using a standard dwelling with dimensions of 10m X 20m.

To fully contain the asset protection zone (BAL-29 setback) large lots are needed especially when the vegetation as classified as forest.

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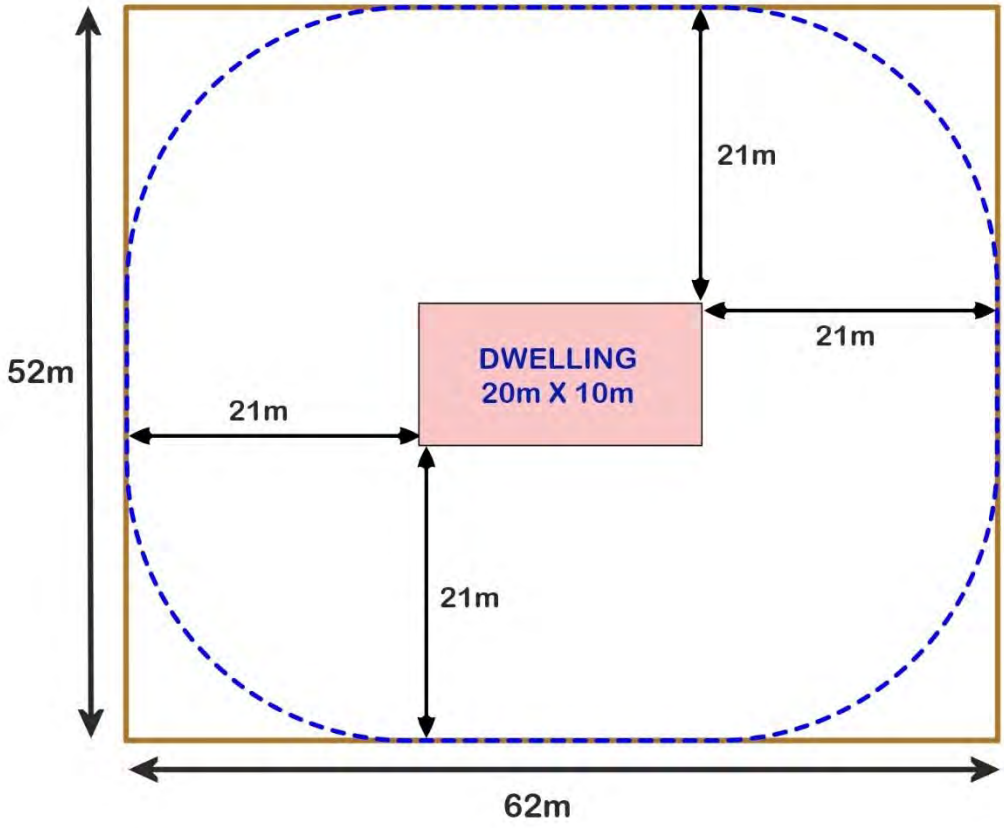
5 Handmer,J & Haynes,K (2008) – Community Bushfire Safety CSIRO Publishing Melbourne - Page 62

The actual lot sizes might be smaller where there is classified vegetation at the rear of the lot and the over lapping asset protection zones allow the side boundaries to be reduced as shown in Figure 20. Similarly, the front setback might be reduced where the asset protection zone extends over the access road. Conversely the BAL-29 setback for the asset protection zone must also include any outbuildings where they are located within 6m of the dwelling.

Given that the predominant vegetation within the Study Area is Class B Woodland then on land with slopes of less than 5 degrees a minimum area of approximately 2,000sqm will be required to accommodate an average size dwelling.

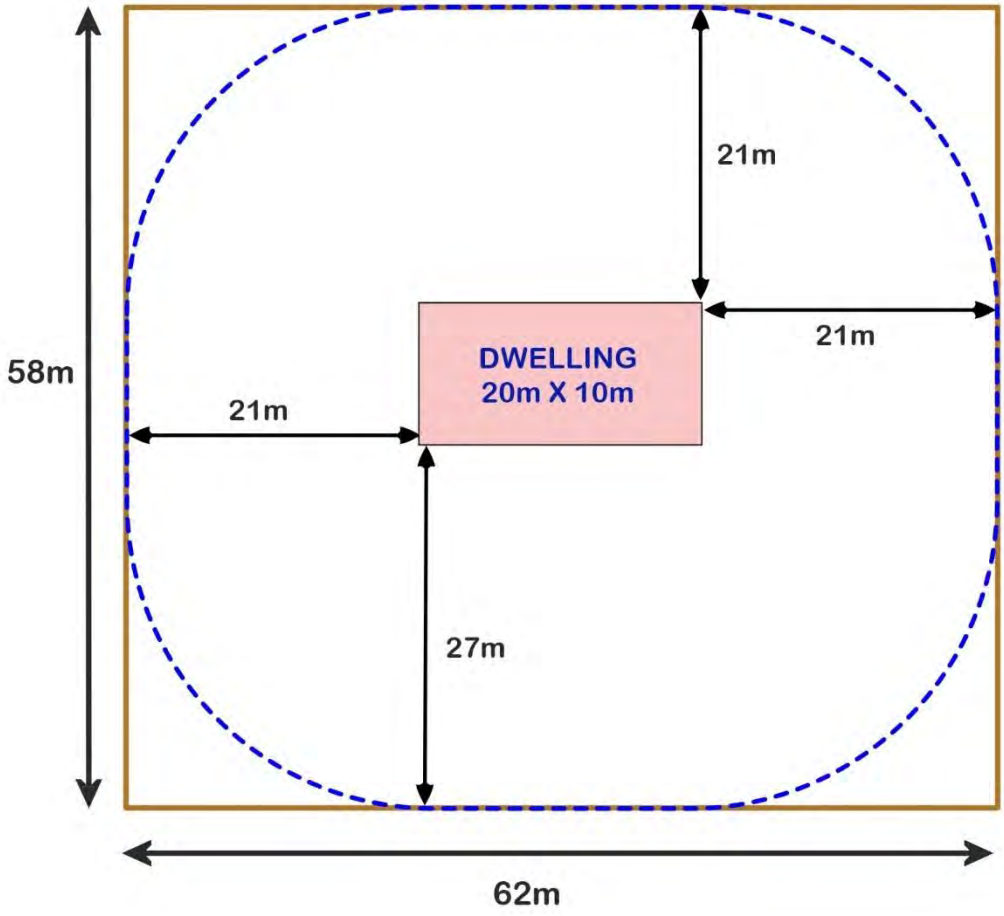
Table 6 BAL-29 Lot Sizes

Vegetation	House Dimensions	Downslope	Upslope	Sides	Lot Area (m^2)
Flat and Upslope					
Forest	10m X 20m	21m	21m	21m	3,224
Woodland	10m X 20m	14m	14m	14m	1,824
Shrubland	10m X 20m	9m	9m	9m	1,064
Scrub	10m X 20m	13m	13m	13m	1,656
Grassland	10m X 20m	8m	8m	8m	936
Downslope > 0 - 5 degrees					
Forest	10m X 20m	27m	21m	21m	3,596
Woodland	10m X 20m	17m	14m	14m	1,968
Shrubland	10m X 20m	10m	9m	9m	1,102
Scrub	10m X 20m	15m	13m	13m	1,748
Grassland	10m X 20m	9m	8m	8m	972



BAL - 29
SETBACK
A FOREST
FLAT LAND

LOT SIZE = 3,224m2



BAL - 29
SETBACK
A FOREST
>0-5 Degrees

LOT SIZE = 3,596m2

FIGURE 19
LOT SIZE - BAL 29 SETBACKS
CONTAINED ASSET PROTECTION ZONE

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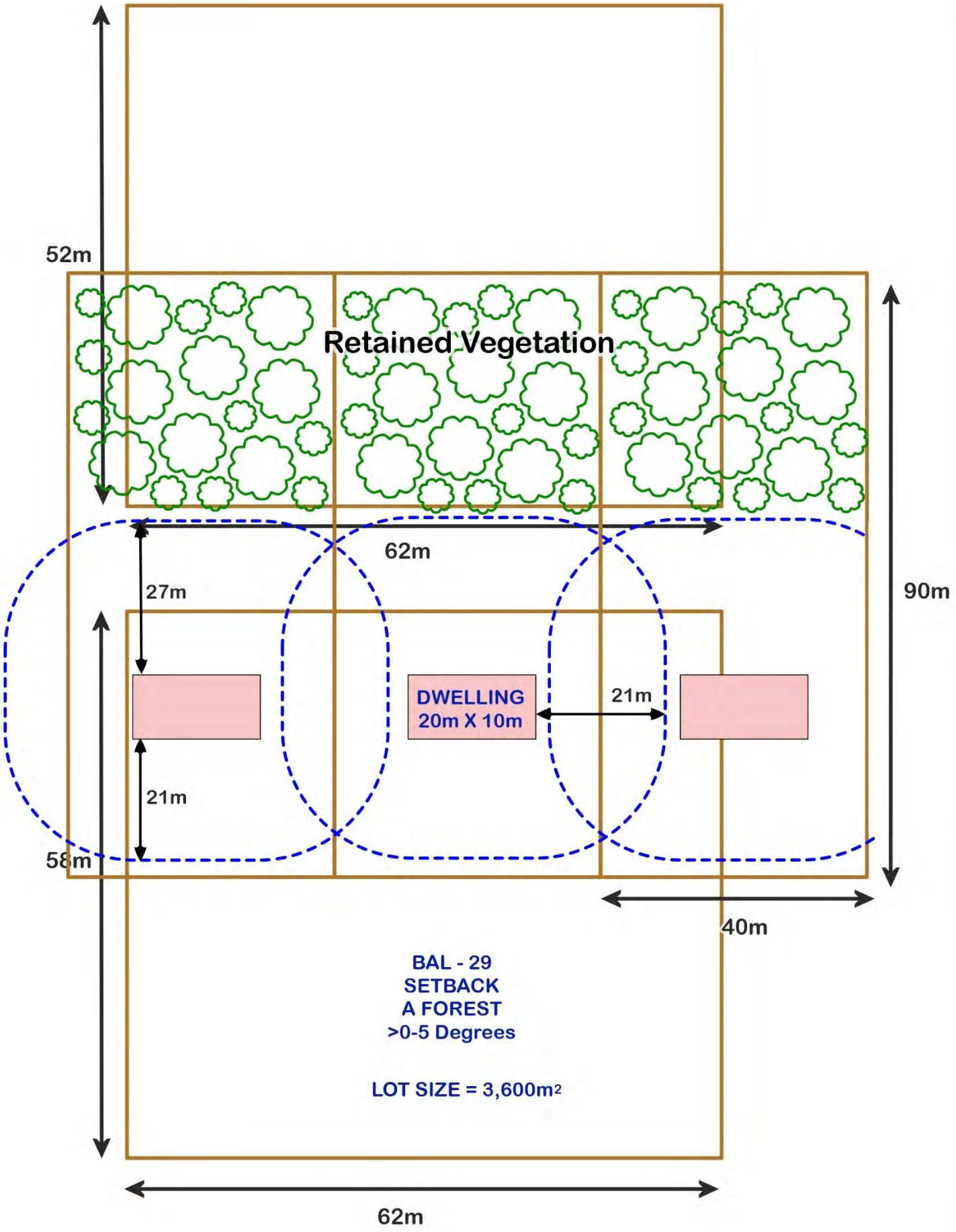

FIGURE 20
LOT SIZE - BAL 29 SETBACKS
OVERLAPPING ASSET PROTECTION ZONES

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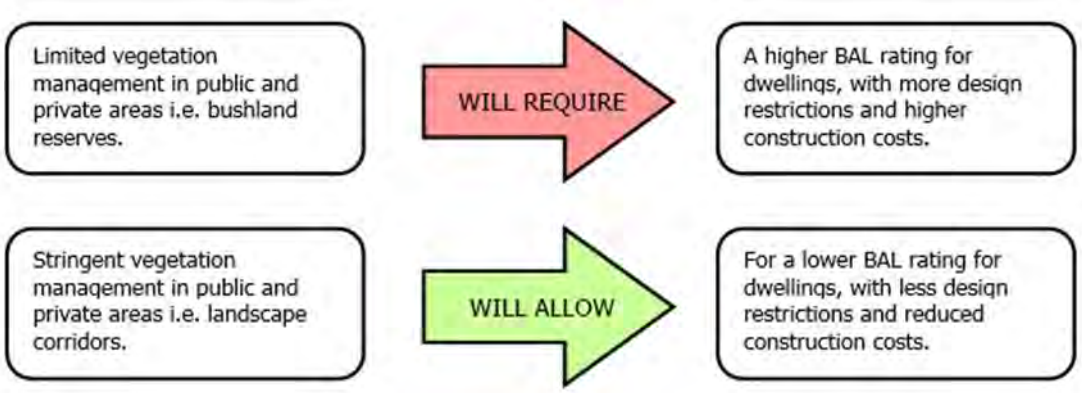
6.2.7 Housing Affordability

Where dwellings are located more than 100m from the hazard vegetation they are classified as having a low BAL rating and do not require any specific protection measures. If there is an objective pf providing more affordable housing then this should recognise that the higher the BAL rating the more expensive the construction cost of dwellings.

The design of a subdivision can actively manage or modify the remnant vegetation so as to reduce the required construction standard of the dwellings. Alternatively, where there is only passive management of the vegetation then the required construction standard of the dwellings will increase.

This is illustrated below.



6.2.8 Bushland Retention / Landscape Design

It is recognised that as there is a desire for people to live in closer contact with natural landscape particularly on the urban fringe, the provision of a wide low fuel zone area which is devoid of trees may not be acceptable. For many communities, substantial modification of the native vegetation is not seen as acceptable (6).

