

Appendix 3
Environmental Assessment Report
(Strategen)





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Alkimos Eglinton District Structure Plan Amendment Central and Eastern Precincts - Lot 6, Eglinton

Environmental Assessment Report

Prepared for
Urban Quarter
by Strategen

September 2018

**Alkimos Eglinton District
Structure Plan Amendment
Central and Eastern Precincts -
Lot 6, Eglinton**

Environmental Assessment Report

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September 2018

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Client: Urban Quarter

Report Version	Revision No.	Purpose	Strategen author/reviewer	Submitted to Client	
				Form	Date
Preliminary Draft Report	A	Client Review	K.Cooper/ D.Newsoms	Electronic	7/8/18
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Final Report	1	Incorporate client comments	K.Cooper	Electronic	06/09/18
Final Report	2	Incorporate amendment to Eastern Precinct Concept Plan	K.Cooper/D.Newsoms	Electronic	13/09/2018

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Executive Summary

Prime Eglinton Pty Ltd, under the management of Urban Quarter is proposing to modify the Alkimos Eglinton District Structure Plan (AEDSP) to allow for residential development of the central portion of Lot 6 (between the rail reserve and the freeway reserve (Central Precinct). The proposal also includes a modification to the eastern boundary of the AEDSP to include the eastern portion of Lot 6 (Eastern Precinct) and land up to Wanneroo Road, with designation of this land as Service Commercial, (Figure 1).

The purpose of this report is to demonstrate that all environmental considerations associated with future land use and development scenarios resulting from the proposed AEDSP amendment can be managed in accordance with policy requirements and have been adequately considered.

Central Precinct

The Central Precinct is current zoned 'Urban' and 'Urban Development' under the Metropolitan Region Scheme (MRS) and the City of Wanneroo's District Planning Scheme No. 2(DPS 2) respectively. The AEDSP currently designates this land for Service Commercial.

A Concept Plan has been prepared for the Central Precinct which includes residential lots, roads and areas of active and managed public open space (POS), Appendix 1. Part of the Central Precinct is within a Karst Risk Zone. The identified Karst poses low risk and can be adequately managed through engineering and design recommendations.

There are several POS areas allocated for passive recreation, drainage provision and vegetation retention. The main POS area (approximately 1.9ha) currently contains remnant vegetation (Banksia Woodland Threatened Ecological Community and Black Cockatoo foraging habitat) and degraded/cleared areas. Where possible remnant vegetation will be retained (as Class B Woodland) with regard to bush fire requirements and passive POS specifications.

Eastern Precinct

The Eastern Precinct is current zoned 'Rural' and 'General Rural' under the MRS and DPS 2 respectively and has been identified as a Planning Investigation Area in the North-West Subregional Planning Framework (WAPC, 2018) (Appendix 2). The environmental considerations identified required to be investigated in accordance with the document include:

- land use transition / interface with Parks and Recreation reserve and Bush Forever areas
- bushfire risk.

Subject to planning investigations, commercial layout and activities within the Eastern Precinct may be supported with the inclusion of areas of open space supporting the retention of key environmental factors and demonstrates linkages to Regional Open Space (ROS).

This Environmental Assessment Report (EAR) provides detail as to how these items can be addressed appropriately.

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1. Introduction

1.1 Background

Prime Eglinton Pty Ltd, under the management of Urban Quarter is proposing to modify the Alkimos Eglinton District Structure Plan (AEDSP) to allow for residential development of the central portion of Lot 6 (between the rail reserve and the freeway reserve (Central Precinct). The proposal also includes a modification to the eastern boundary of the AEDSP to include the eastern portion of Lot 6 (Eastern Precinct) and land up to Wanneroo Road, with designation of this land as Service Commercial, (Figure 1).

The Central Precinct is current zoned 'Urban' and 'Urban Development' under the Metropolitan Regional Scheme (MRS) and the City of Wanneroo's District Planning Scheme No. 2(DPS 2) respectively. The AEDSP currently designates this land for Service Commercial. A Concept Plan has been prepared for the Central Precinct which includes residential lots, roads and areas of active and managed public open space (POS), Appendix 1.

The Eastern Precinct is current zoned 'Rural' and 'General Rural' under the MRS and DPS 2 respectively and has been identified as a Planning Investigation Area in the North-West Subregional Planning Framework (WAPC, 2018) (Appendix 2). The environmental considerations identified required to be investigated in accordance with the document include –

- land use transition / interface with Parks and Recreation reserve and Bush Forever areas
- bushfire risk.

Subject to planning investigations, commercial layout and activities within the Eastern Precinct may be supported with the inclusion of areas of open space supporting the retention of key environmental factors and demonstrates linkages to Regional Open Space (ROS).

The purpose of this Environmental Assessment Report (EAR) is to demonstrate that all environmental considerations associated with future land use and development scenarios resulting from the proposed AEDSP amendment can be managed in accordance with policy requirements and have been adequately considered.

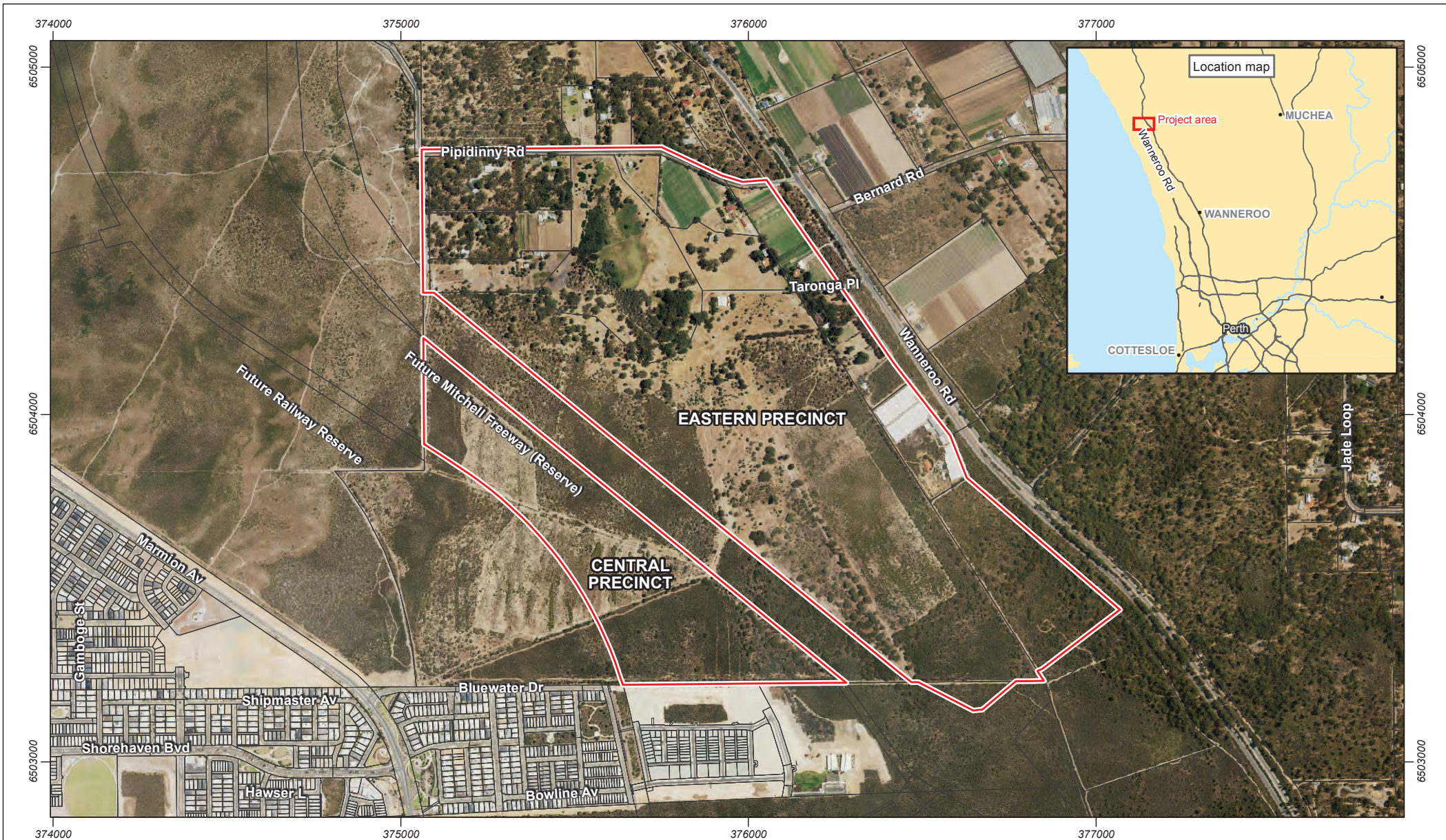
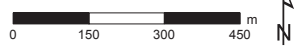


Figure 1: Central and Eastern Precinct locations

Scale 1:15,000 at A4



Coordinate System: GDA 1994 MGA Zone 50
 Note that positional errors may occur in some areas

Date: 23/08/2018

Author: cthatcher

Source: Nearmap: Aerial imagery - 15/04/2018.

Legend

- Study area
- Cadastre

2. Legislation, policy and guidelines

2.1 Commonwealth

Urban Quarter proposes to clear native vegetation to develop Lot 6 Taronga Place, Eglinton, for residential and commercial development (which included the Central and Eastern Precincts). The proposed development was referred to the Department of the Environment and Energy (DEE) in January 2017 for assessment under the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act) (EPBC 2017/7872).

In April 2017, the delegate for the Minister of the Environment determined that the project was a controlled action requiring an assessment through preliminary documentation. Specifically, on the basis of the potential impacts to listed threatened species and ecological community, namely the Carnaby's Black Cockatoo and Banksia Woodlands of the Swan Coastal Plain (SCP) Threatened Ecological Community (TEC).

The assessment documentation has identified the retention values of the Banksia Woodland SCP TEC and proposed the retention of no less than 8ha of the woodland within the Precincts.

The public consultation process has concluded, the proposed offsets have been accepted by DEE and a proposed approval with conditions has been issued (31 August 2018).

2.2 State

The Central Precinct is situated in the central east of the Alkimos-Eglinton District Structure Plan (DSP). The Alkimos-Eglinton DSP was assessed and subsequently approved by the Western Australian Minister for the Environment on 24 April 2006 (Ministerial Statement No. 722). The Alkimos-Eglinton DSP included significant areas of retained vegetation which are located north and south of the proposal area (Appendix 3). These areas of vegetation retention contribute to the local representation and conservation of the proposal area's flora, vegetation and fauna values and were established through the State environmental and land use planning assessment process.

The WAPC (2018) North-west Subregional Planning Framework identifies the Central Precinct as Urban land uses. The Eastern Precinct is identified as Planning Investigation following the outcomes of key considerations, including:

- employment - identification/confirmation of land for employment generating activities
- land use transition/interface with Parks and Recreation reserve and Bush Forever areas
- proposed Whiteman-Yanchep Highway
- access to regional road network
- bushfire risk.

The aspects of Land use transition/interface with Parks and Recreation reserve and Bush Forever areas and Bushfire are further discussed in Sections 4.2.4 and 4.1.7 respectively.

2.3 Local

2.3.1 Local Planning Policy 4.13 Caves and Karstic Features

The City of Wanneroo (2016) has developed Local Planning Policy (LPP) 4.13 to guide the consideration for the investigation and management of caves and karstic features to assist in design, assessment, and determination of planning proposals (i.e. Structure Plans) in areas which are affected by Caves or Karstic features. The objectives of this Policy are to:

1. Conserve caves and significant karstic features for their geological, cultural and environmental values; and
2. Minimise risks to people and property in karst hazard areas (City of Wanneroo, 2016).

With reference to LPP 4.13 (CoW, 2016) regional Karst risk mapping, both the Central and Eastern Precincts are identified within a medium to high risk area. In accordance with the policy a “Desktop Karst Survey” shall be prepared and included Structure Plan. The outcome and recommendations of the Survey will determine whether a “Geotechnical Report” and/ or “Karstic Features Management Plan” is required at Subdivision. Refer to Section 3.1.2 for further information.

2.3.2 Local Planning Policy 4.3 Public Open Space

The LLP 4.3 aims to ensure that new POS areas provide a balance of the following:

- a diversity of recreational uses and options for the community
- nature spaces protecting local natural assets whilst providing the community with managed access
- incorporation of water sensitive urban design principles
- high levels of amenity
- affordability (including consideration of future maintenance costs)
- environmental sustainability
- sports sites for organised sporting activities.

There are Conservation (Nature) POS areas proposed within the Central and Eastern Precincts, that seek to retain areas of the highest priority values, namely Matters of National Environmental Significance (as per The EPBC Act and approval 2017/7872) being Banksia Woodlands SCP TEC and black cockatoo foraging habitat. Where practical POS provided for this purpose will be ecologically viable and meet the minimum viability criteria, as presented in LLP 4.3.

2.3.3 Local Planning Policy 4.8 Tree Preservation Policy

The LLP aims to provide a mechanism to protect significant trees of the City within the following specified areas:

- vacant land and bushland which will be subject to future development
- existing and proposed public open space reserves.

2.3.4 City of Wanneroo Local Biodiversity Strategy

The City of Wanneroo (2011) Local Biodiversity Strategy (LBS) has been produced to plan for expected growth, reduce loss of natural areas and improve biodiversity protection. The main mechanisms to increase and improve biodiversity protection within the City of Wanneroo as specified within the LBS include:

- increasing reservation of natural areas in new urban developments to protect a minimum of three percent of the subdivisible area of Local Natural Areas (LNA) in public open space (POS) vested for a purpose that includes conservation whilst allowing a balanced provision of POS
- formalising the requirements of biodiversity protection by updating the City's' local planning policies
- increasing protection of natural areas within existing public open space
- continuation of conservation maintenance activities
- working cooperatively with other key stakeholders such as the State Government (CoW 2011:6).

There are LNA within both the Central and Eastern Precincts, which are further discussed in Section 3.1.4 and 3.5 respectively.

3. Central Precinct

3.1 Existing environment

3.1.1 Topography, Landform and Soils

Predevelopment topography of the precinct is undulating and ranges from 30 m to 40 m Australian Height Datum (AHD) (Figure 2). The precinct is underlain by sand derived from Tamala Limestone. The soil type is characteristic of the Spearwood dunes and ranges from white to yellow sands to light brown sandy loam and consists of the following units:

- Sand (S₇): pale and olive yellow, medium to coarse-grained, sub-angular quartz with a trace of feldspar, moderately sorted of residual origin
- Limestone (LS₁): light yellowish brown, fine to coarse grained, sub angular to well rounded, quartz, trace of feldspar, shell debris, variably lithified surface kankar of eolian origin (Gozzard, 1982).

The Department of Primary Industries and Regional Development (DPIRD) database maps one soil type on the site consisting of Karrakatta Sand Yellow Phase (211Sp_Ky) which is described as low, hilly to gently undulating terrain with Aeolian yellow sand over limestone at 1-2m (DPIRD, 2018). This soil type has nil to moderate risk of waterlogging, 7% of the map unit has a high risk of water erosion and 13% has a very high risk of wind erosion (DPIRD, 2018).

Tamala limestone indicates that there are high variable permeability rates ranging from less than 0.1m/day to >10m/day depending on in-situ conditions. Infiltration testing (for Lot 6- west of the railway reserve) indicates a good drainage rate for in-situ sand material across the site (CMW 2018: 9).

Acid Sulphate Soils

A search of the Swan Coastal Plain ASS risk mapping (Landgate 2016) identified no known risk of Acid Sulphate Soils (ASS) occurring within 3 m of the natural soil surface of the LSP area (Figure 3). As such and in consideration of the known geology (Spearwood Dunes) and DER (2015) ASS investigation criteria, ASS investigations are not considered necessary for the Central Precinct.

3.1.2 Karst

Further to a karstic features survey undertaken by the Western Australian Speleological Group (WASG) (2007), a preliminary karst assessment was undertaken in 2016 by CMW Geosciences to quantify the presence of karst features and inform a geotechnical assessment (CMW 2016). Everything east of the line shown in Appendix 4 was assessed as being susceptible to instability as a result of karst features (CMW 2016). Areas west of the line were assessed as posing a very low risk to instability due to karst and can be managed by normal geotechnical investigation and design processes. A portion of the Central Precinct is considered to be very low risk.

Subsequent to the 2016 assessment, a Geotechnical Investigation Report was completed by CMW (2018) for the portion of Karst Risk Zone within the Central Precinct (refer to Appendix 4). CMW (2018:8) discusses that within the Karst Risk Zone, sand cover above limestone is to be in excess of 10m. This is deemed to be sufficient to allow bridging of voids within the limestone and distribute any loss of ground over a broader soil zone. Proposed site levels plans for this area are achieved however should site levels decrease within the Karst Risk Zone “a bridging layer of 2m thick layer of crushed limestone covered with a 1m thick surface layer of free draining sand, would be appropriate wherever less than 10m of sand cover is proposed” (pg. 8). Drainage basins are not recommended within Karst Risk Zone areas.

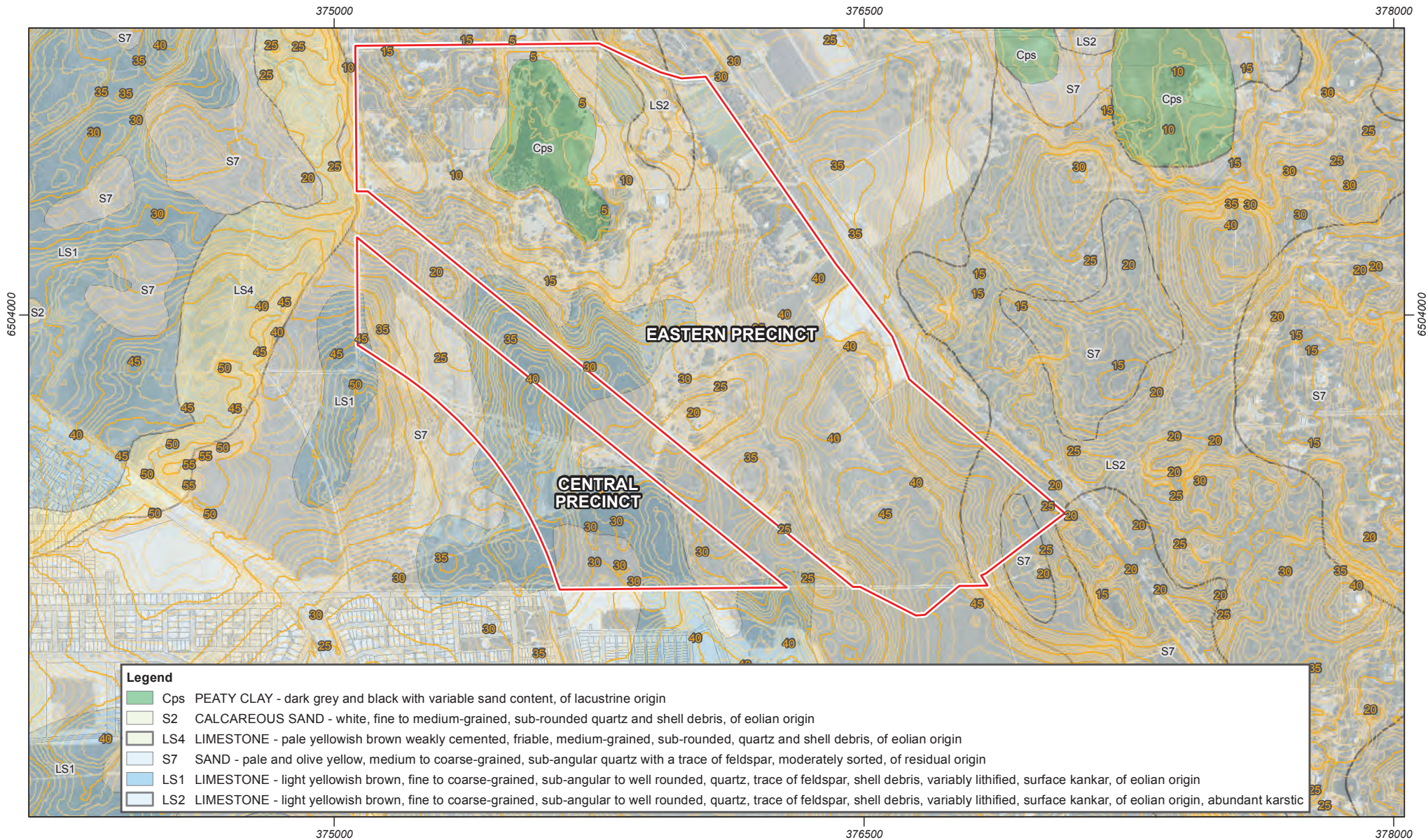
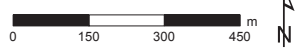


Figure 2: Topography, landforms and soil

Scale 1:15,000 at A4



Coordinate System: GDA 1994 MGA Zone 50
 Note that positional errors may occur in some areas
 Date: 23/08/2018
 Author: cthatcher
 Source: Nearmap: Aerial imagery - 15/04/2018.

Legend

- 1m contour
- Study area
- Cadastre

3.1.3 Hydrology

There are three aquifers underlying the Precinct; each assigned the name of the major geological unit in which the aquifer occurs (DWER 2017). In descending order of depth from natural surface they are:

- Superficial Swan Aquifer (unconfined)
- Leederville Aquifer (confined)
- Yarragadee North (confined).

The Superficial Swan and the Leederville aquifers are both fully allocated while the Yarragadee North aquifer has allocation available. There are two groundwater licences currently allocated within the Precinct, the details are as follows:

Table 1: Groundwater licence allocation for Central Precinct

Licence No.	Applicant	Expiry	Allocation (KL) Perth Superficial Swan
153683	Daws and Son Pty Ltd/ Lot 6 Taronga PI Carabooda	04/04/2027	54,850
200950 (temporary construction licence for dewatering activities and dust suppression)	Daws and Son Pty Ltd/ Lot 6 Taronga PI Carabooda	20/02/2022	88,000

Maximum groundwater level ranges from 3 m to 4 m AHD within the precinct and groundwater flows in an east to west direction. Regional groundwater contours indicate that groundwater within the precinct is approximately 28.3 to 32.5m below natural ground level (DWER, 2018).

In 2012, The DoW (now DWER) released the Perth Coastal and Qwelup Underground Water Pollution Control Area Drinking Water Source Protection Review Integrated Water Supply Scheme. The review at this time proposed to amalgamate these control areas into one Perth Coastal and Gwelup UWPCA and prepare a drinking water source protection plan and did not proposed to change the priority (P3) classification that applied within the UWPCA.

The Central Precinct resides within the Public Drinking Water Source (PDWSA) P3 Perth coastal and Gwelup Underground Water Pollution Control Area. There are wellhead protection zones which are 300m zones around groundwater abstraction wells in Priority 3 PDWSAs within the vicinity of the precinct, approximately 230m south west of the precinct boundary, refer to Figure 3. Priority 3 (P3) areas are defined and managed to maintain the quality of the drinking water source for as long as possible with the objective of risk management. P3 areas occur within PDWSAs where the land is zoned for urban and commercial or light industrial uses. Within P3 areas, drinking water sources need to co-exist with higher intensity land uses compared to P1 and P2 areas (DoW, 2016:4).

There are no geomorphic wetlands within the Central Precinct or water bodies on site. The nearest wetland is a Sumpland Resource Enhancement Wetland (REW) (UFI 8016) adjacent to the Eastern Precinct. (Figure 3).