The promotion of landscape and vegetation protection measures to create a desirable residential character means that the interface between urban development and bushland areas is becoming less clear. Consequently, it is necessary to adopt more sophisticated approaches to vegetation and landscape management in relation to subdivision design and fire management.

A key design issue is the relationship of the development to the vegetation areas which are classified as being a bushfire hazard. This applies:

- Primarily to areas of protected remnant vegetation which are generally external to any development but also occur in the internal habitat and landscape protection areas; and
- Secondly to the areas of public landscaping, parks and reserves.

While the risk of a bushfire in an urban environment might be low, if the land is defined as being bushfire prone then the characteristics of the vegetation in public areas will affect the subsequent BAL ratings. Well managed, designed and publicly accessible landscape areas are likely to have a lower bushfire hazard and this has implications for the adjoining development and subdivision design.

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6 Ramsay C. & Rudolp L. (2006) Landscape and Building Design for Bushfire Areas. Collingwood CSIRO Publishing Page 39.

In areas where increased vegetation might be promoted as part of the overall planning objective, such as the ecological corridors, it is important to understand the attributes of different landscape types. These are documented in Table 7 and Ramsay & Rudolp (7) identified four main landscape types being:

1 Remnant bushland
Forest type vegetation with potential high fuel loads, heavy litter on the ground and flammable vegetation. There is little vegetation management and may become infested with weeds. There are likely to be few open spaces.

2 Modified bushland
Remnant bushland with a modified understorey. There may be periodic vegetation management including fuel reduction. Placement of vegetation is considered and there may be some clearing to create open spaces.

3 Exotic landscape
Native vegetation has been largely cleared and replaced with low flammability or imported species, deciduous trees, lawns and open spaces.

4 Parkland landscape
Highly managed landscape with clumps or belts of trees with selected understorey plants, or the understorey is replaced by pasture. May contain open spaces, pathways and may include playgrounds or in semi rural areas have pasture which is slashed or grazed annually.

Table 7 Landscape Characteristics

	Remnant Bushland	Modified Bushland	Exotic Landscape	Parkland Landscape
Characteristic	**1**	**2**	**3**	**4**
Level of bush fire hazard	XX	X	✓✓	✓
Recovery after fire	✓	✓	XX	✓
Water demand	✓✓	✓	XX	X
Fauna habitat	✓✓	✓	XX	✓
Flora habitat	✓✓	✓	XX	✓
District landscape compatibility	✓✓	✓✓	X	✓
Suitability for large lots – rural residential	X	✓	X	✓✓
Suitability for small lots - urban	XX	X	✓✓	✓

✓✓	very suitable	✓	suitable	X	unsuitable	XX	vey unsuitable

7 ibid pp 50-51

Table 8 and Figure 14 then document the likely characteristics for the different types of public reserves which are expected to be found within the Study Area.

The design and development of open space areas and landscaped reserves should recognise that deliberately lit bush fires (arson) are a crime and that the accepted techniques for crime prevention also apply to bush fires. These are reflected in the Designing Out Crime Guidelines which state in relation to landscaping that (8):

> Landscape treatments are an essential element of urban spaces; parks, gardens and enhanced private spaces are a component of successful urban form. The ill-considered placing of plants and structures can cause and create environments that accommodate antisocial and criminal behaviour. The creation of quality environments contributes to community pride and can encourage use of public realm spaces providing enhanced security through natural surveillance and legitimate uses.

Appropriate design measures for public areas include:

- Providing natural surveillance from activity land uses and activity rooms for communal and public areas;
- Establishing community focal points at locations where surveillance is essential;
- Ensuring public shelters do not impede surveillance;
- Co-locating movement systems to encourage surveillance in public areas; and
- Encouraging mixed uses to extend hours of surveillance, ensuring compatible uses and avoiding conflicting uses.

While the above may be more difficult for conservation reserves, this would then emphasise the need to ensure that there is an adequate separation distance and interface treatment to any nearby development.

8 WAPC (2006) Designing Out Crime Guidelines Page 34

Table 8 Reserve Characteristics

Land Use	Hazard Rating	Description	Fire Management Principles	Maintenance
Conservation Reserve	Extreme	Conservation land for the protection of recognised vegetation or habitat. Bush forever reserves.	• Likely extreme hazard rating. • Areas may be subject to a management plan which may prevent any prescribed burning or has limited methods of fuel reduction. • Expected to have heavy surface fuel loads. • Management for fire safety may be minimal. • May not have any internal boundary firebreaks. • Unlikely to have open spaces. • May be fenced with restricted public access. • May have limited internal access which is unlikely to accommodate fire appliances.	• May have a specific environmental management plan. • Maintenance might be annually and focussing on habitat measures rather than fire protection.
Bushland Reserve General	Extreme	Can be specifically designated in a subdivision. May be an existing reserve for any purpose (or Class) but it has remnant vegetation.	• May not be subject to any overall management plan. • May be included in a district fire management program and may have periodic fuel reduction. • Expected to have moderate to heavy surface fuel loads. • Unregulated public use may result in an increase of fire events. • Should have boundary firebreaks. • Internal access should be designed to accommodate fire appliances.	• May not have any specific management plan. • Maintenance might be annually or less frequent. • Might have periodic fuel reduction.
Wetland Foreshore Reserve	Likely to be extreme	Likely to include revegetation areas potentially to 50m.	• Can contain high fuel loads due to dense fringing vegetation. • Revegetated areas can become the predominant bushfire vegetation. • May include areas for active recreation including walking trails. • Requires physical separation from residential development.	• Annual or less frequent programs for bushland areas. • Weekly programs for high use public activity areas.
Ecological Corridors	Extreme or Moderate	Linear areas serving a conservation function.	• Areas greater than 1 ha require specific fire management measures. • Need for continuous canopy coverage can increase fire hazard. • Must be able to have road access points across the corridor. • Must have clearly defined boundary treatments. • Management plans should include fire management measures. • Increased development setbacks are likely to be required especially on sloping land.	• Will have a specific environmental management plan. • Maintenance might be annually and focussing on habitat measures rather than fire protection i.e. retaining tree hollows and fallen branches.

Land Use	Hazard Rating	Description	Fire Management Principles	Maintenance
Drainage Bio-retention basins	Variable	Can of a variable size and have reed strap plant vegetation in a semi wetland environment.	• When dried out there is potential for the vegetation to cure and become a hazard. • May be isolated from other hazard vegetation and so not classified. • Maybe less than 2,500sqm in size but may not be excluded vegetation depending upon location and nearby development. • Preferable to always be separated from development by a road or pathway.	• Sporadic once the vegetation has been established.
POS Passive Irrigated	Moderate to Low	Generally landscaped or bushland areas with open spaces	• Design includes open spaces which are irrigated with maintained areas of turf. • Need to consider Designing Our Crime Guidelines; • Regular maintenance programs can reduce hazard levels, especially in an urban environment. • Areas greater than 1 ha may require specific fire management measures. • Internal access should be designed to accommodate fire appliances. • Management plans should include fire management measures.	• Regular maintenance of both bush/landscaping and open spaces. • Weekly programs for high use public activity areas.
POS Passive Non Irrigated	Moderate	Generally landscaped or bushland areas with open spaces	• Design includes open spaces which are not irrigated but maintained below 100mm in height. • Trees located closer to the central drainage areas with grassed areas on the periphery. • Little or no middle storey vegetation apart from drainage areas. • Open tree canopy to provide filtered sunlight • Regular maintenance programs can reduce hazard levels, especially in an urban environment. • Areas greater than 1 ha may require specific fire management measures. • Internal access should be designed to accommodate fire appliances. • Management plans should include fire management measures.	• Regular maintenance of both bush/landscaping and open spaces. • Open grassland areas under trees might only be subject to annual slashing before the start of the fire season. • Dead branches and litter should be removed.
POS Active	Low	Generally cleared areas such as sports grounds.	• Will normally be irrigated turf. • Where located centrally they provide a natural safety zone. • Perimeter subdivision roads to ensure that the POS does not abut residential properties • Can be located as part of an overall strategic fire defensive system as they form a natural hazard separation zone.	• Regular maintenance

REMNANT BUSHLAND

- Retained understory with high fuel loads; greater than 8 tph.
- Few if any open spaces and limited or no surveillance.
- Likely weed infestation contributing to fuel loads.
- Potential access restrictions.
- Maintenance may be sporadic.

MODIFIED BUSHLAND

- Reduced understory with moderate fuel loads less than 8 tph.
- Some open spaces.
- Weed management programs.
- Less access restrictions.
- Moderate maintenance annually or seasonally.

MANAGED PARKLAND

- Vegetation located in planned cells.
- Reduced understory with low fuel loads.
- Formal open spaces.
- Weed management programs.
- Minimal access restrictions and improved surveillance.
- Regular maintenance programs weekly or monthly.

CORRIDORS LINEAR VEGETATION

- Reduced understory with low fuel loads less than 5 tph.
- Formal landscaping areas.
- Weed management vegetation programs.
- Minimal access restrictions and improved surveillance.
- Regular maintenance programs weekly or monthly.

DRAINAGE

- Can potentially have dense reeds and other "grassy" vegetation.
- Can become a hazard over summer or during a prolonged dry spell when the vegetation cures.
- Sizes may vary and classification may depend on separation distance from other vegetation and setback from development sites.

FORESHORE BUFFER

- Revegetation normally expected to become the classified vegetation, although there can also be some open areas depending upon the environmental classifications.
- Understory with high fuel loads; greater than 8 tph.
- Potential access restrictions.
- Maintenance may be sporadic.
- Weed invasion can increase surface fuel loads.

6.2.9 Progressive Development / Staging

In the staging of development within the Study Area it will be important for any local structure plan to provide temporary measures for the protection of that stage of development. These may include:

- Provision of a 100m wide low fuel zone so as to maintain the status of any residential areas which are being planned to have a BAL-Low rating with no special construction requirements.
- Provision of temporary road access through an adjoining property. This should normally be protected by an easement in the event that the adjoining land is not developed. This is especially important where a proposed connecting subdivision road terminates at the property boundary effectively creating a cul-de-sac.

A more difficult issue occurs within infill development especially where existing rural residential lots are proposed to be subdivided. In this situation is common for any BAL rating to be inflated because of the vegetation on the neighbouring lot. This can prevent a BAL-29 or lower rating from being able to be achieved and so potentially prevent subdivision.

A further issue is even if a lot is created development of that lot might only be possible at a higher BAL rating. This rating might "fall away" or be reduced when the neighbouring property is subdivided and the hazard vegetation is removed. Hence the initial landowner has been penalised by additional construction costs by developing first.

Options to address and manage this issue to allow for progressive development may require:

- Securing road reserves and alignments in advance of development;
- The use of development contributions to provide for equity; and/or
- The introduction of a development scheme to implement an overall subdivision design.

6.2.10 Non-Residential Buildings

The Building Act 2011 and Building Regulations 2012 contain legislative provisions relating to the applicable building standards for buildings and incidental structures in bush fire prone areas. These primarily relate to residential buildings being Class 1, 2, 3 and 10(a) buildings.

Where non-residential buildings are proposed within the bushfire prone areas, then there should be another mechanism to ensure that appropriate bushfire protection measures are incorporated into the design and construction and that these reflect the equivalent BAL rating.

It is also noted that, any commercial or industrial buildings with a floor area of more than 500m^2 must be referred to DFES for an assessment of compliance with the Fire and Emergency Services Commissioner's operational requirements. Industrial buildings often utilise construction methods and materials that are likely meet elements of the BAL-12.5 ember protection requirements.

The local structure plan can promote that the design of subdivisions for commercial, industrial or service commercial areas are based on achieving a BAL-12.5 setback.

Requirements for any specific bushfire construction measures would have to be included as a provision of the Local Planning Scheme or as a condition of planning approval.

6.2.11 Climate Change

Weather elements such as wind, temperature, humidity and rainfall affect the behaviour of bushfires.

The Climate Commission (9) is predicting hotter and drier conditions particularly in the South West region. These are likely to cause changes to fire regimes, as the conditions for large and intense fires will be more common.

It is likely that a higher fire weather risk will be more common in spring, summer and autumn resulting in an increased annual fire season. This will also have the added implication of reducing the opportunity for hazard reduction activities and specially prescribed burning.

Consequently, there are likely to be more days which have a "severe" Fire Danger Rating resulting in an increased fire threat.

6.2.12 Vulnerable Land Uses

SPP3.7 Planning in Bushfire Prone Areas defines a vulnerable land use as one where persons may be less able to respond in a bushfire emergency. The Guidelines then explain that such uses include hospitals, nursing homes and retirement villages, tourist accommodation including camping grounds and ecotourism, childcare centres, educational establishments, places of worship and corrective institutions. This definition may also encompass places of assembly, retail and office premises as well as subsidiary uses of residential development, such as family day care centres or home businesses, and essential infrastructure such as energy, transport, telecommunications and other utilities.

Under SPP3.7 vulnerable land uses will not be supported in areas with a BAL rating of between BAL-12.5 to BAL-29 unless they are accompanied by a Bushfire Management Plan jointly endorsed by the relevant local government and the State authority for emergency services.

There are a number of vulnerable landuses within the Study Area which is to be expected. Further development in accordance with the planning framework will introduce more vulnerable land uses including schools and retirement villages.

The location and design of these will have to have regard to the surrounding hazard areas and potential evacuation issues. Vulnerable land uses should be designated as discretionary (D) uses in the Local Planning Scheme.