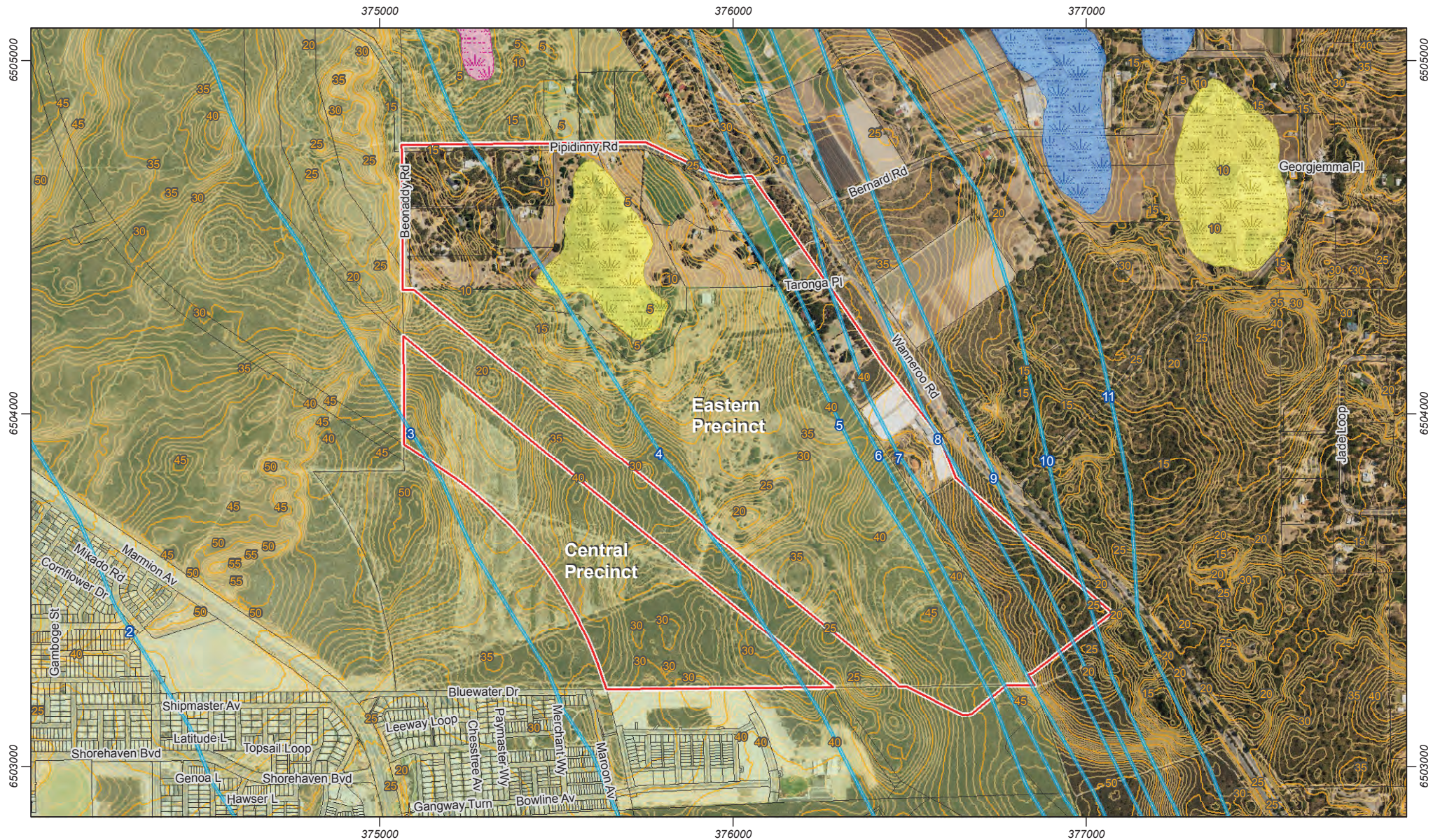
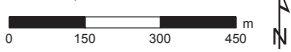


Figure 3: Hydrology

Scale 1:15,000 at A4



Coordinate System: GDA 1994 MGA Zone 50
 Note that positional errors may occur in some areas

Date: 23/08/2018

Author: ctatcher

Source: Nearmap: Aerial imagery - 15/04/2018.

Path: Q:\Consult\2018\URQ\URQ18238\01_GIS_documents\ArcMap_documents\URQ18238_G003_RevE.mxd

Legend

Study area

Cadastre

Public Drinking Water Source Areas

P3

Geomorphic wetland

Conservation

Resource Enhancement

Multiple Use

1m contour

Groundwater maximum

3.1.4 Flora and vegetation

Overview

Beard (1981) vegetation associations mapping indicates that the Central Precinct is mapped within the Guilderton 949- Low woodland; banksia. Heddl et al (1980) broadly mapped vegetation complexes across the Swan Coastal Plain. The precinct comprises the Cottesloe Complex Central and South supports heaths on the limestone outcrops which resemble those in the north. The deeper sands support a mosaic of a woodland of tuart and an open-forest of tuart-jarrah-marri.

It is estimated that approximately 32.17% of the Cottesloe Complex Central and South is remaining in the Swan Coastal Plain compared to the pre-European extent. This vegetation complex has less than 30% of pre-European extent remaining and less than 10% being protected within the Swan Coastal Plain and Jarrah Forest IBRA regions and has only 400 ha or 10% or less protected for conservation on the Swan Coastal Plain portion of Perth and Peel (WALGA, 2018).

The DBCA Naturemap data bases was searched with a 5km buffer and The EPBC Act Protected Matters data base was searched for the Central Precinct and surrounds. Species which were identified are provided within Table 2.

Table 2: Likelihood of Threatened and Priority Flora species occurring within the vicinity of the Central Precinct

Species	Conservation status		Habitat	Likelihood of presence within Central Precinct
	WC Act	EPBC Act		
<i>Acacia benthamii</i>	P2	-	Sand. Typically on limestone breakaways. Distribution within Dandaragan, Gingin, Gosnells, Joondalup, Murray, Perth, Rockingham, Subiaco, Swan, Wanneroo.	Habitat potentially suitable on site. Not recorded within the site survey Strategen, 2016.
<i>Conostylis pauciflora</i> subsp. <i>euryrhipis</i> Hopper	P4	-	White, grey or yellow sand. Consolidated dunes. Distribution within Dandaragan, Gingin, Wanneroo.	Not recorded within the site survey Strategen, 2016.
<i>Conostylis pauciflora</i> subsp. <i>pauciflora</i>	P4	-	Grey sand, limestone. Hillslopes, consolidated dunes. Distribution within Gingin, Harvey, Mandurah, Murray, Rockingham, Wanneroo, Waroona.	Not recorded within the site survey Strategen, 2016.
Dwarf Bee-orchid (<i>Diuris micrantha</i>)	T	V	Dwarf Bee-orchid is known from seven populations, from east of Kwinana and south towards the Frankland area, Western Australia. It is found in small populations, on dark, grey to blackish, sandy clay-loam substrates in winter wet depressions or swamps. The bases of the flowering plants are often covered with shallow water (EPBC Conservation Advice, 2008). Distribution within Harvey, Kwinana, West Arthur, Williams.	Unlikely- outside of known distribution area and habitat not present on site. Not recorded within the site survey Strategen, 2016.
<i>Hibbertia spicata</i> subsp. <i>leptothecha</i>	P3	-	Near-coastal limestone ridges, outcrops & cliffs. Distribution Cambridge, Cottesloe, Dandaragan, Fremantle, Gingin, Harvey, Mandurah, Melville, Perth, Subiaco, Wanneroo, Waroona.	Not recorded within the site survey Strategen, 2016.

Species	Conservation status		Habitat	Likelihood of presence within Central Precinct
	WC Act	EPBC Act		
Glossy-leafed Hammer Orchid (<i>Drakaea elastica</i>)	T	E	White or grey sand. Low-lying situations adjoining winter-wet swamps (florabase, 2018). Distribution within Busselton, Capel, Dandaragan, Harvey, Kwinana, Murray, Rockingham.	Unlikely- outside of known distribution area and habitat not present on site. Not recorded within the site survey Strategen, 2016.
Beaked Lepidosperma (<i>Lepidosperma rostratum</i>)	T	E	Peaty sand, clay. (Flora base, 2018). Distribution within Armadale, Gingin, Gosnells, Serpentine-Jarrahdale, Victoria Plains.	Unlikely- outside of known distribution area and habitat not present on site. Not recorded within the site survey Strategen, 2016.
Lepidium pseudotamanicum	P4	-	Loam, sand. Distribution Albany, Denmark, Gnowangerup, Jerramungup, Plantagenet, Ravensthorpe, Wanneroo, Wongan-Ballidu.	Not recorded within the site survey Strategen, 2016.
Leucopogon maritimus	P1		Distribution Gingin, Joondalup, Wanneroo.	Not recorded within the site survey Strategen, 2016.
Banksia Woodland TEC	-	E		Present on site.

Site Survey

A total of 199 native vascular plant taxa from 56 plant families have the potential to occur within the LSP area (Parks and Wildlife 2007-; DEE 2015). A total of 103 taxa were recorded within Lot 6 Taronga Place (which includes the Central Precinct), 18 of which were introduced species (weeds). No Threatened flora species as listed under section 178 of the EPBC Act or pursuant to Schedule 1 of the WC Act and as listed by Parks and Wildlife (2015) were recorded within the Lot. No Priority flora species as listed by Western Australian Herbarium (1998-) were recorded within the Lot. The Central Precinct is considered to contain a small fraction of the species recorded over the entire Lot (Strategen 2017).

A Vegetation and Flora survey (Strategen 2016) was completed for the Central Precinct in late October and early November 2016 which recorded, five vegetation units consisting of the following represented within Table 3 and Figure 4. The condition of vegetation on site ranged from Completely Degraded and Excellent condition (Figure 5).

Table 3: Vegetation communities and condition (adapted from Strategen 2017)

Vegetation Type (VT)	Description	Vegetation condition. (ha)	Central Precinct. Area approx. (ha)
BaBmEt	<i>Banksia attenuata</i> , <i>Banksia menziesii</i> Low Woodland with <i>Eucalyptus tottiana</i> woodland over Open Heath of <i>Allocasuarina humilis</i> and <i>Xanthorrhoea preissii</i> over Low Open Shrubland of <i>Hibbertia hypericoides</i> over mixed Herbland.	Very Good 1.312 Very Good – Excellent 7.19	8.51
Ed	Woodland of <i>Eucalyptus decipiens</i> with scattered <i>E. tottiana</i> and patches of <i>Allocasuarina fraseriana</i> , over Open Heath to Open Shrubland of <i>Hibbertia hypericoides</i> and <i>Calothamnus quadrifidus</i> .	Very Good – Excellent 2.90	2.90
EdBa	Woodland to Low Open Woodland of <i>Eucalyptus decipiens</i> and <i>Banksia attenuata</i> with Scattered <i>Eucalyptus tottiana</i> and patches of <i>Allocasuarina fraseriana</i> , over Tall Open Scrub to Shrubland of <i>Banksia sessilis</i> and <i>Jacksonia sternbergiana</i> over Open Heath to Open Shrubland of <i>Allocasuarina humilis</i> , <i>Acacia saligna</i> and <i>Xanthorrhoea preissii</i> over Low Shrubland of <i>Hibbertia hypericoides</i> and <i>Calothamnus quadrifidus</i> .	Very Good 0.31	0.31
Bs	Tall Open Scrub of <i>Banksia sessilis</i> over patches of <i>Melaleuca huegelii</i> over Low Shrubland of <i>Melaleuca acerosa</i> , <i>Grevillea preissii</i> and <i>Calothamnus quadrifidus</i> over Open Sedgeland of <i>Lomandra maritime</i> , <i>Desmocladius asper</i> , <i>Mesomelaena pseudostygia</i> and <i>Lepidosperma squamatum</i> .	Excellent- 8.45 Very Good – Excellent- 3.02	11.47
Regrowth	Recently cleared with re-emergent understory species including <i>Hibbertia hypericoides</i> , <i>Acacia pulchella</i> , <i>Allocasuarina humilis</i> , <i>Calothamnus quadrifidus</i> and <i>Conostylis aculeata</i> .	Good to Degraded- 10.00	10.00

An assessment on vegetation types and key diagnostic characteristics was undertaken which identified that this vegetation type was affiliated with the Banksia Woodland TEC. There is approximately 8.8ha of Banksia Woodland TEC within the precinct.

The results of the statistical analysis within the two Banksia woodland communities within the Central Precinct (BaBmEt and BaBmBp), has shown similarities to Floristic Community Type FCT 28.

FCT 28 is not listed as a State Priority Ecological Community (PEC) or TEC.

3.1.5 Fauna and habitat

Overview

A desktop search of the DBCA Naturemap and EPBC Act Protected Matters Databases identified several conservation significant fauna that have a potential to occur within the vicinity of the Central Precinct.

There are no geomorphic wetlands or open water bodies (appropriate habitat) within the Central Precinct, and therefore it is on this basis migratory bird wetland species have not been considered.