6.2.13 High Risk Land Uses

High risk land uses are those uses which may lead to the potential ignition, prolonged duration and/or increased intensity of a bushfire. Examples include service stations, landfill sites, bulk storage of hazardous materials, fuel depots.

It is expected that high risk land uses, especially those relating to industry will be located in the proposed industrial areas. Such uses may require a development approval and the consideration of this can include any associated bushfire management issues. However, uses such a petrol station can be a (P) permitted use in a Commercial or Industrial zone but this should be a discretionary use in bushfire prone areas.

The location and design of these will have to have regard to the surrounding hazard areas and buffers to sensitive land uses. High risk land uses should be designated as discretionary (D) uses in the Local Planning Scheme.

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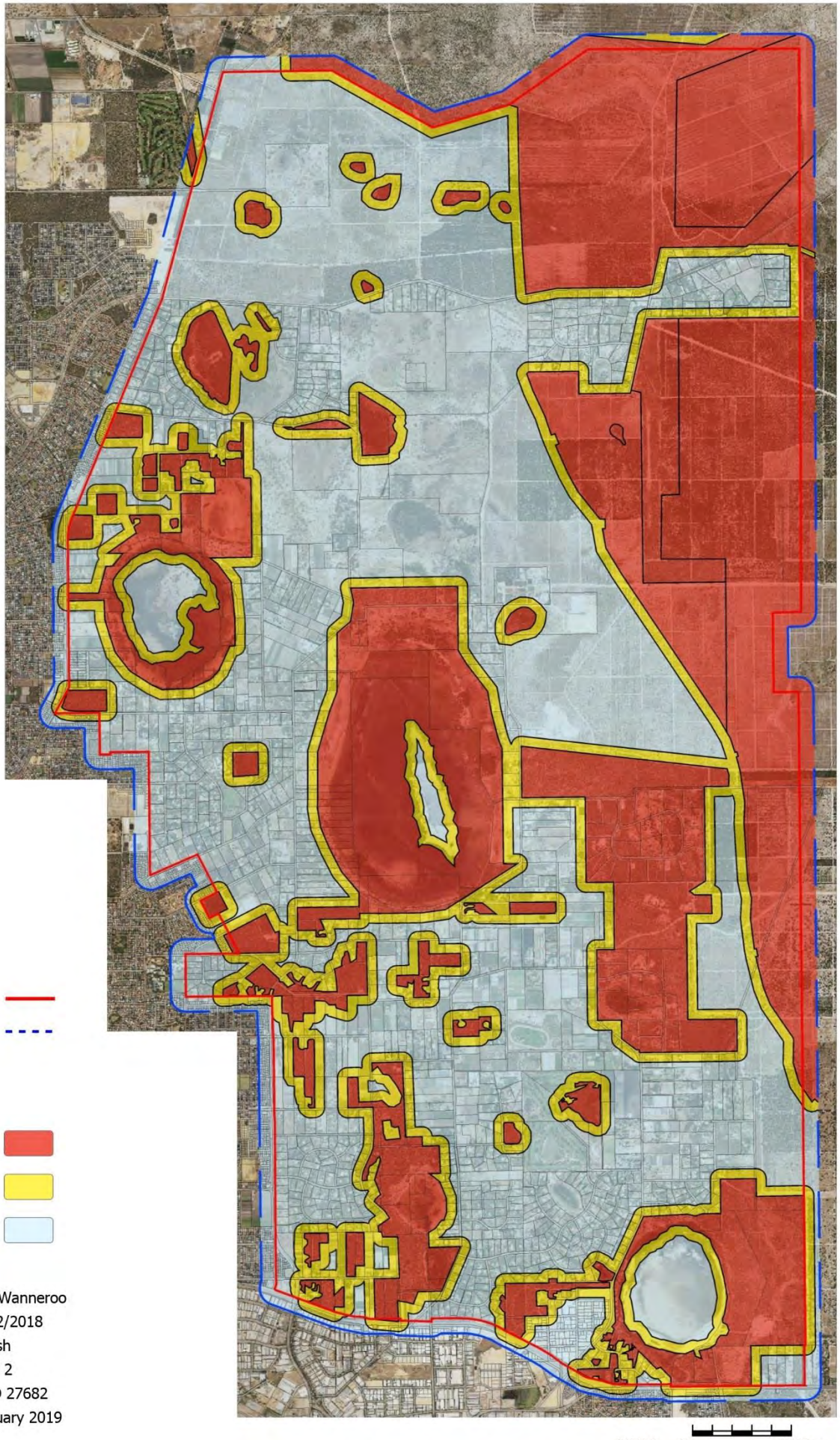
9 Climate Commission (2011) The Critical Decade: Western Australia climate change impacts. Page 10

6.3 Post Development Bushfire Hazard Levels

A key objective is that the identified areas of significant remnant vegetation within the Study Area will be retained and potentially included in the reserve system or as private land with strict development controls. The ultimate extent of this is unknown at this time and is subject to the conservation hierarchy. Hence the focus has been on areas with regional importance while other areas of local importance may ultimately also be included.

The areas of proposed retained vegetation are shown in Figure 7. The bushfire hazard levels associated with this are shown in Figure 22.

This recognises the transmission line connecting to the Neerabup terminal as the proposed tenure of the land under the transmission line is unknown and often these areas have limited vegetation management. Consequently, scrub type vegetation can regenerate and this has an extreme hazard rating.



LEGEND

STUDY AREA

ASSESSMENT AREA
(150m from the boundary of the study area).

HAZARD LEVEL

EXTREME

MODERATE

LOW

Location Details:	East Wanneroo
Assessment Date:	22/02/2018
Prepared by:	G Lush
Accreditation Level:	Level 2
Accreditation Number:	BPAD 27682
Accreditation Expiry Date:	February 2019

SCALE 0m 1000m

FIGURE 22
PROPOSED BUSHFIRE HAZARD LEVELS
(POST DEVELOPMENT)

N

Job No 17-072

Rev	Description	Date
A	Preliminary	13/03/2018
B	Revised Veg	23/07/2018

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7.0 Assessment Against the Bushfire Protection Criteria

At this strategic level, there is generally not enough detail to demonstrate compliance with the bushfire protection criteria.

A preliminary examination of the precincts in terms of the how likely it is that development can comply with the Bushfire Protection Criteria is shown in Table 9. This is not a risk assessment and it is not quantifiable unless an actual subdivision design is considered.

To assist with this assessment the initial investigation precincts have been revised and a number of sub-precincts included as shown in Figure 23.

The Bushfire Protection Criteria elements relate to:

- Location;
- Siting and Design;
- Vehicular Access; and
- Water.

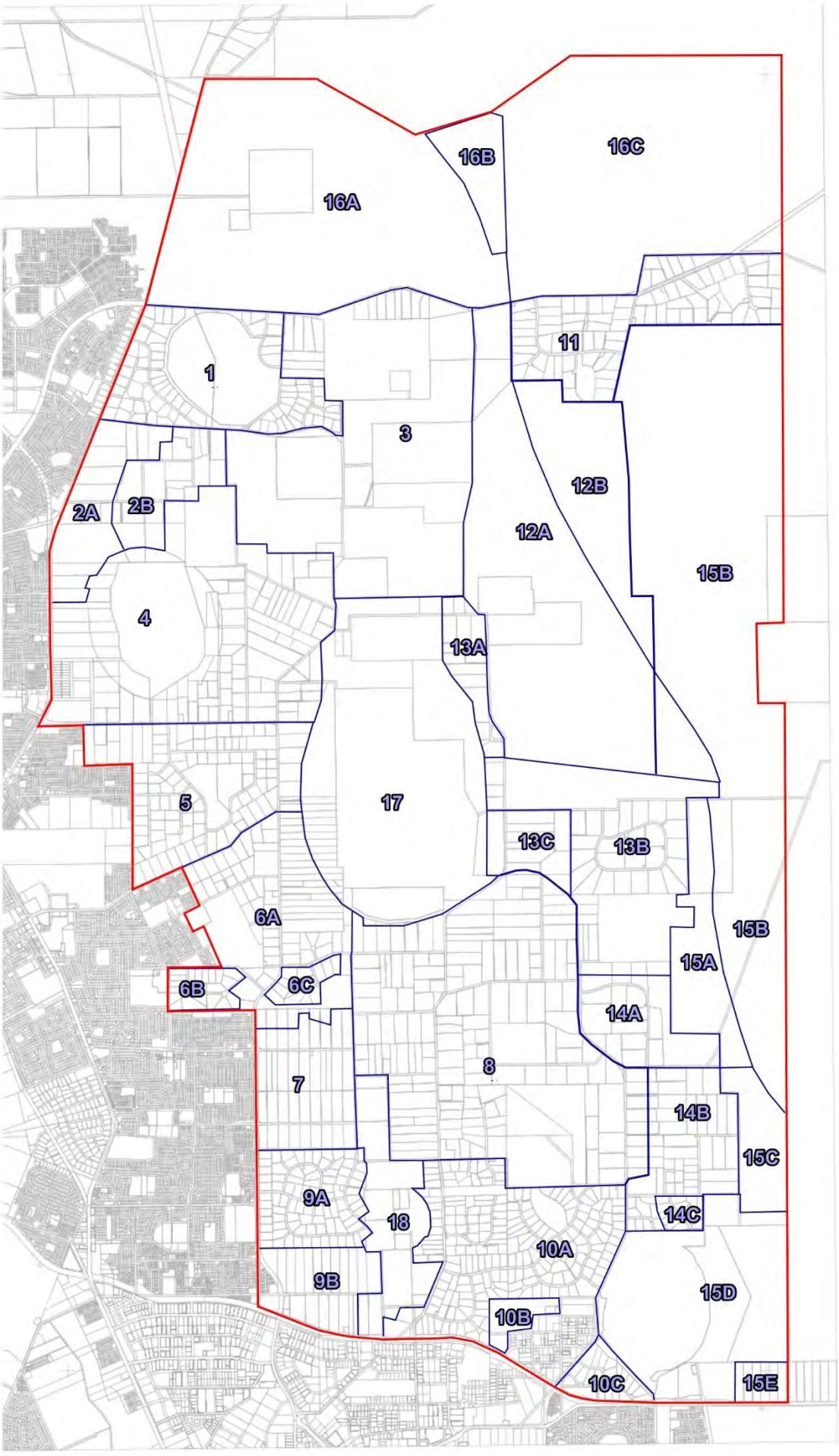
Element 1 Location considers the extent of bushfire prone vegetation both within each area and surrounding it. Where there is adjacent hazard vegetation then weighting of this factor increases depending upon how many boundaries are affected.

Element 3 Access considers access at both the district and local level.

The categories which have been used to consider these are:

Relativity Weighting	Description - expectation
Significant	Unlikely to meet the criteria.
High	May meet the criteria subject to further investigation and design.
Moderate	Should meet the criteria depending upon the design.
Low	Expected to meet the criteria.

The purpose of this is to identify where multiple factors may contribute to the suitability of one area in comparison to others. For example, an area might not have any "significant" ratings but has multiple "high" ratings. This may suggest that the area is unlikely to be suitable for development.



LEGEND

STUDY AREA

PRECINCTS

01 Mariginiup North Rural
02 Mariginiup North
03 Mariginiup Wetlands
04 Mariginiup South
05 Wanneroo North
06 Wanneroo South
07 Hocking East
08 Jandabup - Gnangara
09 Pearsall East
10 Gnangara South
11 Mariginiup NE Rural
12 Mariginiup East
13 Jandabup
14 Gnangara East Rural
15 East
16 Northern
17 Jandabup Lake
18 Wanneroo Bush Forever

FIGURE 23
PRECINCT SUB AREAS

N

Job No 17-072

Rev	Description	Date
A	Preliminary	15/05/2018

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Table 9 BPC Assessment

Legend

Significant	Unlikely to meet the criteria.	High	May meet the criteria subject to further investigation and design.	Moderate	Should meet the criteria depending upon the design.	Low	Expected to meet the criteria.