Table 4: Likelihood of Threatened and Priority Fauna species occurring within the vicinity of the Central Precinct

Species	Conservation status		Habitat	Likelihood of presence within Central Precinct
	WC Act	EPBC Act		
Australasian Bittern (<i>Botaurus poiciloptilus</i>)		E	Includes wetlands with tall dense vegetation, where it forages in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water.	Unlikely- outside of known distribution area and habitat not present on site.
Red Knot (<i>Calidris canutus</i>)	IA	E	Inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts and sometimes on sandy ocean beaches or shallow pools on exposed rock platforms.	Unlikely- outside of known distribution area and habitat not present on site.
Curlew Sandpiper (<i>Calidris ferruginea</i>)	T	CE	Intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms.	Unlikely- outside of known distribution area and habitat not present on site.
Carnaby's Cockatoo (<i>Calyptorhynchus latirostris</i>)	T	E		Present on site. Evidence of foraging by CC was observed during the Strategen 2016 surveys.
Malleefowl (<i>Leipoa ocellate</i>)		V	Semi-arid to arid shrublands and low woodlands, especially those dominated by mallee and/or acacias.	Unlikely- outside of known distribution area and habitat not present on site.
Australian Painted Snipe (<i>Rostratula australis</i>)		E	Shallow freshwater (occasionally brackish) wetlands, both ephemeral and permanent, such as lakes, swamps, claypans, inundated or waterlogged grassland/saltmarsh, dams, rice crops, sewage farms and bore drains, generally with a good cover of grasses, rushes and reeds, low scrub.	Unlikely- outside of known distribution area and habitat not present on site.
Chuditch, Western Quoll (<i>Dasyurus geoffroii</i>)	T		Forest, mallee shrublands, woodland and desert. The most dense populations have been found in riparian jarrah forest.	Unlikely- outside of known distribution area and habitat not present on site.
Water-rat, Rakali (<i>Hydromys chrysogaster</i>)	P4		Usually found near permanent bodies of fresh or brackish water.	Unlikely- habitat not present on site.
Quenda, southwestern brown bandicoot (<i>Isoodon fusciventer</i>)	P4		Quenda have a patchy distribution through the Jarrah and Karri forest, the Swan Coastal Plain. Scrubby, often swampy, vegetation with dense cover up to 1 m high, often feeds in adjacent forest and woodland that is burnt on a regular basis and in areas of pasture and cropland lying close to dense cover.	Likely. Strategen 2016 survey did not record any evidence of species occurring within the site.
Black-striped Snake, (Neelaps calonotos)	P3		Banksia woodlands and sandy areas of the Perth region.	Potentially occurring.
Oxyura australis (Blue-billed Duck)	P4		Prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. The species is completely aquatic, swimming low in the water along the edge of dense cover.	Unlikely- habitat not present on site.

Black Cockatoo Habitat

The Central Precinct occurs in the known habitat range of Carnaby's Cockatoo (CC), based on the Carnaby's Cockatoo Recovery Plan (Parks and Wildlife 2013). CC is listed as Threatened under the State WC Act and as Endangered under the EPBC Act. According to the EPBC Act Referral guidelines for three threatened black cockatoo species (DSEWPac 2012), the Central Precinct is not situated within the range of Forest Red-Tailed Black Cockatoos or Baudin's Black Cockatoos.

Three VTs within the precinct (BaBmEt, Bs, regrowth) contain flora species which are considered to be utilised by CC for foraging; therefore, approximately 30ha of potential foraging habitat for CC exists within the Central Precinct (Groom 2011, Johnstone 2010) (Figure 4). No potentially significant trees (Diameter at Breast Height [DBH] >50 cm) were recorded during the surveys therefore no potential black cockatoo breeding or roosting habitat occurs within the precinct.

The highest quality foraging habitat for black cockatoos was noted within BaBmEt which contained high densities of black cockatoo food species including *Banksia attenuata*, *Banksia menziesii*, *Eucalyptus todtiana* and *Banksia sessilis* at canopy and midstorey levels as well as *Mesomelaena pseudostygia* and other suitable food species in the understorey. The lowest quality foraging habitat for black cockatoos (not including cleared areas) was noted within Ed, which contained scattered *E. todtiana* and patches of *Allocasuarina fraseriana* and Pasture containing *Lupinus* sp. and scattered *Banksia* spp. and *Eucalyptus* spp., which provide limited food resources for CC only.

Table 5: Vegetation types and black cockatoo foraging species within the Central Precinct

Vegetation type	CC foraging species	Foraging quality	Area (ha)
BaBmEt	<i>Banksia attenuata</i> , <i>B. menziesii</i> , <i>Eucalyptus todtiana</i> , <i>B. sessilis</i> , <i>Xanthorrhoea preissii</i> , <i>Mesomelaena pseudostygia</i> .	Excellent	8.5
Bs	<i>B. sessilis</i> .	Good	11.4
Regrowth	<i>X. Preissii</i> .	Very Poor	10

Table 6: Definition of black cockatoo foraging habitat within the survey area

Foraging quality	Justification
Excellent	High density of species suitable for foraging by black cockatoos (i.e. foliage cover of suitable species >60%) and presence of food sources at several strata (i.e. canopy, midstorey and understorey).
Good	High density of species suitable for foraging by black cockatoos (i.e. foliage cover of suitable species >60%) but food sources only present at one or two strata (i.e. canopy and midstorey).
Moderate	Moderate foraging value density of species suitable for foraging by black cockatoos (i.e. foliage cover of suitable species 20-40%) and food sources only present at one or two strata (i.e. canopy and midstorey).
Poor	Low density of species suitable for foraging by black cockatoos (i.e. foliage cover of suitable species 10-20%) and presence of food sources at only one stratum (i.e. canopy).
Very poor	Very low density of species suitable for foraging by black cockatoos (i.e. foliage cover of suitable species <10%) and presence of food sources at only one stratum (i.e. canopy).
Nil	Cleared areas - no suitable vegetation present.

3.1.6 Bush Forever sites and local natural areas

Bush Forever Sites are considered regionally significant urban bushland areas and appropriate management of them is outlined in the draft Bushland Policy for the Perth Metropolitan Region Statement of Planning Policy No 2.8 (Western Australian Planning Commission, 2010) and more specifically in Planning Bulletin No. 69 (Western Australian Planning Commission, 2004b).

There are no Bush Forever sites within the Central Precinct, however the following Bush Forever sites are located within the vicinity of the precinct:

- Bush Forever site No. 288 Yanchep National Park and adjacent bushland (340m North east). Management structure including part DBCA, Western Australian Planning Commission, part Crown Land Vested in State Government, part private
- Bush Forever site No. 130 Link between Yanchep and Neerabup National Parks (187m South east). Management structure including Crown Land Vested in State Government/Local Government
- Bush Forever site No. 397 Coastal Strip from Wilbinga to Mindarie (1.2km South west). Management structure Crown Reserve vested in Local Government, part Private, part Western Australian Planning Commission, part Local Government, part State Government.

Remnant vegetation within the precinct has been identified as LNAs, refer to Figure 6.

3.2 Site contamination

The DWER (2018) contamination site database indicates that there are no registered sites within and adjacent to the Central Precinct. A review of historical aerial photography from 1965 to present day visually indicates that the precinct was fully cleared by 1977, with a portion of the site used for broad acre agricultural purposes (2000) with the majority of the site supporting native vegetation since 1965 (Landgate 2018).

3.3 Bushfire management

The Central Precinct is located in a designate bushfire prone area as per the Western Australia State Map of Bush Fire Prone Areas (DFES 2016). As a result, Strategen has prepared a Bushfire Management Plan (BMP) to support the Concept Plan in accordance with State Planning Policy 3.7: Planning in Bushfire Prone Areas. The BMP should be read in conjunction with this EAR.

3.4 Cultural heritage

3.4.1 Aboriginal heritage

The Department of Planning Lands and Heritage (2018) Aboriginal Heritage Inquiry System (AHIS) did not identify any Registered Sites or Other Heritage Places within the Central Precinct (DPLH 2018). Similarly, there are no listings of Heritage areas under the Municipal Heritage Inventory or the Heritage List as per the City of Wanneroo District Planning Scheme No. 2.

Two Aboriginal heritage sites occur within 1 km of the Central Precinct; site 17451 occurs 0.5 km to the north of the site and site 1018 occurs 1 km to the east (DPLH 2018). These sites will not be impacted by the development.

3.4.2 European Heritage

There are no places listed in the state and local Heritage Places Register within the precinct (State Heritage Office, 2018).

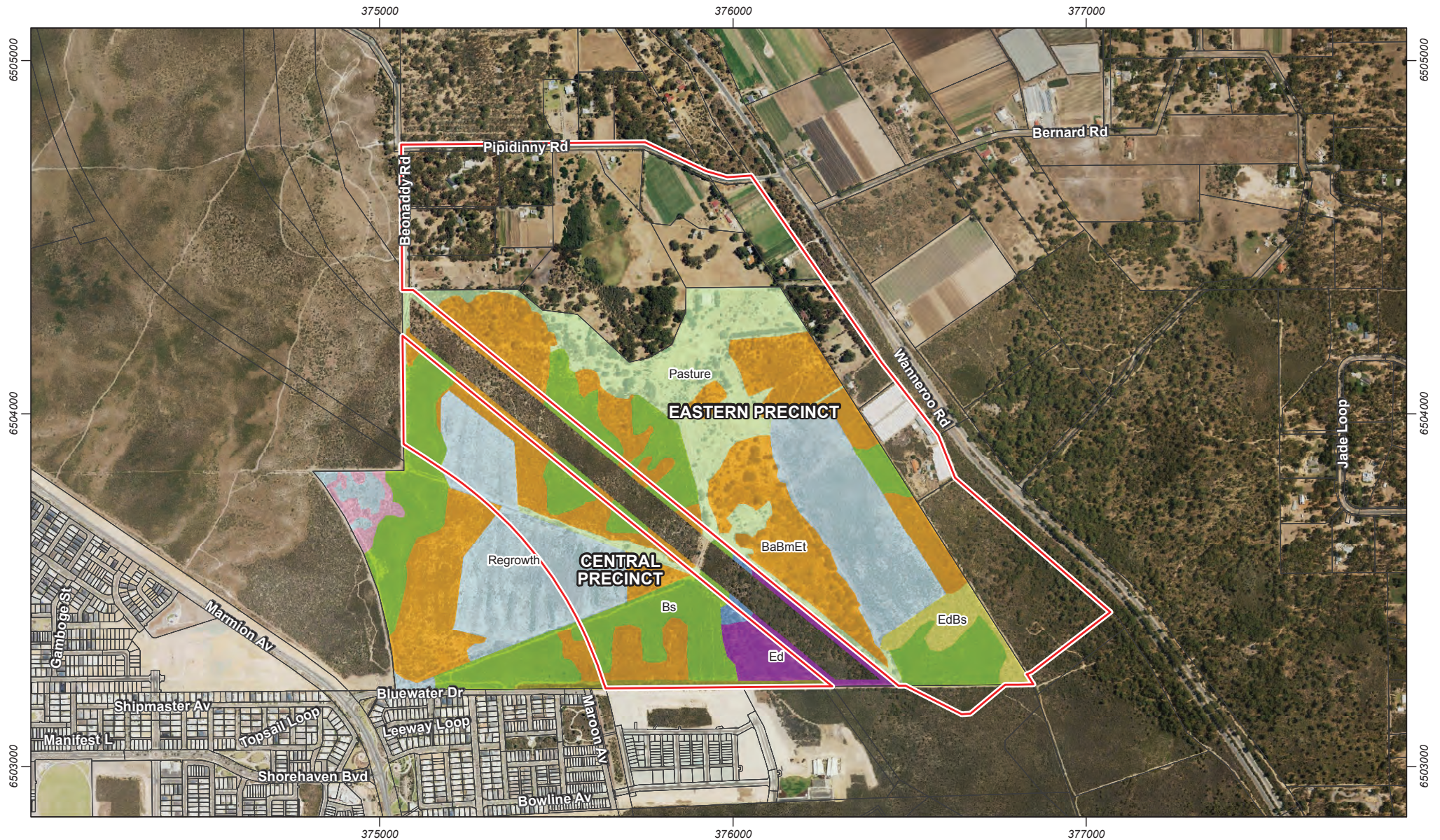
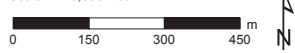


Figure 4: Vegetation type

Scale 1:15,000 at A4



Coordinate System: GDA 1994 MGA Zone 50
 Note that positional errors may occur in some areas

Date: 23/08/2018

Author: cthatcher

Source: Nearmap: Aerial imagery - 15/04/2018.

Path: Q:\Consult\2018\URQ\URQ18238\01_GIS_documents\ArcMap_documents\URQ18238_G004_RevD.mxd

Legend

- Study area
- Cadastre

Vegetation Type

- | | | |
|--|--|---|
| BaBmEt | Ed | Planted trees |
| BaBmBp | EdBa | Regrowth |
| Bs | EdBs | |
| Pasture | | |



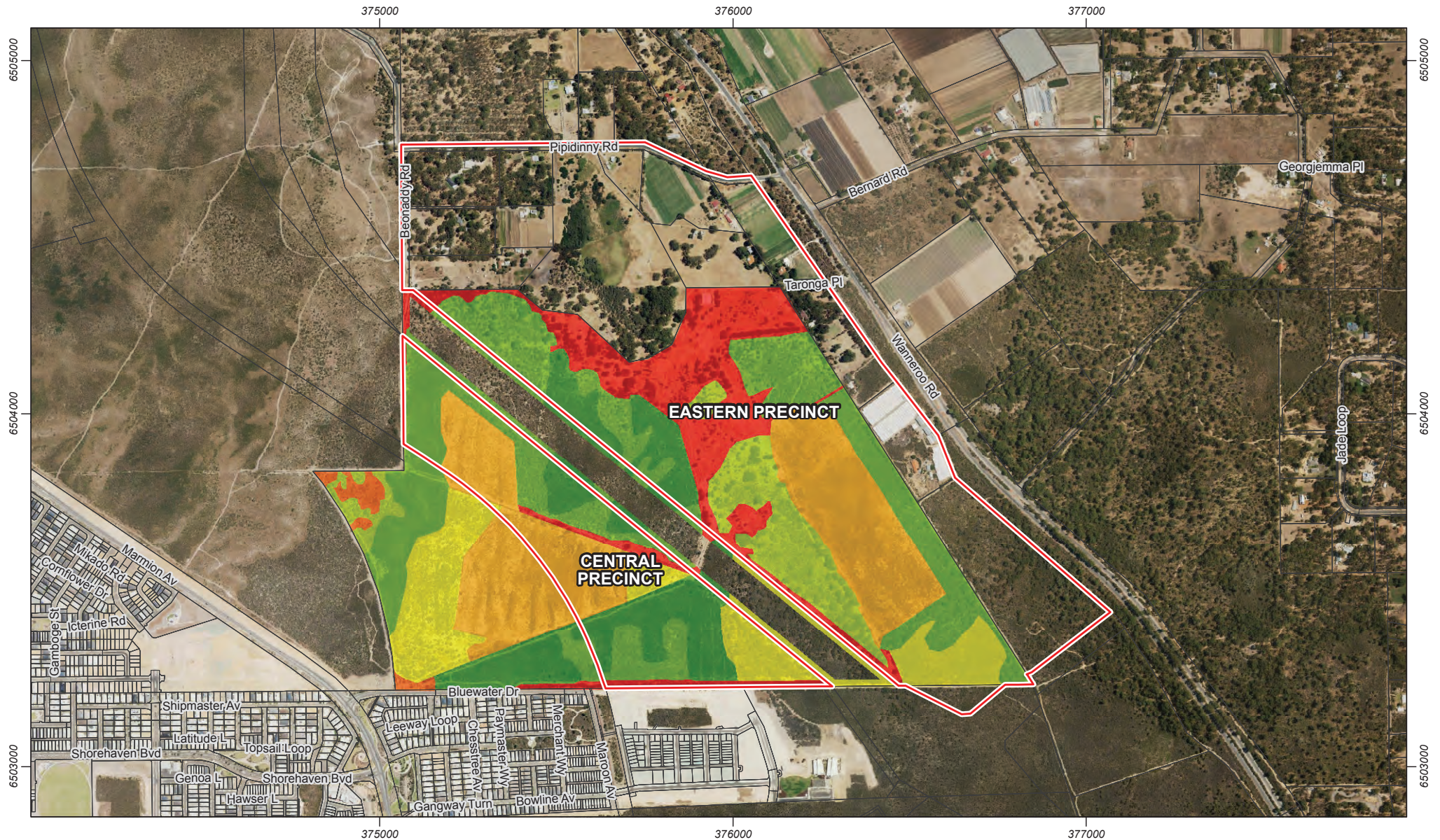
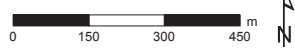


Figure 5: Vegetation condition

Scale 1:15,000 at A4



Coordinate System: GDA 1994 MGA Zone 50
 Note that positional errors may occur in some areas
 Date: 23/08/2018

Author: vdnh
 Source: Nearmap: Aerial imagery - 15/04/2018.

Path: Q:\Consult\2018\URQ\URQ18238\01_GIS_documents\ArcMap_documents\URQ18238_G005_RevC.mxd

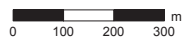
Legend

- | | | |
|------------|-----------------------|---------------------|
| Study area | Excellent | Completely Degraded |
| Cadastre | Very Good - Excellent | Good - Degraded |
| | Very Good | |
| | Good - Very Good | |



Figure 6: Bushforever sites and local natural areas

Scale 1:15,000 at A4



Coordinate System: GDA 1994 MGA Zone 50
 Note that positional errors may occur in some areas
 Date: 23/08/2018
 Author: ctatcher
 Source: Nearmap: Aerial imagery - 15/04/2018.

Legend

- Study area
- Cadastre
- Bush Forever site
- Local natural area



3.5 Management Strategy

In response to the proposed SP design, the following management actions have been proposed.

3.5.1 Karst

In accordance with LPP 4.13 a Preliminary Karst Landform Management Methodology for Lot 19 (CMW 2016) and a Geotechnical Investigation for Lot 6 (CWM 2018) which are both applicable for the Central Precinct have been completed and provide the required information in support of the SP. The identified Karst poses low risk and can be adequately managed through engineering and design recommendations.

CMW (2018:8) discusses that within the Karst Risk Zone, sand cover above limestone is to be in excess of 10m. This is deemed to be sufficient to allow bridging of voids within the limestone and distribute any loss of ground over a broader soil zone. Proposed site levels plans for this area are achieved however should site levels decrease within the Karst Risk Zone “a bridging layer of 2m thick layer of crushed limestone covered with a 1m thick surface layer of free draining sand, would be appropriate wherever less than 10m of sand cover is proposed” (pg. 8). Drainage basins are not recommended within Karst Risk Zone areas. Refer to the Local Water Management Strategy (LWMS) for further information.

3.5.2 Hydrology and water allocation

As discussed in Section 3.1.3 The Central Precinct resides within the PDWSA P3 Perth coastal and Gwelup Underground Water Pollution Control Area. According to DOW (2016) residential development (dwelling) are acceptable within a P3 areas if the development is connected to deep sewerage. The proposed development within the Central Precinct will be connected to reticulated water and sewerage.

The DoW (2018) notes that groundwater reserves are fully allocated and that water is not readily available for abstraction, however there is an existing groundwater license which covers the precinct area. The licence allocation is proposed to be used for construction (i.e. earthworks/dust suppression) and irrigation requirements within POS areas. Refer to the Local Water Management Strategy (LWMS) for further information.

3.5.3 Retention of remnant vegetation and POS design

The SP design is responsive in the retention of Banksia Woodlands SCP TEC and black cockatoo foraging habitat (where feasible) within POS areas. There are several POS areas allocated for passive recreation, drainage provision and vegetation retention. The main POS area (approximately 1.9ha) currently contains of Banksia Woodland TEC and black cockatoo foraging habitat and these values will be retained were possible in accordance with Bushfire Management Plan specifications.

A Vegetation Conservation Area Management Plan (or equivalent) for the POS areas will be developed in accordance with the City of Wanneroo’s Environmental Management Plan Guidelines (2018) through the subsequent planning process. The aim of the plan will be to:

- incorporate a Landscape Plan to specify area where classifiable vegetation is retained or planted (introduced). Refer to Central Precinct Bushfire Management Plan for more information (Strategen, 2018)
- ensure the protection and management of the sites environmental assets (i.e. retained native vegetation)
- ensure that best practice management is employed during the clearing stage of development, to minimise impact to vegetation retention within the Central Precinct prior to the commencement of clearing activities
- identification and implementation of management measures i.e. dieback hygiene, controlled access (pathways and fencing/bollards).

3.5.4 Fauna Management

Prior to the commencement of subdivision works within the Central Precinct, A Fauna Management Plan will be prepared to ensure that impact to fauna, in particular Carnaby's Cockatoo (*Calyptorhynchus latirostris*) and Southern Brown Bandicoot (*Isodon obesulus*) is minimal.

4. Eastern Precinct

4.1 Existing environment

4.1.1 Topography, geology, acid sulphate soils

Predevelopment topography of the precinct is undulating and ranges from 4 m to 44 m Australian Height Datum (AHD) (Figure 2). The precinct is underlain by sand derived from Tamala Limestone. The soil type is characteristic of the Spearwood dunes and ranges from white to yellow sands to light brown sandy loam and consists of the following units:

- Peaty Clay (Cps): dark grey and black with variable sand content of lacustrine origin
- Sand (S₇): pale and olive yellow, medium to coarse-grained, sub-angular quartz with a trace of feldspar, moderately sorted of residual origin
- Limestone (LS₁): light yellowish brown, fine to coarse grained, sub angular to well rounded, quartz, trace of feldspar, shell debris, variably lithified surface kankar of eolian origin (Gozzard, 1982).

The Department of Primary Industries and Regional Development (DPIRD) database maps one soil type on the site consisting of Karrakatta Sand Yellow Phase (211Sp_Ky) which is described as low, hilly to gently undulating terrain with Aeolian yellow sand over limestone at 1-2m (DPIRD, 2018). This soil type has nil to moderate risk of waterlogging, 7% of the map unit has a high risk of water erosion and 13% has a very high risk of wind erosion (DPIRD, 2018).

Tamala limestone indicates that there are high variable permeability rates ranging from less than 0.1m/day to >10m/day depending on in-situ conditions. Infiltration testing (for Lot 6- west of the railway reserve) indicates a good drainage rate for in-situ sand material across the site (CMW 2018: 9).

A search of the Swan Coastal Plain ASS risk mapping (Landgate 2018) indicates that a significant portion of the Eastern Precinct has no known risk of Acid Sulphate Soils (ASS) occurring within 3 m of the natural soil surface of the LSP area. There is a High to Moderate ASS risk (<3m from surface) (Class I) associated with the REW.

4.1.2 Karst

The Eastern Precinct is mapped within an inferred potential Karst Risk Zone and there are two known existing cave features (WASG 2007), one within the REW (Beonaddy Swamp) and the other within the development area. As per LPP 4.13 this will assist in the planning design and determining engineering specification for the site, in subsequent planning phases. CMW Geosciences Pty Ltd has provided measures to management Karst on site which is presented in Appendix 4. As per Mather (2013) design recommendations for developments for surface water discharge and engineering design strategies can be incorporated to reduce any risk factor. "The use of CPT has proved a reliable investigation technique on which to base engineering design within areas with a reasonable thickness of sand cover and can provide some indication of the strength of the underlying limestone sometimes penetrating the rock layer and intersecting voids to provide direct evidence of their existence (p. 56)".

4.1.3 Hydrology

There are three aquifers underlying the Precinct; each assigned the name of the major geological unit in which the aquifer occurs (DWER 2017). In descending order of depth from natural surface they are:

- Superficial Swan Aquifer (unconfined)
- Leederville Aquifer (confined)
- Yarragadee North (confined).

The Superficial Swan and the Leederville aquifers are both fully allocated while the Yarragadee North aquifer has allocation available. There are several groundwater licences currently allocated within the Precinct, the details are as follows (Table 7).

Table 7: Groundwater licence allocation within the Eastern Precinct

Licence No.	Applicant	Expiry	Allocation (KL) Perth Superficial Swan
153683	Daws and Son Pty Ltd/ Lot 6 Taronga PI Carabooda	04/04/2027	54,850
200950 (temporary construction licence for dewatering activities and dust suppression)	Daws and Son Pty Ltd/ Lot 6 Taronga PI Carabooda	20/02/2022	88,000
152033	Doughty, Barbara, Doughty, Joseph/ Lot 3 Beonaddy Road Eglinton	30/11/2019	19,000
96939	Brown, Steven Douglas/Lot 8 Pipidinny Rd Eglinton	18/11/2019	33,150
47322	Germann, Anton Paul/Lot 4 Taronga Place Carabooda	16/11/2019	7,900
62676	S Cheng & K Keath/ 2, Wanneroo Rd, Carabooda	06/01/2025	14,400
56317	Maloney, Jane, Maloney, Peter/ Lot 1 Taronga PI Carabooda	05/02/2020	8,200
101314	Herongate Pty Ltd/ 6280, Wanneroo Rd, Carabooda	05/02/2020	49,150

Regional maximum groundwater contours indicate that groundwater within the precinct is approximately 7mADH to 4mADH which is estimated to be 2.8m below natural ground level near the Resource Enhancement Wetland (REW) to 35.5m below natural ground level (DWER, 2018) in the south-east corner of the precinct. DEC (2012) reports that Gngangara Mound monitoring program has indicated signs of long-term decline in the vigour and distribution of some wetland and terrestrial species in response to declining groundwater levels in the Yanchep area.

4.1.4 Land uses and potential contamination

The DWER (2018) contamination site database was searched and there are currently no registered sites within and adjacent to the Eastern Precinct. A review of historical aerial photography from 1965 to present day visually indicates that the precinct was fully cleared by 1977, with a building present from 1995. A portion of the site has been used for broad acre agricultural and market garden purposes (from 2000) with the majority of the site supporting native vegetation (Landgate 2018).