No	Reference	Proposed Land Use	Location			Siting & Design	Vehicular Access			Water	Land Uses	
			Subject Land Cleared/ uncleared	Slopes	Surrounding Land Cleared/uncleared	Asset Protection	District access	Local access	Emergency Access Way - Fire Access	Reticulated Non Reticulated	Vulnerable	High Risk
P01	**Mariginiup North Rural**	Rural Residential	Semi cleared	Low gradient < than 10 degrees	Scattered hazard vegetation around the lake.	Within lots subject to lot size.	Neaves Road	Coogee and Adams Road. No access to south east via Rouset Road.	Subject to subdivision design.	Existing retic supply.	Possible subject to zoning provisions	Highly unlikely in proposed zone
P02	**Mariginiup North Sub Area A**	Urban	Contains scattered areas of remnant vegetation.	Low gradient < than 10 degrees	Adjoining hazard vegetation lake foreshore.	Within lots subject to lot size.	Proposed new district access road	Orientated to Pinjar Road	Subject to subdivision design.	Existing retic supply.	Possible subject to zoning provisions	Highly unlikely in proposed zone.
	Mariginiup North Sub Area B	Urban	Vegetation areas in close proximity	Low gradient < than 10 degrees	Adjoining hazard vegetation lake foreshore.	Within lots subject to lot size.	Proposed new district access road	Restricted access to the south east and north.	Significant connection distances	Existing retic supply.	Possible subject to zoning provisions.	Highly unlikely in proposed zone
P03	**Mariginiup Wetlands**	Urban	Predominantly cleared	Low gradient < than 10 degrees	Minor hazard areas	Within lots subject to lot size.	Proposed new district access roads	Restricted access to Coogee Road and Lakeview Street	Subject to subdivision design	Potential retic supply.	Possible subject to zoning provisions.	Highly unlikely in proposed zone
P04	**Mariginiup South**	Urban Open Space	Predominantly cleared	Low gradient < than 10 degrees	Minor hazard areas & lake foreshore	Within lots subject to lot size.	Franklin Road proposed as new district access road.	Restricted because of Lake Mariginiup	Subject to subdivision design	Existing retic supply.	Possible subject to zoning provisions	Highly unlikely in proposed zone
P05	**Wanneroo North**	Urban	Semi cleared	Low gradient < than 10 degrees	Minor hazard areas & lake foreshore	Within lots subject to lot size.	Franklin Road proposed as new district access road.	External access roads but internal cul-de-sacs.	Required for access connections	Existing retic supply.	Possible subject to zoning provisions	Highly unlikely in proposed zone
P06	**Wanneroo South Sub Area A**	Urban Public Purpose Open Space	Contains areas of remnant vegetation.	Moderate < than 10 degrees	Minor hazard areas & lake foreshore	Within lots subject to lot size.	Franklin Road proposed as new district access road.	Subject to subdivision design but can connect to external access roads	Subject to subdivision design	Existing retic supply.	Possible subject to zoning.	Highly unlikely in proposed zone
	Wanneroo South Sub Area B	Urban	Predominantly uncleared with major vegetation areas.	Moderate < than 10 degrees	Adjoining hazard vegetation.	Within lots subject to lot size.	Franklin Road proposed as new district access road.	Non compliant cul-de-sac single access.	Difficult to provide but required for access connections.	Existing retic supply.	Possible subject to zoning. Evacuation access issue	Highly unlikely in proposed zone
	Wanneroo South Sub Area C	Urban	Predominantly uncleared with major vegetation areas.	Moderate < than 10 degrees	Adjoining hazard vegetation.	Within lots subject to lot size.	Franklin Road proposed as new district access road.	Non compliant cul-de-sac single access.	Difficult to provide but required for access connections.	Existing retic supply.	Possible subject to zoning. Evacuation access issue	Highly unlikely in proposed zone
P07	**Hocking East**	Urban Open Space Investigation	Contains areas of remnant vegetation.	Low gradient < than 10 degrees	Adjoining hazard vegetation to the north and south east.	Within lots subject to lot size.	Elliot Road proposed as new district access road.	Requires co-ordination between owners due to elongated lots	Subject to subdivision design	Existing retic supply.	Possible subject to zoning provisions	Highly unlikely in proposed zone
P08	**Jandabup-Gnangara**	Urban	Predominantly cleared with some vegetated areas in the north west.	Low gradient < than 10 degrees	Adjoining hazard vegetation separated by roads.	Within lots subject to lot size.	Elliot & Badgerup Roads proposed as new district access road	Subject to subdivision design but can connect to external access roads	Subject to subdivision design	Existing retic supply.	Possible subject to zoning provisions	Highly unlikely in proposed zone

Legend

Significant	Unlikely to meet the criteria.	High	May meet the criteria subject to further investigation and design.	Moderate	Should meet the criteria depending upon the design.	Low	Expected to meet the criteria.

No	Reference	Proposed Land Use	Location			Siting & Design	Vehicular Access			Water	Land Use	
			Subject Land Cleared/ uncleared	Slopes	Surrounding Land Cleared/uncleared	Asset Protection	District access	Local Access	Emergency Access Way - Fire Access	Reticulated Non Reticulated	Vulnerable	High Risk
P09	Pearsall East Sub Area A	Planning Investigation	Contains high value habitat vegetation	Low gradient < than 10 degrees	Adjoining hazard vegetation with major reserve to the east.	Within lots subject to lot size.	Nearby external district access roads.	Restricted access to the south and east.	Subject to subdivision design but few external options for connections.	Existing retic supply.	Possible subject to zoning. Evacuation access issue	Highly unlikely in proposed zone
	Pearsall East Sub Area B	Urban Open Space	Contains major vegetation areas.	Low gradient < than 10 degrees	Adjoining hazard vegetation with major reserve to the east.	Within lots subject to lot size.	Nearby external district access roads.	Non compliant cul-de-sac single access.	Difficult to provide but required for access connections.	Existing retic supply.	Possible subject to zoning. Evacuation access issue	Highly unlikely in proposed zone
P10	Gnangara South Sub Area A	Urban Urban Investigation Industry Rural	Semi cleared with vegetation areas	Moderate < than 10 degrees	Adjoining hazard vegetation to the west with road separation.	Within lots subject to lot size.	Badgerup Road proposed as new district access road	Developed internal access connecting to boundary roads.	Subject to subdivision design	Existing retic supply.	Possible subject to zoning provisions	Highly unlikely in proposed zone
	Gnangara South Sub Area B		Uncleared remnant vegetation	Moderate < than 10 degrees	Minor hazard areas	Cluster design may need over lapping areas.	Nearby external district access roads.	Single access with potential access restrictions in other directions.	Difficult to provide but required for access connections.	Existing retic supply.	Evacuation access issue	Highly unlikely in proposed zone
	Gnangara South Sub Area C		Contains areas of remnant vegetation.	Low gradient < than 10 degrees	Adjoining hazard vegetation adjacent to lake to the north.	Within lots subject to lot size.	Adjacent to external district access roads.	Non compliant cul-de-sac single access.	Difficult to provide but required for access connections.	Existing retic supply.	Possible subject to zoning. Evacuation access issue	Possible subject to zoning provisions
P11	Mariginiup NE Rural		Semi cleared with non-homogenous plantings	Low gradient < than 10 degrees	Major hazard areas on multiple sides.	Within lots subject to lot size.	Adjacent to external district access road.	Loop roads but also multiple non compliant cul-de-sacs	Required for access connections	Non-reticulated tanks are required at strategic locations.	Possible subject to zoning. Evacuation access issue	Highly unlikely in proposed zone
P12	Mariginiup East Sub Area A	Industry Public Purpose	Contains areas of remnant vegetation, plantations	Low gradient < than 10 degrees	Adjoining hazard vegetation to the east.	Within lots subject to lot size.	Adjacent to external district access road.	Access in multiple directions but with a possible constraint in the SE corner.	Subject to subdivision design	Existing retic supply.	Unlikely in proposed zone	Possible subject to zoning provisions
	Mariginiup East Sub Area B	State Forest	Remnant vegetation and plantations	Low gradient < than 10 degrees	Cleared land	N/A	Adjacent to external district access roads.	Existing access network in multiple directions but has some access restrictions.	N/A.	N/A	N/A	N/A
P13	Jandabup Sub Area A	Urban Investigation	Predominantly cleared	Low gradient < than 10 degrees	Adjoining hazard vegetation adjacent to lake and to the east.	Within lots subject to lot size.	Adjacent to external district access roads.	Linear corridor can be difficult to design multiple access routes.	Subject to subdivision design	Proposed reticulation for development	Possible subject to zoning provisions	Highly unlikely in proposed zone
	Jandabup Sub Area B	Planning Investigation Open Space	Contains high value habitat vegetation	Low gradient < than 10 degrees	Adjoining hazard vegetation to the east, north and south.	Within lots subject to lot size.	Adjacent to external district access roads.	Piani Way single access direction.	Difficult to provide but required for access connections.	Non-reticulated tanks are required at strategic locations.	Possible subject to zoning. Evacuation access issue	Highly unlikely in proposed zone

Legend

Significant	Unlikely to meet the criteria.	High	May meet the criteria subject to further investigation and design.	Moderate	Should meet the criteria depending upon the design.	Low	Expected to meet the criteria.

No	Reference	Proposed Land Use	Location			Siting & Design	Vehicular Access			Water	Land Use	
			Subject Land Cleared/ uncleared	Slopes	Surrounding Land Cleared/uncleared	Asset Protection	District access	Local Access	Emergency Access Way - Fire Access	Reticulated Non Reticulated	Vulnerable	High Risk
P13	**Jandabup Sub Area C**	Planning Investigation	Generally cleared	Low gradient < than 10 degrees	Adjoining hazard vegetation to the east and north.	Within lots subject to lot size.	Adjacent to external district access roads.	Has two frontages but existing wetland may restrict connections.	Subject to subdivision design but few external options for connections	Proposed reticulation for development	Possible subject to zoning provisions	Highly unlikely in proposed zone
P14	**Gnangara East Rural Sub Area A**	Planning Investigation	Contains high value habitat vegetation	Low gradient < than 10 degrees	Adjoining hazard vegetation to the east and north.	Within lots subject to lot size.	Adjacent to external district access roads.	Potential access in multiple directions	Subject to subdivision design but few external options for connections.	Non-reticulated tanks are required at strategic locations.	Possible subject to zoning provisions	Highly unlikely in proposed zone
	Gnangara East Rural Sub Area B	Urban	Contains areas of remnant vegetation	Low gradient < than 10 degrees	Adjoining hazard vegetation to the east and north.	Within lots subject to lot size.	Adjacent to external district access roads.	Limited existing road network which requires additional connections.	Subject to subdivision design	Partial reticulated supply to be extended for development	Possible subject to zoning provisions	Highly unlikely in proposed zone
	Gnangara East Rural Sub Area C	Urban	Contains areas of remnant vegetation	Low gradient < than 10 degrees	Adjoining hazard vegetation to the east and south.	Within lots subject to lot size.	Nearby external district access roads.	Non compliant cul-de-sac single access.	Difficult to provide but required for access connections.	Existing retic supply.	Possible subject to zoning. Evacuation access issue	Highly unlikely in proposed zone
P15	**East Sub Area A**	Planning Investigation	Plantations and regeneration.	Low gradient < than 10 degrees	Adjoining hazard vegetation to the east and west with narrow separation distances.	Within lots subject to lot size.	Adjacent to external district access roads.	Narrow development corridor with little opportunity for connections.	Difficult to provide but required for access connections.	Reticulation extensions required for development	Possible subject to zoning. Evacuation access issue	Highly unlikely in proposed zone
	East Sub Area B	State Forest	Plantations and regeneration.	Low gradient < than 10 degrees	Adjoining hazard vegetation	N/A	Adjacent to external district access roads.	Existing access network in multiple directions but has some access restrictions.	N/A.	N/A	N/A	N/A
	East Sub Area C	Planning Investigation	Plantations and regeneration to be cleared for development.	Low gradient < than 10 degrees	Adjoining hazard vegetation to the south and east.	Within lots subject to lot size.	Adjacent to external district access roads.	Requires connections into 14B to the west and north.	Subject to subdivision design.	Reticulation extensions required for development	Possible subject to zoning provisions	Highly unlikely in proposed zone
	East Sub Area D	Open Space	Contains high value habitat vegetation	Low gradient < than 10 degrees	Adjoining hazard vegetation to the east.	N/A	Adjacent to external district access roads.	N/A	N/A.	N/A	N/A	N/A
	East Sub Area E	Planning Investigation	Semi cleared with vegetation areas	Low gradient < than 10 degrees	Adjoining hazard vegetation to the north and west.	Within lots subject to lot size.	Adjacent to external district access roads.	Limited ability for internal access in multiple directions	Difficult to provide but may not be required	Proposed reticulation for development along Gnangara Road	Possible subject to zoning provisions	Possible subject to zoning provisions

Legend

Significant	Unlikely to meet the criteria.	High	May meet the criteria subject to further investigation and design.	Moderate	Should meet the criteria depending upon the design.	Low	Expected to meet the criteria.

No	Reference	Proposed Land Use	Location			Siting & Design	Vehicular Access			Water	Land Use	
			Subject Land Cleared/ uncleared	Slopes	Surrounding Land Cleared/uncleared	Asset Protection	District access	Local Access	Emergency Access Way - Fire Access	Reticulated Non Reticulated	Vulnerable	High Risk
P16	Northern Sub Area A	Industry Urban Investigation	Plantations and regeneration to be cleared for development.	Low gradient < than 10 degrees	Adjoining hazard vegetation to the east and north.	Within lots subject to lot size.	Adjacent to external district access roads.	Has multiple frontages.	Subject to subdivision design.	Proposed reticulation for development	Possible subject to zoning provisions	Possible subject to zoning provisions
	Northern Sub Area B	Industry	Plantations and regeneration to be cleared for development.	Low gradient < than 10 degrees	Adjoining hazard vegetation to the east, north and south.	Within lots subject to lot size.	Adjacent to external district access roads.	Single frontage and limited ability for internal access in multiple directions.	Difficult to provide but required for access connections.	Proposed reticulation for development	Unlikely in proposed zone	Possible subject to zoning provisions noting access and surrounding hazard issues.
	Northern Sub Area C	State Forest Open Space	Plantation and remnant vegetation	Low gradient < than 10 degrees	Adjoining hazard vegetation	N/A	Adjacent to external district access roads.	Existing access network in multiple directions but has some access restrictions.	N/A.	N/A	N/A	N/A
P17	Jandabup Lake	Open Space	Contains areas of remnant vegetation around lake.	Low gradient < than 10 degrees	Adjoining hazard vegetation	N/A	Adjacent to external district access roads.	N/A	N/A.	N/A	N/A	N/A
P18	Wanneroo Bush Forever	Open Space Open Space Investigation	Contains high value habitat vegetation	Low gradient < than 10 degrees	Adjoining hazard vegetation	N/A	Adjacent to external district access roads.	Potential east west connections required for adjacent precincts	N/A.	N/A	N/A	N/A

8.0 Conclusion and Recommendations

This bushfire hazard level assessment has been undertaken to support and inform the preparation of the East Wanneroo District Structure Plan and any subsequent local structure plans. The assessment has been undertaken at a strategic level given that it was not possible to physically inspect all of the vegetation units in each investigation area.

The Study Area has a network of significant wetlands and vegetation areas. It is also adjacent to a State Forest which has both plantation and remnant vegetation. The Study Area has a range of environmental and landscape values.

Many precincts have significant areas of bushland with an extreme bushfire hazard level or are adjacent to such areas. For many communities and government agencies the substantial modification of the native vegetation is not acceptable and all of the investigation areas are within catchments with clearing controls.

The objectives of State Planning Policy 3.7 Planning in Bushfire Prone Areas are in summary to:

1. Avoid any increase in the threat of bushfire to people, property and infrastructure.
2. Reduce vulnerability to bushfire through the identification and consideration of bushfire risks in decision-making.
3. Ensure that strategic planning proposals take into account bushfire protection requirements and include specified bushfire protection measures.
4. Achieve an appropriate balance between bushfire risk management measures and environmental protection.

In order to comply with these objectives urban expansion and development within the Study Area will need to balance both bushfire management and environmental issues while recognising community expectation for high levels of amenity.

There is a need to define a hierarchy of public land reserves from conservation bushland through to active public open space and to document the characteristics of each classification including the different bushfire implications and management measures such as edge treatments. The inference being that multiple use public land can have the vegetation actively managed achieving reduced fuel and hence fire hazards.

A basic fire management measure is to physically separate development areas from vegetation areas with a high bushfire risk. SPP3.7 promotes that the maximum Bushfire Attack Level to be used for the design of subdivision or development is BAL-29. However, in many of the investigation areas this setback distance should be increased where land adjoins major hazard areas.

The most important issue arising from this assessment is the need to ensure that at both a district and local level that there is suitable multiple access to localities and development sites. Where this does not occur, any additional development is difficult to justify strategically without a more detailed risk management assessment being undertaken.

It is recommended that the preparation of the District Structure Plan consider the following general recommendations:

1) Define a hierarchy of public land reserves from conservation bushland through to active public open space and to document the characteristics of each classification including the different bushfire implications and management measures such as edge treatments.
2) Confirm areas of conservation bushland which are to be retained in either public or private ownership.

3) Promote the Whiteman to Yanchep Highway as the strategic delineation between urban development and State Forest.
4) That the design of open space areas incorporate accepted techniques for surveillance and crime prevention (arson).
5) Stipulate that planning proposals on land with a moderate or extreme hazard rating should be accompanied by a bushfire management plan with a more detailed bushfire hazard assessment for the proposed site.
6) Give high priority to the provision of multiple access especially for subdivisions by either a public road, emergency access way or fire service access route in all policy areas.
7) Acknowledge that the clearing of remnant vegetation to the "minimum extent necessary" to permit development is based upon the setbacks required for a BAL-29 rating.
8) Require that any local structure plan or Planning Scheme review to consider the location, zoning permissibility and development criteria for vulnerable and high-risk land uses. All vulnerable or high risk land uses should be discretionary uses in the Local Planning Scheme.
9) Promote that non residential buildings in bushfire prone areas require a mechanism to ensure that appropriate construction measures are included in the design as AS3959 provisions do not apply under the Building Code of Australia.

The assessment of the Study Area has identified a number of areas with significant constraints as reflected in Table 9 and these are shown in Figure 24. The recommendations for the precincts are:

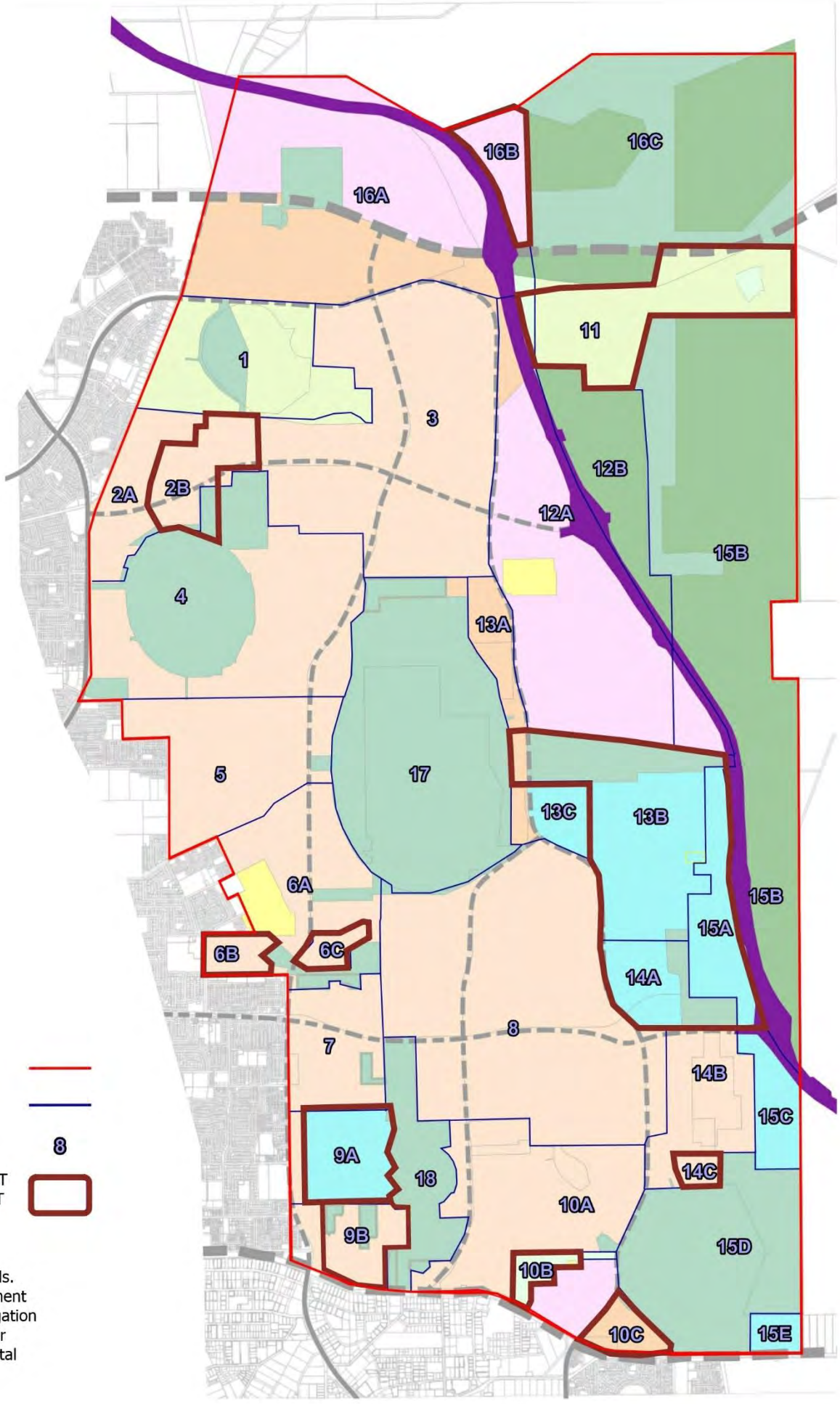
P01	**Mariginiup North Rural**		• Has moderate constraints and can be developed in accordance with SPP3.7 and the Guidelines. • Requires an access connection from Coogee Road to Rouset Road.
P02	**Mariginiup North**		
		Sub Area A	• Has moderate constraints and can be developed in accordance with SPP3.7 and the Guidelines.
		Sub Area B	• Has high development constraints due to retained vegetation and limited local access. Requires further consideration once the extent of the vegetation retention is confirmed.
P03	**Mariginiup Wetlands**		• Has low constraints and can be developed in accordance with SPP3.7 and the Guidelines.
P04	**Mariginiup South**		• Has low constraints and can be developed in accordance with SPP3.7 and the Guidelines.
P05	**Wanneroo North**		• Has low constraints and can be developed in accordance with SPP3.7 and the Guidelines.
P06	**Wanneroo South**		
		Sub Area A	• Has low constraints and can be developed in accordance with SPP3.7 and the Guidelines.
		Sub Area B	• Has very high development constraints due to retained vegetation and limited local access. Requires further consideration once the extent of the vegetation retention is confirmed.
		Sub Area C	• Has very high development constraints due to retained vegetation and limited local access. Requires

			further consideration once the extent of the vegetation retention is confirmed.
P07	**Hocking East**		• Has moderate constraints and can be developed in accordance with SPP3.7 and the Guidelines.
P08	**Jandabup-Gnangara**		• Has moderate constraints and can be developed in accordance with SPP3.7 and the Guidelines.
P09	**Pearsall East**		
		Sub Area A Sub Area B	• Has significant development constraints due to high value habitat vegetation; adjoining vegetation areas and limited local access. Additional access routes required. Further subdivision which seeks to retain existing vegetation and provide appropriate bushfire setbacks will create significant design challenges.
P10	**Gnangara South**		
		Sub Area A	• Has moderate constraints and can be developed in accordance with SPP3.7 and the Guidelines.
		Sub Area B	• Has high development constraints due to retained vegetation and limited local access. • Existing zoning and development in the Local Planning Scheme should be reviewed.
		Sub Area C	• Has very high development constraints due to retained vegetation and limited local access. Requires further consideration once the extent of the vegetation retention is confirmed and potential second access is examined.
P11	**Mariginiup NE Rural**		• Has significant development constraints due to surrounding vegetation; and limited local access. Further subdivision is unlikely to comply with SPP3.7 and the Guidelines.
P12	**Mariginiup East**		
		Sub Area A	• Has moderate constraints and can be developed in accordance with SPP3.7 and the Guidelines.
		Sub Area B	• To be retained as State Forest.
P13	**Jandabup**		
		Sub Area A	• Has low constraints and can be developed in accordance with SPP3.7 and the Guidelines.
		Sub Area B	• Has significant development constraints due to high value habitat vegetation; adjoining vegetation areas and limited local access. Further subdivision is unlikely to comply with SPP3.7 and the Guidelines.
		Sub Area C	• Has moderate constraints and can be developed in accordance with SPP3.7 and the Guidelines.
P14	**Gnangara East Rural**		
		Sub Area A	• Has significant development constraints due to high value habitat vegetation; adjoining vegetation areas and limited local access. Further subdivision is unlikely to comply with SPP3.7 and the Guidelines.

		Sub Area B	• Has moderate constraints and can be developed in accordance with SPP3.7 and the Guidelines.
		Sub Area C	• Has significant development constraints due to surrounding vegetation; and limited local access. Further subdivision is unlikely to comply with SPP3.7 and the Guidelines.
P15	**East**		
		Sub Area A	• Has significant development constraints due adjoining vegetation areas and limited local access. Further subdivision is unlikely to comply with SPP3.7 and the Guidelines.
		Sub Area B	• To be retained as State Forest.
		Sub Area C	• Has moderate constraints and can be developed in accordance with SPP3.7 and the Guidelines.
		Sub Area D	• To be retained as Conservation Reserve.
		Sub Area E	• Has moderate constraints and can be developed in accordance with SPP3.7 and the Guidelines.
P16	**Northern**		
		Sub Area A	• Has moderate constraints and can be developed in accordance with SPP3.7 and the Guidelines.
		Sub Area B	• Has significant development constraints due adjoining vegetation areas and limited local access. Further subdivision is unlikely to comply with SPP3.7 and the Guidelines.
		Sub Area C	• To be retained as State Forest.
P17	**Jandabup Lake**		• To be retained as Conservation Reserve.
P18	**Wanneroo Bush Forever**		• To be retained as Conservation Reserve.

The implementation of the above recommendations is also documented in Table 10. This references how the recommendation applies to the different planning stages or policies as follows:

- District Structure Plan;
- Planning Scheme Amendment;
- Local Structure Plan;
- Development Application; or
- Local Planning Policy.



LEGEND

STUDY AREA

PRECINCT BOUNDARY

PRECINCT NUMBER 8

AREA WITH SIGNIFICANT BUSHFIRE MANAGEMENT CONSTRAINTS TO DEVELOPMENT

Refer to Table 9 for details. Subdivision and development subject to further investigation and consideration of other planning and environmental issues.