In accordance with the DER (2014a) Assessment and management of contaminated sites, the presence of turf farm (and associated infrastructure- shade houses) is likely to result in the requirement of a Preliminary Site Investigation and accompanying Auditors Report to be undertaken in support of subsequent planning phases (i.e. subdivision) of the project for land areas affected by current or historic market garden operations.

Given the proposed commercial land use it is assumed that a buffer is not required in the event that the market garden operations continue as the Precinct is developed for commercial purposes.

4.1.5 Flora and Vegetation

Beard (1981) vegetation associations mapping indicates that the Eastern Precinct is mapped within two associations:

- 949- Low woodland; banksia
- 998 - Medium woodland; tuart (north of Taronga Place).

Heddle et al (1980) broadly mapped vegetation complexes across the Swan Coastal Plain. The precinct comprises of the following:

- Cottesloe Complex Central and South supports heaths on the limestone outcrops which resemble those in the north. The deeper sands support a mosaic of a woodland of tuart and an open-forest of tuart-jarrah-marri
- Herdsman Complex Sedgeland and fringing woodland of *Eucalyptus rudis* (Flooded Gum) – *Melaleuca* species.

A Vegetation and Flora survey (Strategen 2016) was completed for Lot 6 Taronga Place within covers most of the Eastern Precinct which recorded, several vegetation units consisting of the following represented within Table 3.

Table 8: Vegetation communities (adapted from Strategen 2017)

Vegetation Type (VT)	Description
BaBmEt	<i>Banksia attenuata</i> , <i>Banksia menziesii</i> Low Woodland with <i>Eucalyptus tottiana</i> woodland over Open Heath of <i>Allocasuarina humilis</i> and <i>Xanthorrhoea preissii</i> over Low Open Shrubland of <i>Hibbertia hypericoides</i> over mixed Herbland.
Ed	Woodland of <i>Eucalyptus decipiens</i> with scattered <i>E. tottiana</i> and patches of <i>Allocasuarina fraseriana</i> , over Open Heath to Open Shrubland of <i>Hibbertia hypericoides</i> and <i>Calothamnus quadrifidus</i> .
EdBs	Woodland of <i>Eucalyptus decipiens</i> over Tall Open Scrub to Shrubland of <i>Banksia sessilis</i> and <i>Jacksonia sternbergiana</i> over Open Heath to Open Shrubland of <i>Hibbertia hypericoides</i> and <i>Calothamnus quadrifidus</i> .
Bs	Tall Open Scrub of <i>Banksia sessilis</i> over patches of <i>Melaleuca huegelii</i> over Low Shrubland of <i>Melaleuca acerosa</i> , <i>Grevillea preissii</i> and <i>Calothamnus quadrifidus</i> over Open Sedgeland of <i>Lomandra maritime</i> , <i>Desmocladius asper</i> , <i>Mesomelaena pseudostygia</i> and <i>Lepidosperma squamatum</i> .
Regrowth	Recently cleared with re-emergent understory species including <i>Hibbertia hypericoides</i> , <i>Acacia pulchella</i> , <i>Allocasuarina humilis</i> , <i>Calothamnus quadrifidus</i> and <i>Conostylis aculeata</i> .

Banksia Woodlands SCP TEC is mapped as occurring within the Eastern Precinct, which coincide with vegetation types BaBmEt and BaBmBp, which has shown similarities to FCT28.

WALGA (2018) environmental consideration mapping indicates that remnant vegetation within the north western corner of the precinct (91 and 73 Pipidiny Road and 23 Beonaddy Road) potentially support Tuart (*Eucalyptus gomphocephala*) Woodlands.

The following Bush Forever sites are located within Eastern Precinct.

- Bush Forever site No. 288 Yanchep National Park and adjacent bushland (340m North east). Management structure including part DBCA, Western Australian Planning Commission, part Crown Land Vested in State Government, part private
- Bush Forever site No. 130 Link between Yanchep and Neerabup National Parks (187m South east). Management structure including Crown Land Vested in State Government/Local Government.

Remnant vegetation within the precinct has been identified as LNAs, refer to Figure 6.

According to Del Marco et al. (2004) the importance of ecological linkage is to connect natural areas, preferably with continuous corridors of native vegetation, which assists in fauna movement between the areas and to access resources and habitats. The protection, management and buffering of existing natural areas within an ecological linkage is a higher priority than revegetation of cleared portions of the link. A regional ecological linkage is present along the eastern boundary of the precinct along Wanneroo Road.

4.1.6 Fauna and habitats

A desktop search of the DBCA Naturemap and EPBC Act Protected Matters Databases identified several conservation significant fauna that have a potential to occur within the vicinity of the Eastern Precinct.

Table 9: Likelihood of Threatened and Priority Fauna species occurring within the vicinity of the Central Precinct

Species	Conservation status		Habitat	Likelihood of presence within Central Precinct
	WC Act	EPBC Act		
Australasian Bittern (<i>Botaurus poiciloptilus</i>)		E	Includes wetlands with tall dense vegetation, where it forages in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water.	Unlikely- outside of known distribution area and habitat not present on site.
Red Knot (<i>Calidris canutus</i>)	IA	E	Inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts and sometimes on sandy ocean beaches or shallow pools on exposed rock platforms.	Unlikely- outside of known distribution area and habitat not present on site.
Curlew Sandpiper (<i>Calidris ferruginea</i>)	T	CE	Intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms.	Unlikely- outside of known distribution area and habitat not present on site.
Carnaby's Cockatoo (<i>Calyptorhynchus latirostris</i>)	T	E		Present on site. Evidence of foraging by CC was observed during the Strategen 2016 surveys.
Malleefowl (<i>Leipoa ocellate</i>)		V	Semi-arid to arid shrublands and low woodlands, especially those dominated by mallee and/or acacias.	Unlikely- outside of known distribution area and habitat not present on site.
Australian Painted Snipe (<i>Rostratula australis</i>)		E	Shallow freshwater (occasionally brackish) wetlands, both ephemeral and permanent, such as lakes, swamps, claypans, inundated or waterlogged grassland/saltmarsh, dams, rice crops, sewage farms and bore drains, generally with a good cover of grasses, rushes and reeds, low scrub.	Unlikely- outside of known distribution area and habitat not present on site.
Chuditch, Western Quoll (<i>Dasyurus geoffroii</i>)	T		Forest, mallee shrublands, woodland and desert. The most dense populations have been found in riparian jarrah forest.	Unlikely- outside of known distribution area and habitat not present on site.
Water-rat, Rakali (<i>Hydromys chrysogaster</i>)	P4		Usually found near permanent bodies of fresh or brackish water.	Unlikely- habitat not present on site.
Quenda, southwestern brown bandicoot (<i>Isoodon fusciventer</i>)	P4		Quenda have a patchy distribution through the Jarrah and Karri forest, the Swan Coastal Plain. Scrubby, often swampy, vegetation with dense cover up to 1 m high, often feeds in adjacent forest and woodland that is burnt on a regular basis and in areas of pasture and cropland lying close to dense cover.	Likely. Strategen 2016 survey did not record any evidence of species occurring within the site.
Black-striped Snake, (Neelaps calonotos)	P3		Banksia woodlands and sandy areas of the Perth region.	Potentially occurring.
Oxyura australis (Blue-billed Duck)	P4		Prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. The species is completely aquatic, swimming low in the water along the edge of dense cover.	Unlikely- habitat not present on site.

Black Cockatoo Habitat

The Eastern Precinct occurs in the known habitat range of Carnaby's Cockatoo (CC), based on the Carnaby's Cockatoo Recovery Plan (Parks and Wildlife 2013). CC is listed as Threatened under the State WC Act and as Endangered under the EPBC Act. According to the EPBC Act Referral guidelines for three threatened black cockatoo species (DSEWPac 2012), the Eastern Precinct is not situated within the range of Forest Red-Tailed Black Cockatoos or Baudin's Black Cockatoos.

Three VTs within the precinct (BaBmEt, Bs, regrowth) contain flora species which are considered to be utilised by CBC for foraging; therefore approximately 49ha of potential foraging habitat for CC exists within the Eastern Precinct (Groom 2011, Johnstone 2010) (Figure 4). No potentially significant trees (Diameter at Breast Height [DBH] >50 cm) were recorded during the surveys therefore no potential black cockatoo breeding or roosting habitat occurs within the precinct.

The highest quality foraging habitat for black cockatoos was noted within BaBmEt which contained high densities of black cockatoo food species including *Banksia attenuata*, *Banksia menziesii*, *Eucalyptus todtiana* and *Banksia sessilis* at canopy and midstorey levels as well as *Mesomelaena pseudostygia* and other suitable food species in the understorey. The lowest quality foraging habitat for black cockatoos (not including cleared areas) was noted which contained scattered *E. todtiana* and patches of *Allocasuarina fraseriana* and Pasture containing *Lupinus* sp. and scattered *Banksia* spp. and *Eucalyptus* spp., which provide limited food resources for CC only.

Table 10: Vegetation types and black cockatoo foraging species within the Eastern Precinct

Vegetation type	CC foraging species	Foraging quality
BaBmEt	<i>Banksia attenuata</i> , <i>B. menziesii</i> , <i>Eucalyptus todtiana</i> , <i>B. sessilis</i> , <i>Xanthorrhoea preissii</i> , <i>Mesomelaena pseudostygia</i> .	Excellent
Bs	<i>B. sessilis</i> .	Good
Regrowth	<i>X. Preissii</i> .	Very Poor

4.1.7 Bushfire management

The Eastern Precinct is situated within a designated bushfire prone area according to the DFES State Map of Bush Fire Prone Areas (DFES 2018), which triggers bushfire planning requirements under Policy Measures 6.2 and 6.3 of State Planning Policy 3.7 Planning in Bushfire Prone Areas (SPP 3.7; WAPC 2015). A Bushfire Hazard Level assessment has been completed for the precinct and should be read in conjunction with the strategic environmental assessment advice.

4.1.8 Cultural heritage

The Department of Planning Lands and Heritage (2018) Aboriginal Heritage Inquiry System (AHIS) did not identify any Registered Sites or Other Heritage Places within the Central Precinct (DPLH 2018). Similarly, there are no listings of Heritage areas under the Municipal Heritage Inventory or the Heritage List as per the City of Wanneroo District Planning Scheme No. 2.

Two Aboriginal heritage sites occur within 1 km of the Central Precinct, site 17451 occurs 150m to the north of Pipidinny Road and site 1018 occurs 1 km to the east (DPLH 2018). These sites will not be impacted by the development. The Aboriginal Heritage Inquiry System identified no other Heritage Places present in or within 2 km of the site (DPLH 2018).

There are no places listed in the state and local Heritage Places Register within the precinct (State Heritage Office, 2018).

4.2 Future concept design response and further investigation

4.2.1 North East Sub Regional Planning Framework

As discussed in Section 2.2, the Eastern Precinct has been identified as Planning Investigation Area (Appendix 2) with two key (environmental) considerations of:

- land use transition/interface with Parks and Recreation reserve and Bush Forever site to investigated to determine whether the it is possible or appropriate to rezone the Eastern Precinct
- bushfire risk.

To address the above, future concept plan(s) for the precinct should preserve current Bush forever sites (refer to Section 4.2.4) and provide for a 'green link' along Wanneroo Road which coincides with Regional Ecological Linkage mapping. POS areas will contain vegetation consisting of Very-Good to Excellent condition (as per EPBC Act referral negotiations) which allows for ecological stepping stones within an internal ecological links network between the two Bush forever sites (no. 130 and 288). This is further discussed in 4.2.4.

The strategic Bushfire risk assessment provides bushfire management measures which have been devised to demonstrate how the bushfire protection criteria can be and will be met at subsequent stages of the planning process.

4.2.2 Acid Sulfate Soil

Regional ASS mapping indicates Moderate to High risk ASS areas (associated with REW). At the appropriate and subsequent planning phases, further ASS investigations will be completed in accordance with DWER [previously DER] (2015) Identification and investigation of acid sulfate soils and acidic landscapes guidelines should the nature of disturbance involve earthworks that will disturb more than 100m³ of soil and dewatering or soil draining activity in the vicinity of Moderate to High Risk ASS area.

4.2.3 Karst

In accordance with CoW (2016) LLP 4.13 specifications a Geotechnical Report will be completed for the precinct to demonstrate suitability for commercial development. A 'Karstic Features Management Plan' may be required as a result of karst investigations for the Eastern Precinct Structure Plan and subsequent Subdivision stages of the project.

4.2.4 Regional Open Space and Public Open Space/ revegetation retention

The Bush Forever sites (also referred to Regional Open Space) within the precinct are to be retained and managed under the existing ownership arrangements. Future management focus with development and interface with Bush Forever sites should be controlled /restricted access and hard edge i.e. road reserve and bollard/fencing, to the following):

- Bush Forever site No. 130: Crown Land Vested in State Government/Local Government
- Bush Forever site No. 288 (includes Yanchep National Park): Part DBCA, WAPC, part Crown Land Vested in State Government, part Private.