FIGURE 24
AREAS WITH MAJOR CONSTRAINTS

N

Job No 17-072

Rev	Description	Date
A	Preliminary	15/05/2018

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Table 10 Implementation

RECOMMENDATIONS		District Structure Plan	Planning Scheme Amendment	Local Structure Plan	Development Application	Local Planning Policy
General Recommendations						
1	Define a hierarchy of public land reserves from conservation bushland through to active public open space and to document the characteristics of each classification including the different bushfire implications and management measures such as edge treatments.	Yes		Yes		Yes
2	Confirm areas of conservation bushland which are to be retained in either public or private ownership.	Yes		Yes		
3	Promote the Whiteman to Yanchep Highway as the strategic delineation between urban development and State Forest.	Yes		Yes		
4	That the design of open space areas incorporate accepted techniques for surveillance and crime prevention (arson).			Yes		Yes
5	Stipulate that planning proposals on land with a moderate or extreme hazard rating should be accompanied by a bushfire management plan with a more detailed bushfire hazard assessment for the proposed site.	Yes	Yes	Yes	Yes	
6	Give high priority to the provision of multiple access especially for subdivisions by either a public road, emergency access way or fire service access route in all policy areas.	Yes	Yes	Yes	Yes	Yes
7	Acknowledge that the clearing of remnant vegetation to the "minimum extent necessary" to permit development is based upon the setbacks required for a BAL-29 rating.	Yes		Yes	Yes	
8	Require that any local structure plan or Planning Scheme review to consider the location, zoning permissibility and development criteria for vulnerable and high-risk land uses. All vulnerable or high risk land uses should be discretionary uses in the Local Planning Scheme.	Yes	Yes	Yes		

RECOMMENDATIONS		District Structure Plan	Planning Scheme Amendment	Local Structure Plan	Development Application	Local Planning Policy
9	Promote that non residential buildings in bushfire prone areas require a mechanism to ensure that appropriate construction measures are included in the design as AS3959 provisions do not apply under the Building Code of Australia.	Yes	Yes	Yes	Yes	Yes
Precinct Recommendations						
P01	**Mariginiup North Rural**					
	Requires an access connection from Coogee Road to Rouset Road.					
P02	**Mariginiup North**					
Sub Area B	Has very high development constraints due to retained vegetation and limited local access. Requires further consideration once the extent of the vegetation retention is confirmed and potential access connections to adjacent areas are investigated.	Yes	Yes	Yes		
P06	**Wanneroo South**					
Sub Area B	Has very high development constraints due to retained vegetation and limited local access. Requires further consideration once the extent of the vegetation retention is confirmed and potential access connections to adjacent areas are investigated.	Yes	Yes	Yes		
Sub Area C	Has very high development constraints due to retained vegetation and limited local access. Requires further consideration once the extent of the vegetation retention is confirmed and potential access connections to adjacent areas are investigated.	Yes	Yes	Yes		
P09	**Pearsall East**					
	Has very high development constraints due to retained vegetation and limited local access. Requires further consideration once the extent of the vegetation retention is confirmed and potential access connections to adjacent areas are investigated.	Yes	Yes	Yes		

RECOMMENDATIONS		District Structure Plan	Planning Scheme Amendment	Local Structure Plan	Development Application	Local Planning Policy
P10	**Gnangara South**					
Sub Area B	Existing zoning and development should be reviewed due to the high development constraints		Yes		Yes	
Sub Area C	No further subdivision due to high development constraints.	Yes				
P11	**Mariginiup NE Rural**					
	No further subdivision due to high development constraints.	Yes				
P13	**Jandabup**					
Sub Area B	No further subdivision due to high development constraints.	Yes				
P14	**Gnangara East Rural**					
Sub Areas A & C	No further subdivision due to high development constraints.	Yes				
P15	**East**					
Sub Area A	Has very high development constraints due to adjacent vegetation and limited local access. Requires further consideration once potential access connections to adjacent areas are investigated.	Yes	Yes	Yes		
P16	**Northern**					
Sub Area B	Has significant development constraints due adjoining vegetation areas and limited local access. Requires further consideration once potential access connections to adjacent areas are investigated.	Yes	Yes	Yes		

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APPENDIX 1 - PRECINCT EXISTING CONDITION PLANS

P01 - MARIGINIUP NORTH RURAL

N

Job No

Rev	Description	Date
A	Preliminary	23/04/2018

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P02 - MARIGINIUP NORTH

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Job No

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A	Preliminary	23/04/2018

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P03 - MARIGINIUP WETLANDS

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Job No

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A	Preliminary	23/04/2018

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P04 - MARIGINIUP SOUTH

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Job No

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A	Preliminary	23/04/2018

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P05 - WANNEROO NORTH

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Job No

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A	Preliminary	23/04/2018

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P06 - WANNEROO SOUTH

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Job No

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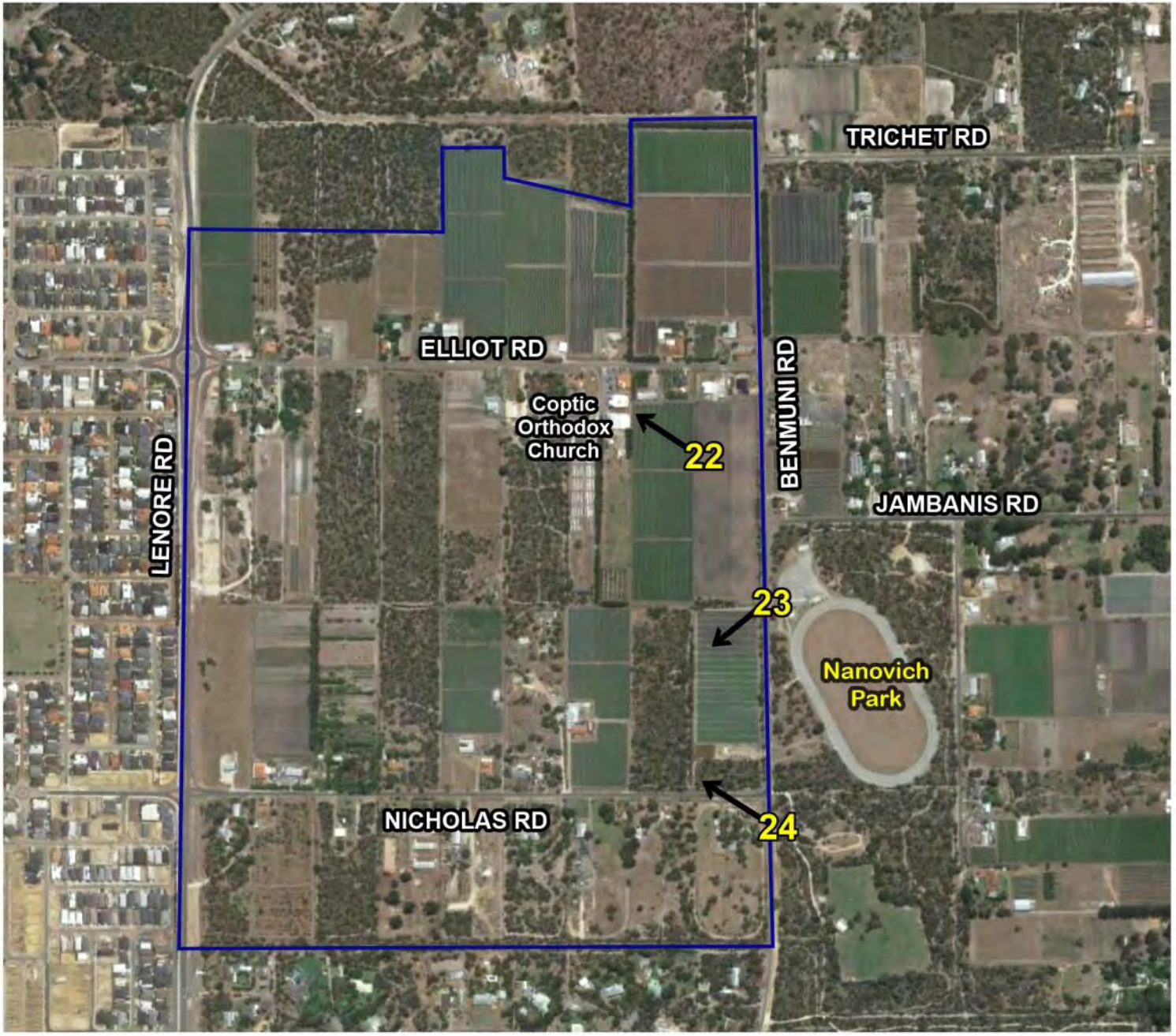

P07 - HOCKING EAST

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Job No

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A	Preliminary	23/04/2018

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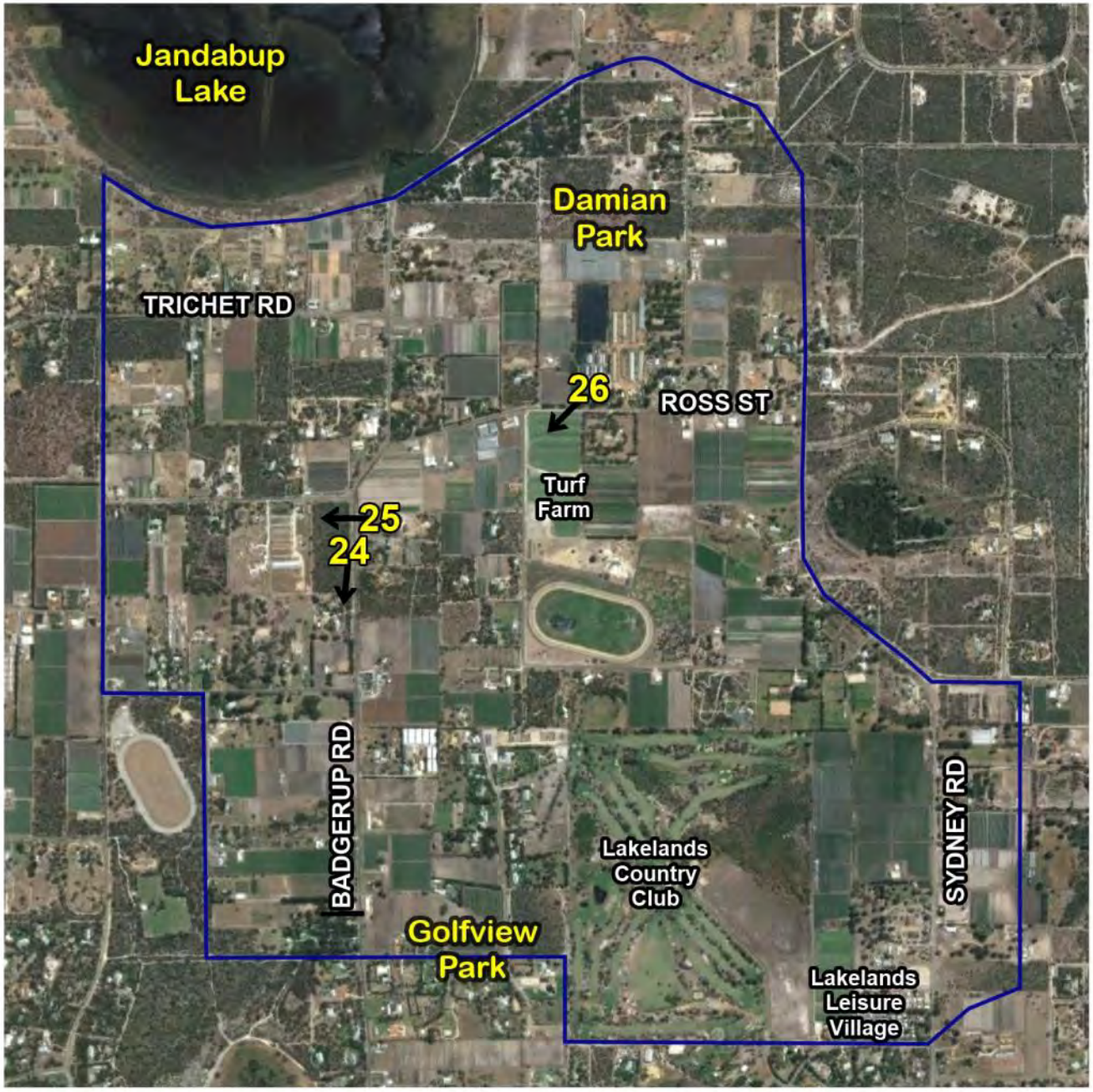

P08 - JANDABUP - GNANGARA

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A	Preliminary	23/04/2018

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P09 - PEARSALL EAST

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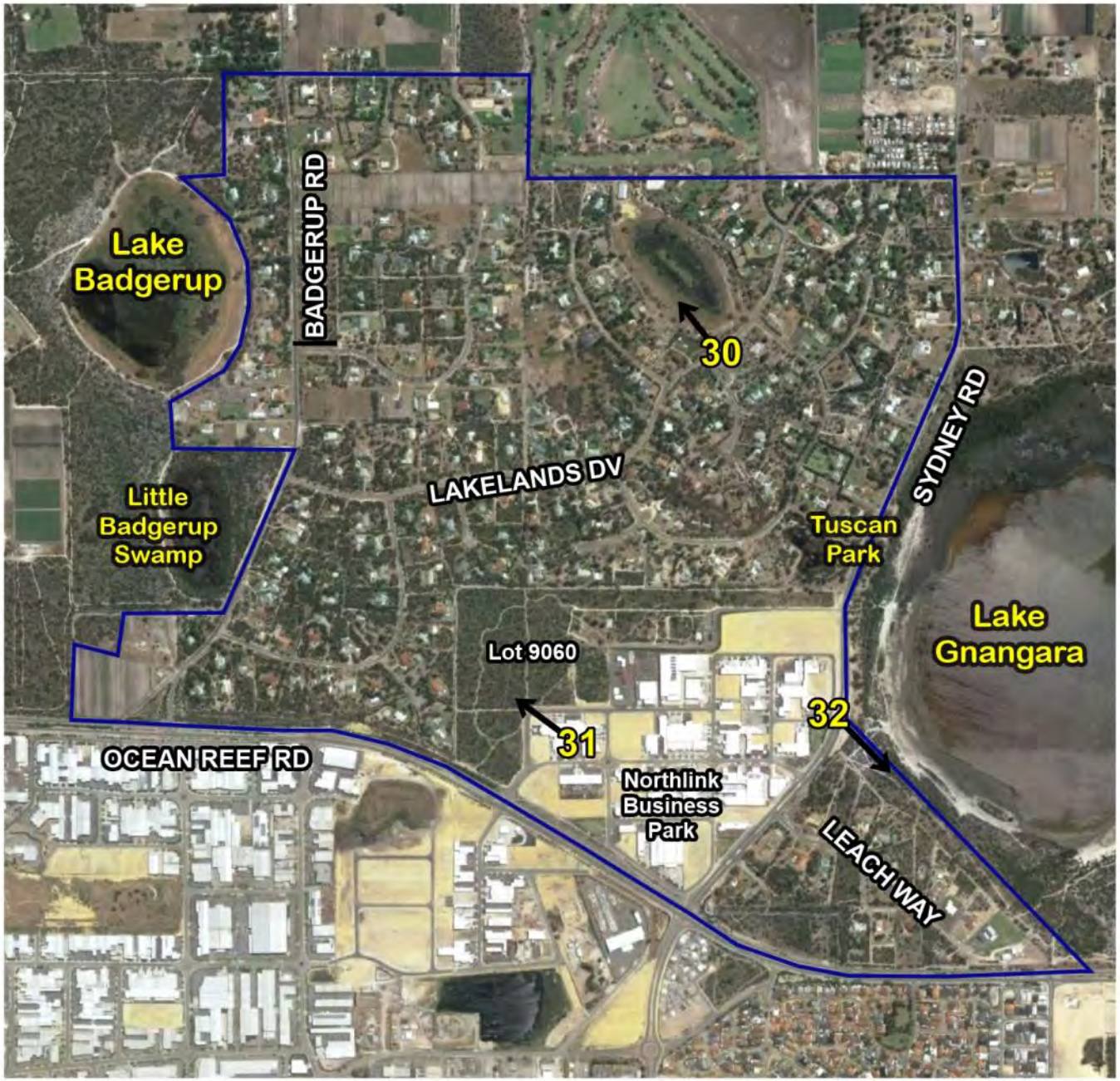