A western section of Bush Forever site 130 (approximately 1ha) extends slightly within the Eastern Precinct. When Mitchell Freeway extension progresses and the precinct is developed this section of the Bush Forever site will potentially become an unviable isolated pocket (refer to Figure 6). The future retention of this area will need to be investigated to determine whether land acquisition or incorporation of other viable land within the Eastern Precinct adjacent to Regional Open Space or Conservation POS may be a more sustainable outcome.

It is recommended that the regional ecological linkage, which is currently mapped along the eastern boundary of the precinct along Wanneroo Road is preserved and potentially enhanced (and rehabilitated) through a 'green link'.. Future Concept Plan(s) should provide a connection of existing Bush Forever sites through the preservation of remnant areas (creating 'stepping stones'). The retention of existing and future planted (native) vegetation within proposed road reservations is encouraged as this will provide for local ecological linkages throughout the precinct.

Conservation POS which incorporate the 'best' environmental attributes i.e. vegetation type, condition and black cockatoo habitat are to be retained and managed within the precinct as per EPBC approval 2017/7872.

In accordance with the EPBC Act (EPBC 2017/7872) approval, Conservation POS areas will retain Banksia Woodlands SCP TEC and black cockatoo foraging habitat. These areas are to comprise no less than 8 ha of Banksia Woodlands SCP TEC and Black Cockatoo foraging habitat and are to be ceded to the City of Wanneroo for ongoing management. It is recommended that the viability assessment of POS areas are undertaken in accordance with City of Wanneroo's LLP 4.3. A Vegetation and Conservation Area Management Plan (or equivalent) for the POS areas should be developed in accordance with the City of Wanneroo's Environmental Management Plan Guidelines (2018) through the EPBC approvals process and/or the subsequent WA planning process. The aim of the plan will be to:

- ensure the protection and management of the sites environmental assets (i.e. retained native vegetation)
- ensure that best practice management is employed during the clearing stage of development, to minimise impact to vegetation retention within the Central Precinct prior to the commencement of clearing activities
- identification and implementation of management measures i.e. dieback hygiene, controlled access (pathways and fencing/bollards).

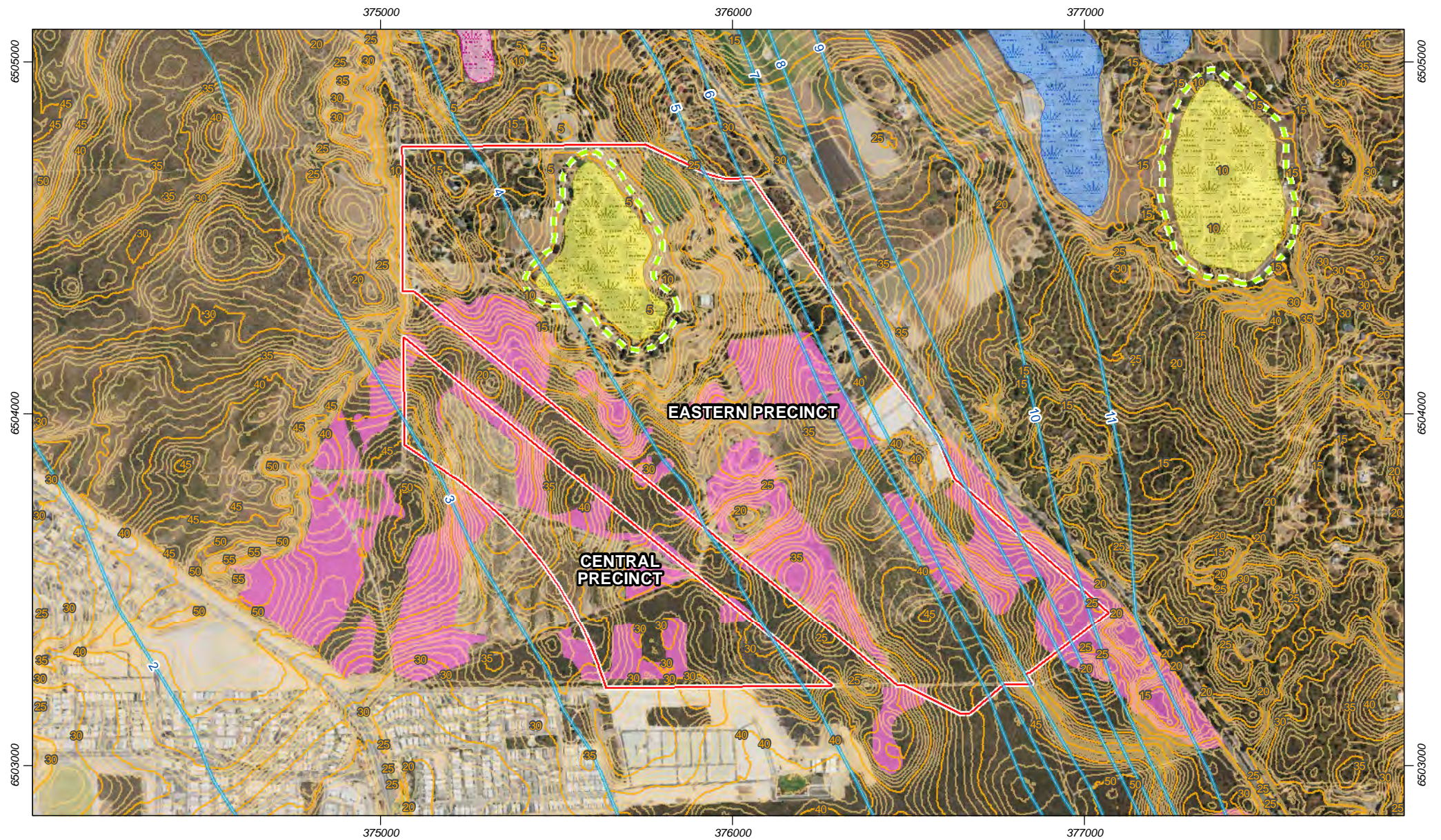
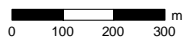


Figure 7: Eastern Precinct Environmental Summary

Scale 1:14,813 at A4



Coordinate System: GDA 1994 MGA Zone 50
 Note that positional errors may occur in some areas
 Date: 12/09/2018
 Author: ctatcher
 Source: Nearmap; Aerial imagery - 15/04/2018.

Legend

- Study area
- Banksia TEC
- 30m Resource Enhancement
- 30m Resource Enhancement Wetland buffer

- Geomorphic wetland**
- Conservation
 - Resource Enhancement
 - Multiple Use

- 1m contour
- Groundwater contour

4.2.5 Tuart Woodlands

A significant portion of the Eastern Precinct (within the EPBC referral Act) was surveyed (refer to Figure 4) with no Tuart (*Eucalyptus Gomphocephala*) recorded. The northern section of the precinct within properties 91 and 73 Pipidiny Road and 23 Beonaddy Road may contain remnant areas of Tuarts. It is recommended that a preliminary site survey be completed for the identified lots to confirm to presence of Tuart (*Eucalyptus Gomphocephala*) and whether the DEE (2017) draft Tuart (*Eucalyptus Gomphocephala*) Woodlands and Forests of The Swan Coastal Plain Ecological Community Draft Conservation Advice is applicable, should the site(s) be developed.

5. References

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Western Australian Planning Commission 2018, North-west Sub Regional Planning Framework. Western Australian Planning Commission, Perth.

Western Australian Local Government Association (WALGA) 2018 Environmental Planning Tool [online].

Appendix 1
Central Precinct Concept Plan

This plan has no formal approval status and has been prepared by CLE to demonstrate one potential land use scenario for the land which could be investigated further by the Client. Implementation in any form would be subject to the receipt of all appropriate approvals. The plan may be changed without notice and should not be relied upon. This plan remains the property of CLE.

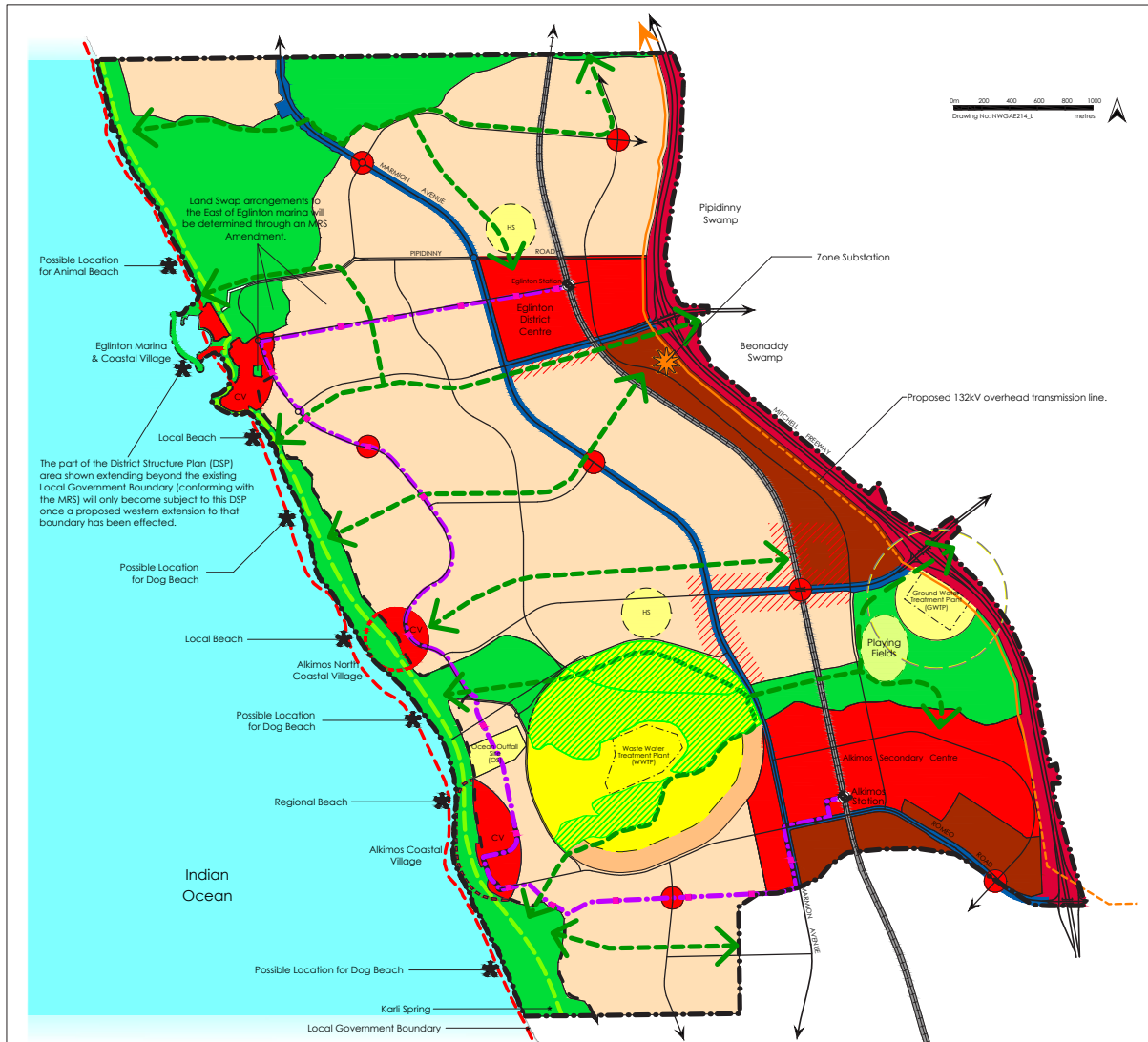


Appendix 2
Planning Investigation Area

This plan has been prepared for general information purposes only and uses potentially uncontrolled data from external sources. CLE does not guarantee the accuracy of this plan and it should not be used for any detailed site design. This plan remains the property of CLE.