P10 - GNANGARA SOUTH RURAL

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Job No

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A	Preliminary	23/04/2018

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P11 - MARIGINIUP NE RURAL

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A	Preliminary	23/04/2018

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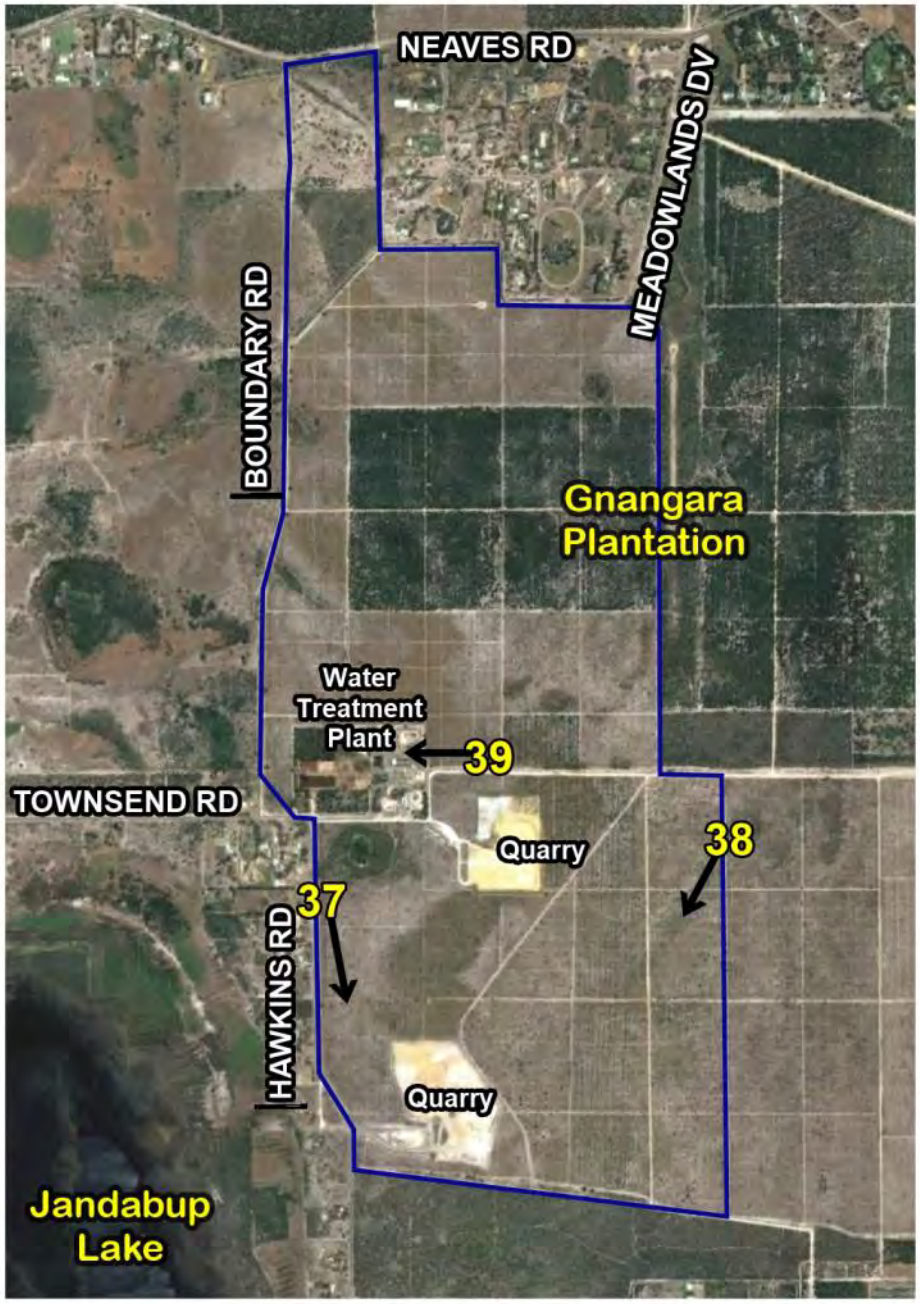

P12 - MARIGINIUP EAST

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Job No

Rev	Description	Date
A	Preliminary	23/04/2018

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P13 - JANDABUP

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Job No

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A	Preliminary	23/04/2018

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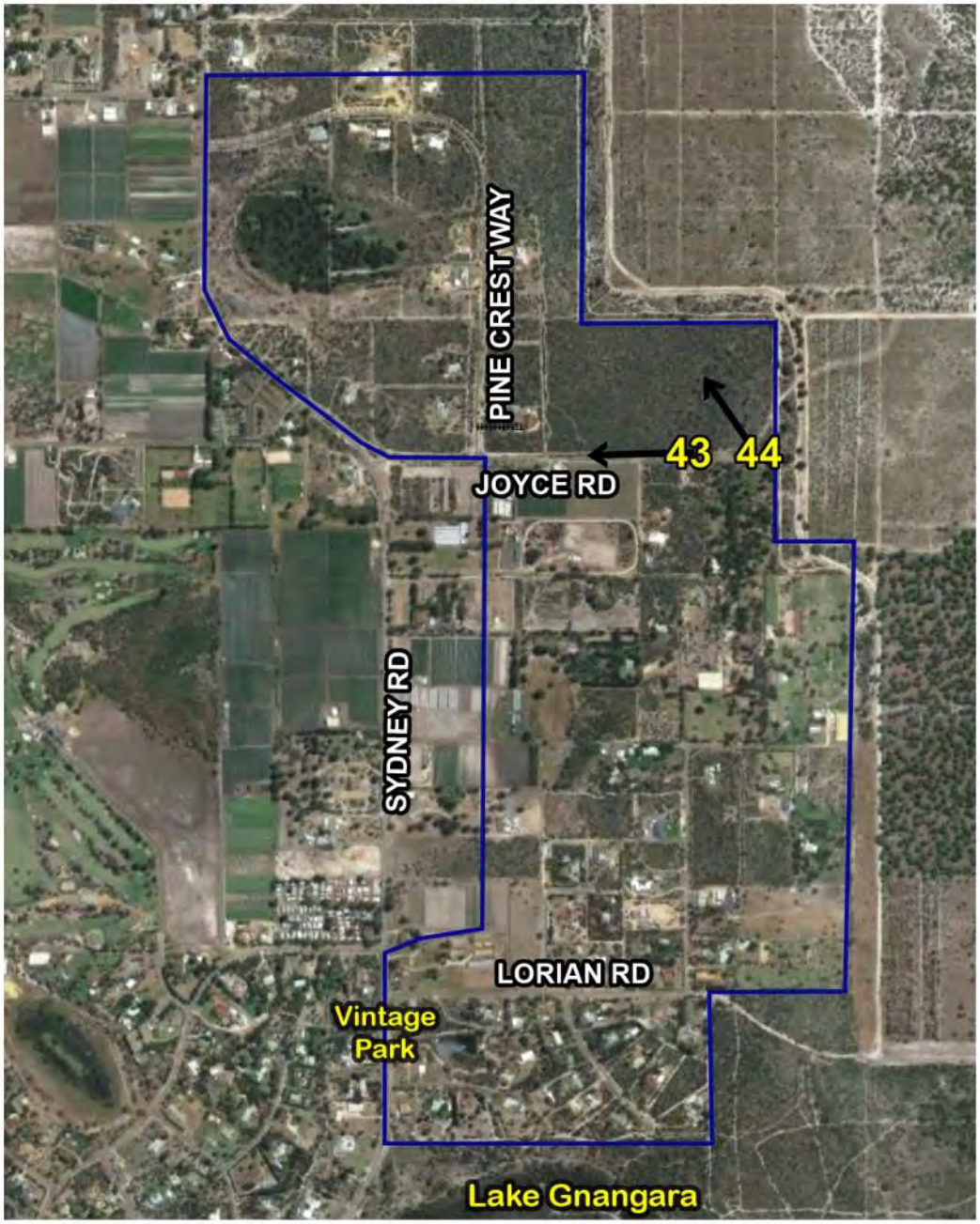

P14 - GNANGARA EAST RURAL

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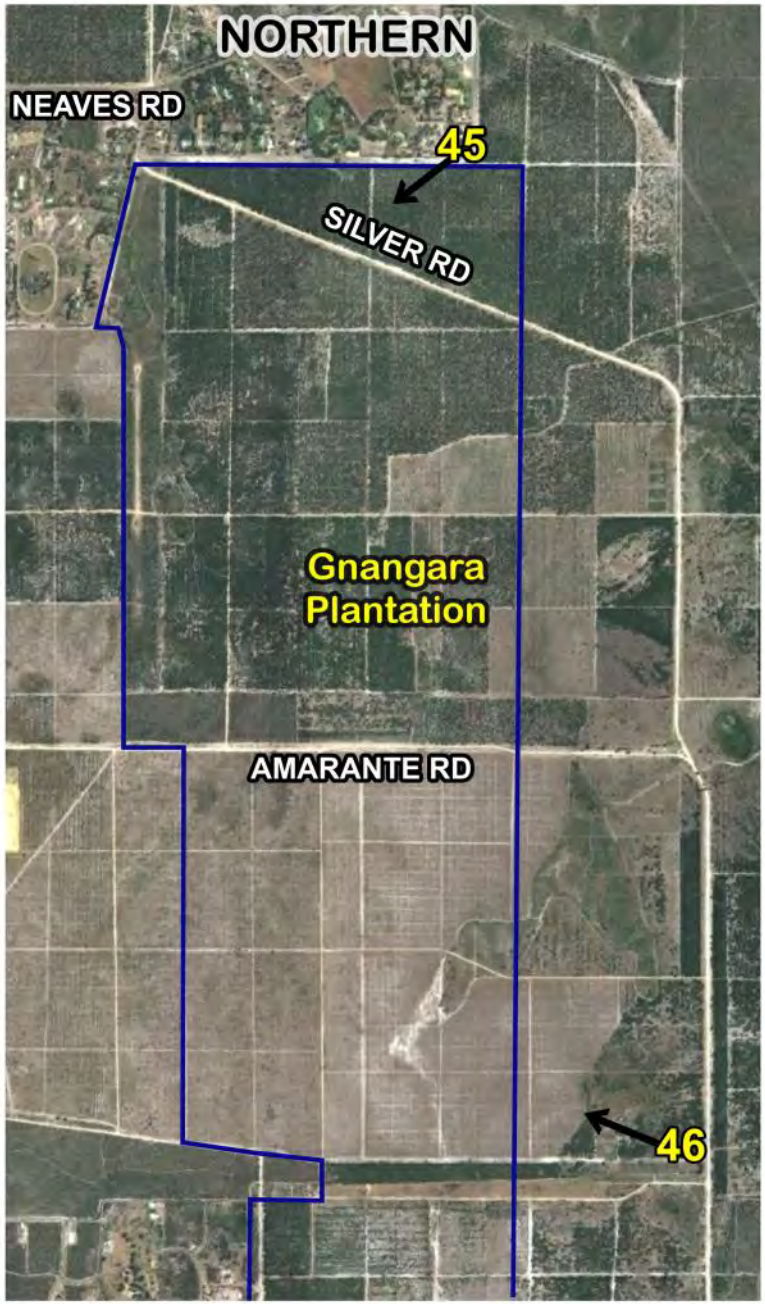