Appendix 3
Alkimos Eglinton District Structure Plan



The following notes relate to the Structure Plan:

- The final locations and configurations of the government school sites depicted on this Structure Plan will occur at the local structure planning stage through landowner consultation with the Department of Education and Training, the City of Wanneroo and the Department of Planning. Locations depicted are notional and approximate to reflect catchment requirements.
- The coastal setbacks, including any proposed reduction in coastal setback for the coastal activity nodes are to be consistent with State Planning Policy No. 2.6, State Coastal Policy.
- Final location of railway stations and associated pedestrian and vehicular crossings will need to be determined to the satisfaction of the Public Transport Authority, in consultation with the City of Wanneroo and the WAPC.
- The north-south road on the western side of the WWTP which transverses the 'Parks and Recreation' reserve is supported in principle and is subject to further approval from the Environmental Protection Authority.
- Retail floorspace allocation for the proposed activity centres as outline in the Structure Plan has not been assessed in terms of its impact upon other proposed and existing centres. Accordingly, the activity centres are notional and will require compliance with any approved State Planning Policy relating to Activity Centres.
- Areas identified as being of National Environmental Significance under the Environmental Protection and Biodiversity Conservation Act 1999 may be subject to assessment by the Federal Department of the Environment, Water, Heritage and the Arts. The outcome of any such assessment may require modification to the DSP.
- District Open Space identified within the Structure Plan does not form part of the public open space allocation.
- Local Open Space will be determined at the time of Local Structure Plan preparation in consultation with the City of Wanneroo and the WAPC. Detail in relation to drainage credits will be assessed at the Local Structure Planning stage, and will need to be consistent with Liveable Neighbourhoods and WAPC Policy DC 2.3 'Public Open Space in Residential Areas'.
- Activity Centres will be subject to further structure planning, to ensure there is a mix of retail, residential, community and service provision meeting main street design objectives.
- Subdivision and/or development within the DSP is required to contribute to infrastructure items as identified in the Developer Contribution Plan to be approved by the City of Wanneroo.
- The Structure Plan is subject to Environmental Conditions, Statement No. 722.
- Final servicing requirements will need to be accommodated within the Structure Plan, and will be determined at the Local Structure Planning Stage.
- This DSP is subject to monitoring and review commencing in 2017.
- An easement of up to 32m may be required for the proposed 132kv overhead transmission line. This may have implications on adjacent land uses. Final width of the easement to be determined at LSP stage.

LEGEND

	DISTRICT STRUCTURE PLAN BOUNDARY
	LOCAL GOVERNMENT BOUNDARY
	URBAN
	FUTURE POTENTIAL URBAN
	REGIONAL OPEN SPACE
	CONSERVATION
	PUBLIC PURPOSES / COMMUNITY FACILITIES
	HIGH SCHOOL
	GROUND WATER TREATMENT PLANT
	WASTE WATER TREATMENT PLANT
	OCEAN OUTFALL SITE
	SERVICE COMMERCIAL
	SECONDARY & DISTRICT CENTRES
	COASTAL VILLAGE ACTIVITY CENTRES
	NEIGHBOURHOOD CENTRES
	OPPORTUNITY FOR BUSINESS, COMMERCIAL AND MIXED USE DEVELOPMENT
	INDICATIVE LOCATION OF PROPOSED SUBSTATION
	ROADS:
	PRIMARY REGIONAL ROADS
	OTHER REGIONAL ROADS
	SECONDARY ROADS
	COASTAL ROADS
	RAILWAY RESERVE, RAILWAY STATIONS
	SECONDARY PUBLIC TRANSPORT SYSTEM
	GROUND WATER TREATMENT PLANT 500m BUFFER
	DISTRICT OPEN SPACE
	SOCIAL/PEDESTRIAN/CYCLE LINKAGES
	COASTAL DUAL USE PAIN
	132kV TRANSMISSION LINE

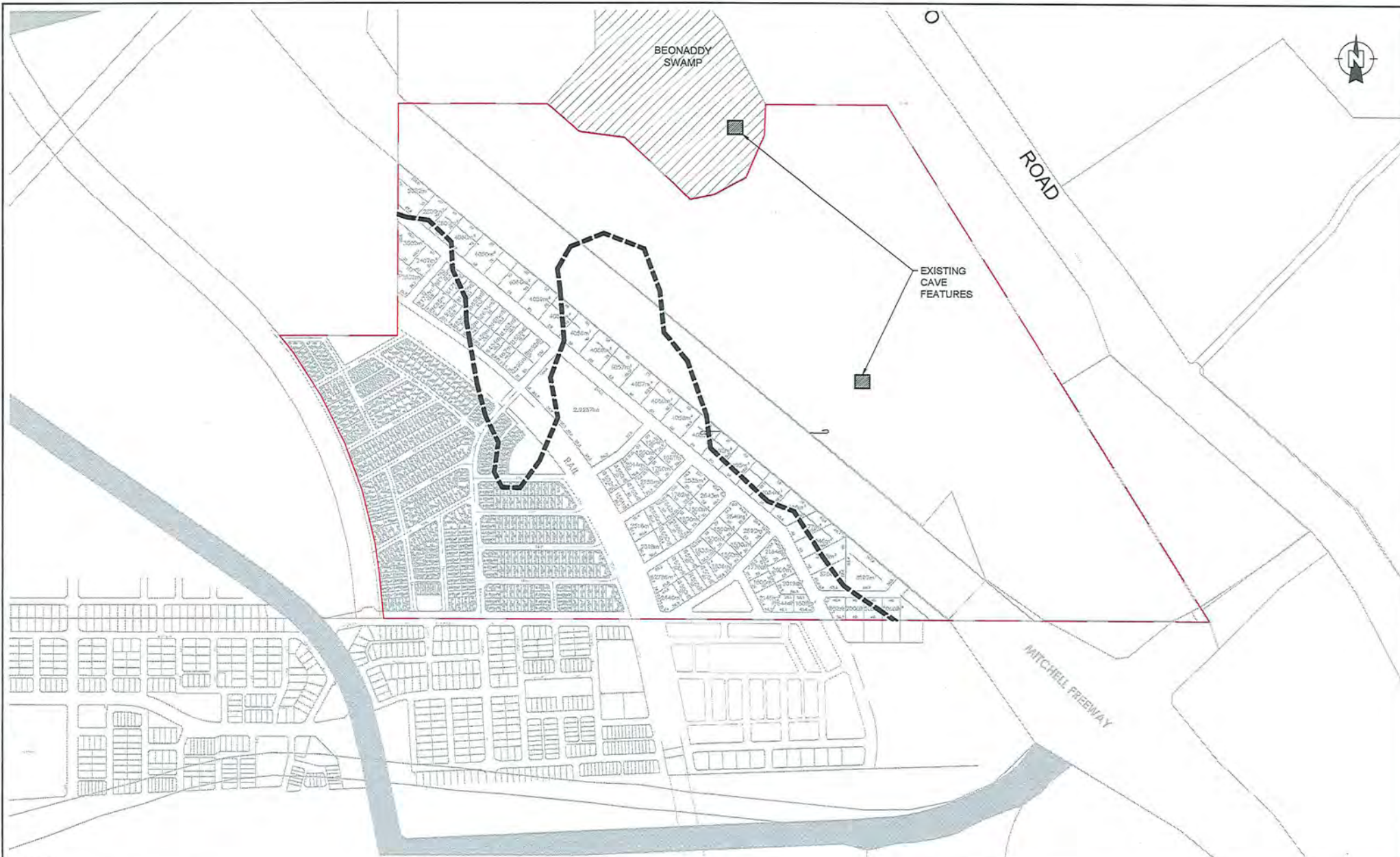
District Structure Plan

**ALKIMOS
EGLINTON**

Figure 1: District Structure Plan (Amendment 01)

Appendix 4

Lot 6 Taronga Place Eglinton: Karst Risk area site investigation plan

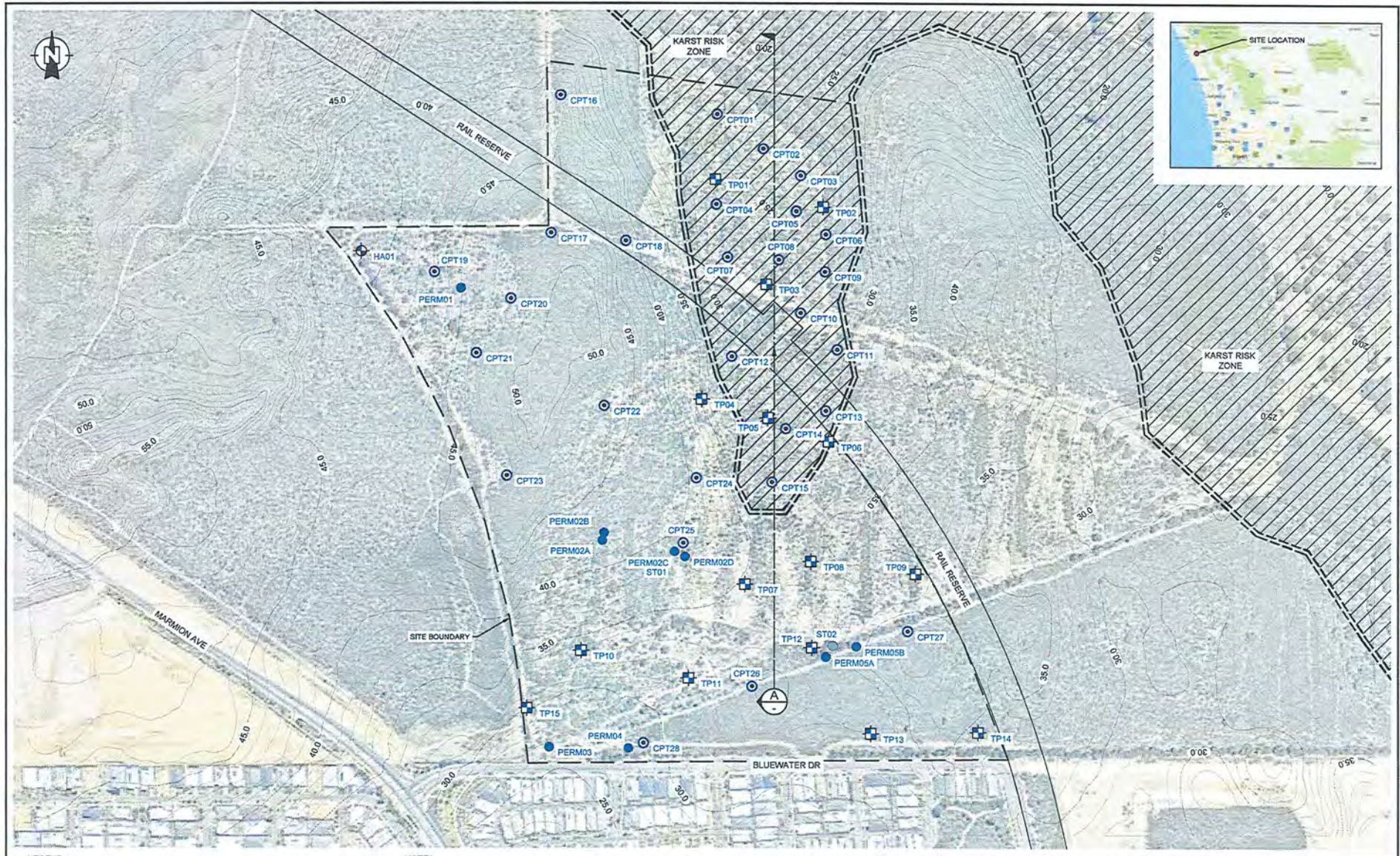


LEGEND:
 - - - - - INFERRED WESTERN EDGE OF POTENTIAL KARST RISK ZONE
 - - - - - SITE BOUNDARY

NOTES:
 1. BASE PLAN ADAPTED FROM: ROBERTS DAY CONCEPT PLAN, DRAWING NO. RD1 016, REV A, DATED 29.06.15



CLIENT:	QUBE PROPERTY GROUP PTY LTD	DRAWN:	DE	PROJECT:	PER2016-0407
PROJECT:	LOT 19 TARONGA PLACE, CARABOODA, WA	CHECKED:	PJM	FIGURE:	01
TITLE:	PRELIMINARY KARST RISK ASSESSMENT PLAN	REVISION:	0	SCALE:	1:7500
		DATE:	15/02/2016	SHEET:	A3 L

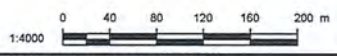


LEGEND:

- HA01 HAND AUGER (HA) LOCATION
- CPT01 CONE PENETROMETER TEST (CPT) LOCATION
- TP01 TEST PIT (TP) LOCATION
- PERM01 PERM TEST LOCATION
- ST01 SOAKAGE TEST LOCATION

NOTES:

1. IMAGE FROM NEARMAP 11.02.18
2. BACKGROUND SURVEY SUPPLIED



CLIENT:	URBAN QUARTER	DRAWN:	DE	PROJECT No:	PER2018-0005
PROJECT:	LOT 6 TARONGA PLACE, EGLINTON	CHECKED:	AKY	DRAWING:	01
TITLE:	SITE INVESTIGATION PLAN	REVISION:	0	SCALE:	1:4000
		DATE:	028.03.18	SHEET:	A3 L