P15 - EAST ZONE

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Job No

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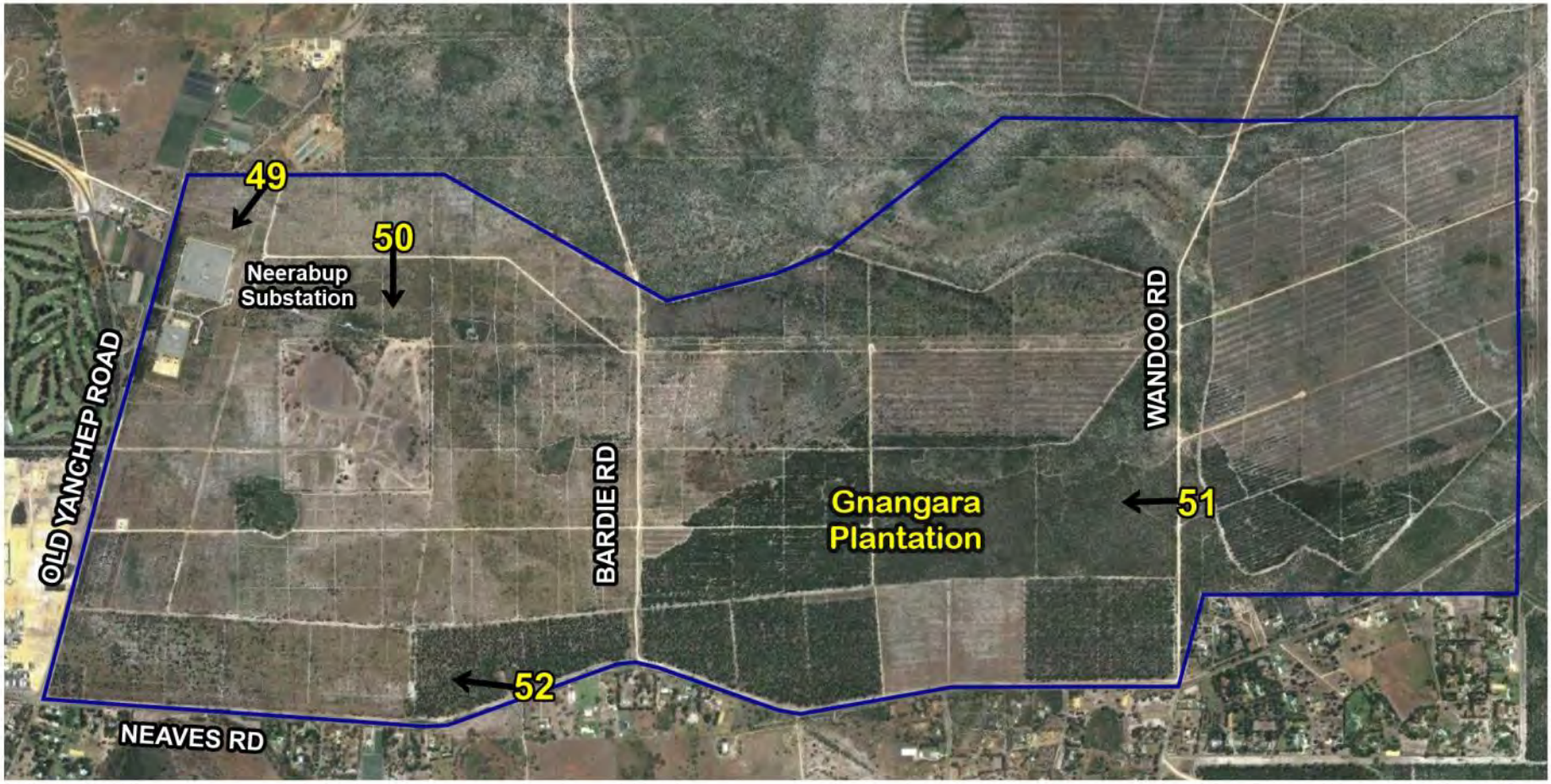

P16 - NORTHERN INDUSTRIAL

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A	Preliminary	23/04/2018

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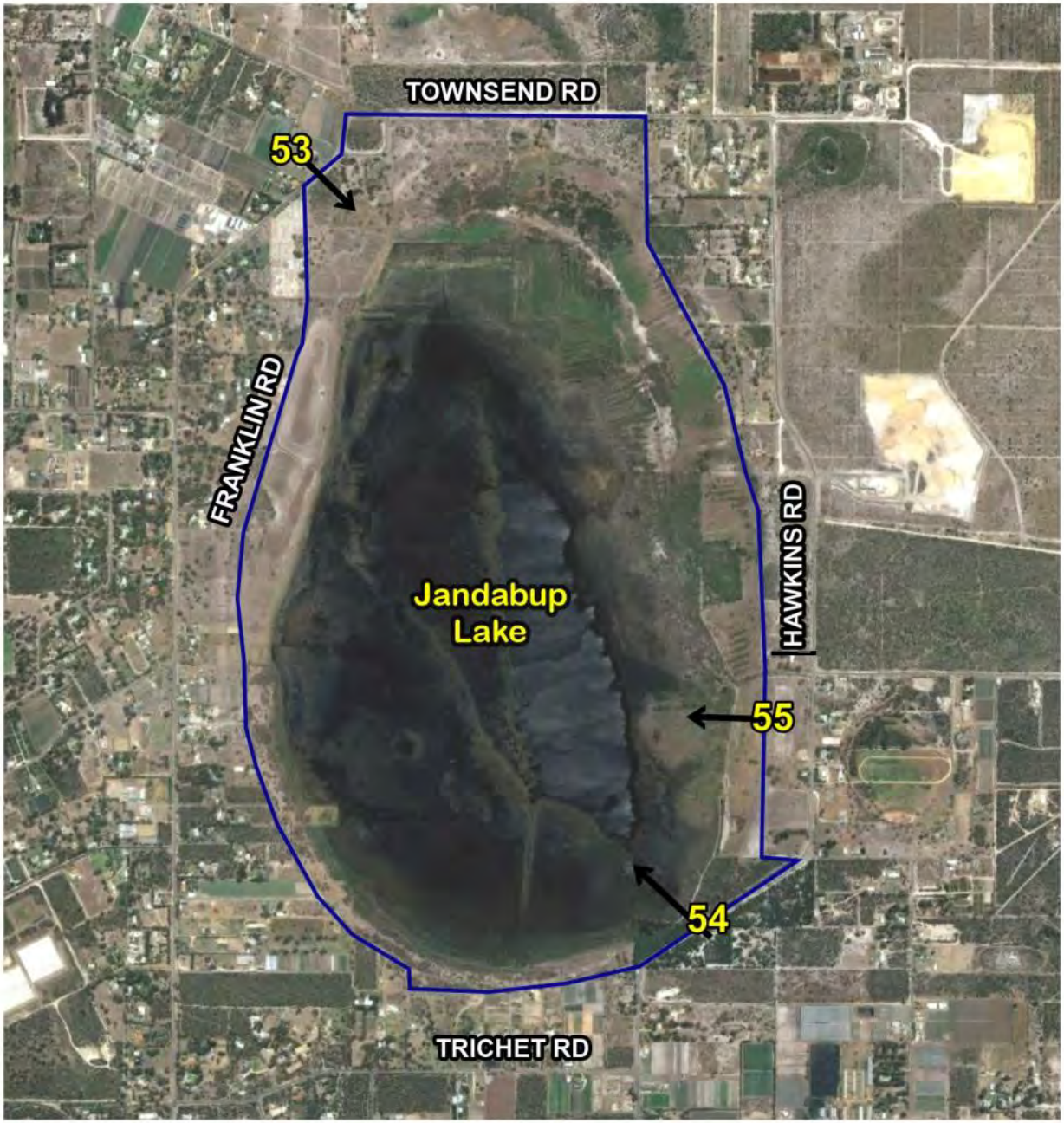

P17 - JANDABUP LAKE

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Job No

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A	Preliminary	23/04/2018

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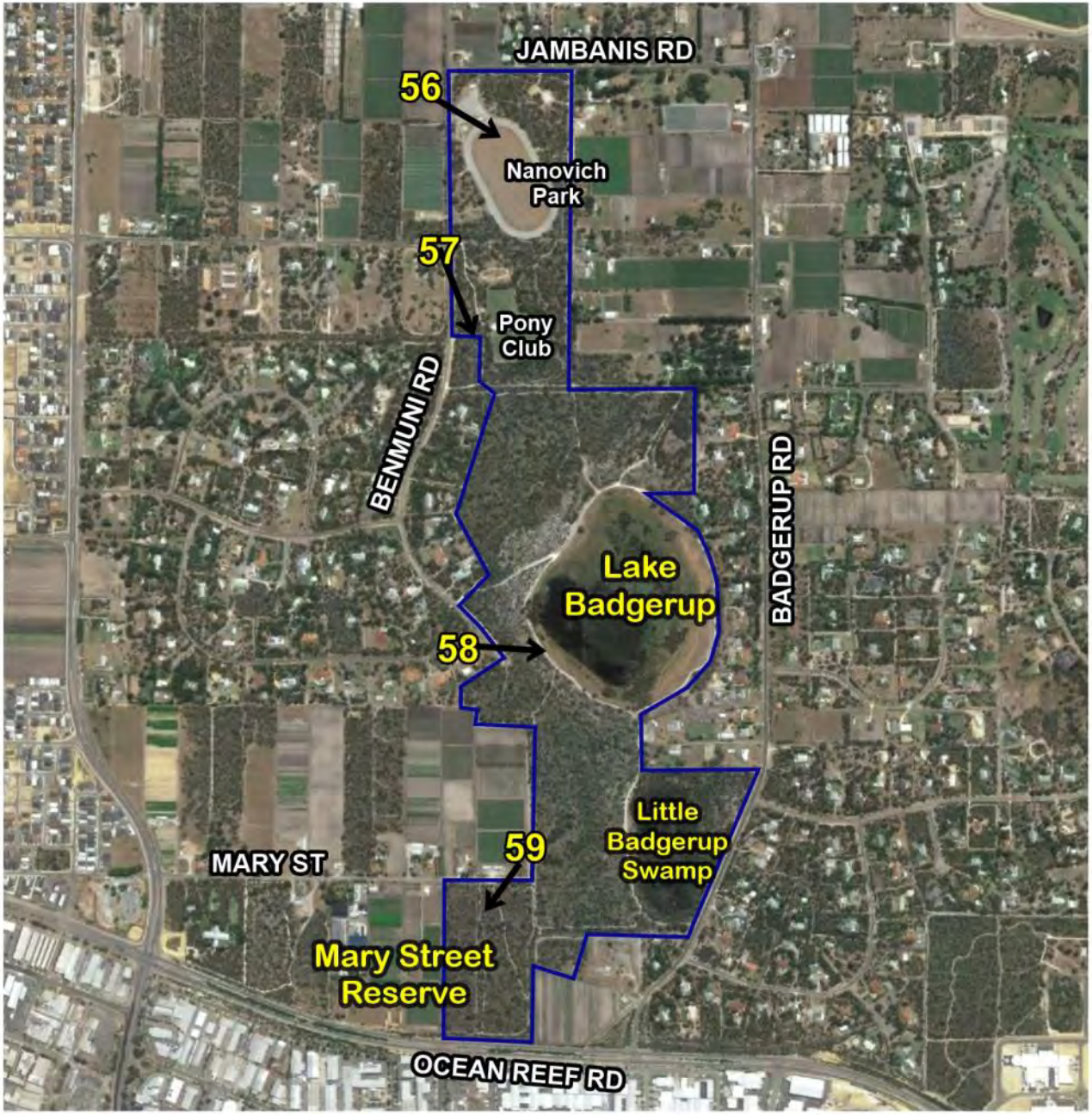

P18 - WANNEROO BUSH FOREVER

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Job No

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A	Preliminary	23/04/2018

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APPENDIX 2 - INVESTIGATION AREA KEY CONSIDERATIONS.

Ref	Site	Key considerations
		Urban
1	South Pinjar	• Impacts, risks and management of groundwater resources (existing Priority 1 Source Protection Area) • Protection of Bush Forever areas and Conservation Category Wetlands • Basic raw materials – sequential land use allowing for extraction of sand resources • Bushfire risk
2	South Gnangara (Leach Way precinct)	• Land use transition/interface with Parks and Recreation reserve (Lake Gnangara) and Bush Forever areas • Impacts, risks and management associated with groundwater resources (existing Priority 1 Source Protection Area) • Bushfire risk
3	West Jandabup	• Impacts, risks and management of groundwater resources (existing Priority 2 Source Protection Area) • Land use transition/interface with Parks and Recreation reserve (Jandabup Lake) and Bush Forever areas • Bushfire risk
		Planning
4	Wanneroo (Bebich Drive precinct)	• Land use transition/interface with Parks and Recreation Reserve (Bagerup Lake) and Bush Forever areas • Protection of significant environmental values including high value Carnaby's Black Cockatoo and Redtail Cockatoo feeding habitats, vegetation with between 10%-30% remaining in Perth and Peel regions and threatened ecological communities • Bushfire risk
5	Jandabup/East Gnangara	• Land use transition/interface with Parks and Recreation reserve, Bush Forever areas and Conservation Category Wetland • Impacts, risks and management associated with groundwater resources (existing Priority 1 and 2 Source Protection Area) • Protection of significant environmental values including high value Carnaby's Black Cockatoo and Redtail Cockatoo feeding habitats, vegetation with 10-30% remaining in Perth and Peel regions, resource enhancement wetlands and threatened ecological communities • Potential East Wanneroo Rail Link (to be investigated as part of METRONET Stage 2) • Proposed Whiteman-Yanchep Highway • Bushfire risk
6	East Gnangara (Gnangara Road)	• Land use transition/interface with Parks and Recreation reserve and Bush Forever areas

Ref	Site	Key considerations
		• Impacts, risks and management associated with groundwater resources (existing Priority 1 Source Protection Area) • Protection of significant environmental values including high value Carnaby's Black Cockatoo and Redtail Cockatoo feeding habitats, vegetation with 10-30% remaining in Perth and Peel regions, resource enhancement wetlands and threatened ecological communities • Potential East Wanneroo Rail Link (to be investigated as part of METRONET Stage 2) • Proposed Whiteman-Yanchep Highway
Industry		
7	Jandabup	• Impacts, risks and management of groundwater resources (existing Priority 1 Source Protection Area) • Basic raw materials – sequential land use allowing for extraction of sand resources • Protection of Conservation Category Wetlands • Bushfire risk
8	Pinjar	• Impacts, risks and management of groundwater resources (existing Priority 1 Source Protection Area) • Protection of Bush Forever areas and Conservation Category Wetlands • Bushfire risk