



Lot 5131 Jandakot Road, Treeby

Environmental Assessment Report

Prepared for
Perron Developments Pty Ltd

28 June 2021

● people ● planet ● professional

Document Reference	Revision	Prepared by	Reviewed by	Admin Review	Submitted to Client Copies	Date
4588AA_Rev0	Internal Draft	V.Mugabe	SB	-		11/05/21
4588AA_Rev1	Client Draft	V.Mugabe	SB	-	1 Electronic	11/05/21
4588AA_Rev2	Client Draft	V.Mugabe	SB	-	1 Electronic	28/06/21

Disclaimer

This report is issued in accordance with, and is subject to, the terms of the contract between the Client and 360 Environmental Pty Ltd, including, without limitation, the agreed scope of the report. To the extent permitted by law, 360 Environmental Pty Ltd shall not be liable in contract, tort (including, without limitation, negligence) or otherwise for any use of, or reliance on, parts of this report without taking into account the report in its entirety and all previous and subsequent reports. 360 Environmental Pty Ltd considers the contents of this report to be current as at the date it was produced. This report, including each opinion, conclusion and recommendation it contains, should be considered in the context of the report as a whole. The opinions, conclusions and recommendations in this report are limited by its agreed scope. More extensive, or different, investigation, sampling and testing may have produced different results and therefore different opinions, conclusions and recommendations. Subject to the terms of the contract between the Client and 360 Environmental Pty Ltd, copying, reproducing, disclosing or disseminating parts of this report is prohibited (except to the extent required by law) unless the report is produced in its entirety including this cover page, without the prior written consent of 360 Environmental Pty Ltd.

© Copyright 2021 360 Environmental Pty Ltd ACN 109 499 041

Executive Summary

360 Environmental Pty Ltd (360 Environmental) was commissioned by Perron Developments Pty Ltd (Perron) to prepare an Environmental Assessment Report (EAR) in relation to a development site within Lot 5131 Jandakot Road, Treeby. This EAR has been prepared to support the development of a structure plan for this site.

The footprint of the Urban zoned area which makes up the site has been defined through an MRS amendment process. The land within the Urban zoned area will be cleared, earth worked and developed for residential use. The MRS process resulted in the majority of Lot 5131 being retained as Bush Forever to facilitate protection of Lot 5131's important environmental values. There was recognition that some native vegetation needed to be cleared to facilitate the proposed residential development. Given the above this EAR appropriately focuses on the environmental management issues associated with the structure planning phase of the Urban zoned area only.

The urban design of the residential component is designed to facilitate protection of the adjacent Bush Forever 390 areas. A road has been designed to provide a clear demarcation between the residential area and the Bush Forever area on the western side of the residential area. The design of the urban form includes the locating of public open space immediately adjacent to the Bush Forever areas in the south that contain the Grand Spider Orchids. This provides an additional buffer between the residential component of the development and the Grand Spider Orchids which occur within Bush Forever 390. It is envisaged that a conservation style fence will extend around the entirety of the Bush Forever area and that a management plan will be prepared during the subdivision approval phase for the development which described in detail how interface issues will be managed.

The development has been designed to ensure it avoid impacts to the REW to the east of the site that is located within Bush Forever 390. A buffer distance of 50 m is proposed between the development and the REW to allow for protection of the REW.

An LWMS (JDA, 2021) details how water management issues will be implemented through urban design. A feature of the design is that public open space is strategically placed along, but outside areas set aside as buffers for the REW. This allows for surface water flows from small rainfall events to be captured, treated, and infiltrated into the ground. This will prevent untreated discharges from low flow events that have the potential to impact on wetland water quality from entering the wetland without treatment.

In conclusion none of the key environmental issues identified in this EAR pose a significant constraint to future residential development of the site. Avoidance of important environmental assets during the rezoning phase has resulted in the development having limited potential impact. Where the environment could possibly be impacted environmental management measures are proposed to avoid or mitigate these impacts. Those issues not addressed through the structure planning design process will be addressed in detail in the subdivision approval phase accordingly.

Table of Contents

1	Introduction.....	1
1.1	Background.....	1
1.2	Environmental Assessment Objectives	1
1.3	Scope of Works.....	2
2	Legislation.....	3
2.1	Environmental	3
2.2	Planning	6
3	Site Environmental Features	7
3.1	Climate	7
3.2	Surrounding Land Uses	7
3.3	Topography.....	8
3.4	Regional Geology and Soils.....	8
3.5	Hydrogeology.....	8
3.6	Hydrology	9
3.7	Environmentally Sensitive Areas	10
3.8	Conservation Areas	10
3.9	Flora and Vegetation.....	10
3.10	Fauna	14
3.11	Heritage.....	17
3.12	Site History.....	17
4	Environmental Constraints and Management.....	19
4.1	Key Environmental Issues, Factors and Objectives	19
4.2	Vegetation and Flora.....	19
4.3	Terrestrial Fauna.....	21
4.4	Hydrological Processes	21
4.5	Inland Waters Environmental Quality	23
4.6	Other Environmental Issues and Factors	24
5	Summary and Conclusion	26
5.1	Outcome and Key Findings.....	26
5.2	Conclusions.....	27
6	Limitations	28
7	References	29
8	Figures.....	32

List of Tables

Table 1: Key State Legislation	3
Table 2: Relevant Policies and Guidelines	4
Table 3: Broad Vegetation Type Representation (Government of Western Australia 2017).	11
Table 4: Vegetation Association Descriptions	12
Table 5:Vegetation Condition and Extend	12
Table 6: Weed Species Identified Within the Site and Their Status	14
Table 7:Contaminated Sites within 2 km Radius of the site	17

Table 8:EPA Environmental Factors and Objectives	19
---	-----------

List of Graphs

Graph 1: Climate Statistics for Jandakot Aero Station (009172) 1972-2021 (BOM 2021).....	7
---	----------

List of Figures

Figure 1: Location of Lot 5131

Figure 2: Development Footprint

Figure 3: Conservation and Environmentally Sensitive Areas

Figure 4: Hydrography and Wetlands

Figure 5: Vegetation Associations

Figure 6: Vegetation Condition

Figure 7: Fauna Habitat

Figure 8: Black Cockatoo Habitat Foraging and Breeding Areas

1 Introduction

1.1 Background

360 Environmental Pty Ltd (360 Environmental) was commissioned by Perron Developments Pty Ltd (Perron) to prepare an Environmental Assessment Report (EAR) in relation to a development site within Lot 5131 Jandakot Road, Treeby (Figure 1). This EAR has been prepared to support the development of a structure plan for this site.

The site consists of 32 ha of urban land proposed for development that is surrounded by approximately 33 ha of Bush Forever site 390 which is zoned rural-groundwater protection (Figure 2). The site is located approximately 18 km south of Perth's Central Business District within the City of Cockburn local government area (the site). It is zoned 'Urban' under the State's Metropolitan Region Scheme (MRS) and 'Resource Zone' under the City's Town Planning Scheme No. 3 (TPS 3). The site is mostly surrounded by land that makes up the remainder of Lot 5131 and this land is part of Bush Forever site 390 (Figure 2).

The entirety of Lot 5131 was the subject of an MRS amendment that resulted in the rezoning of the site to Urban. The land within the Urban zoned area (the development footprint) will be cleared, earth worked and developed for residential use (Figure 2). The MRS amendment also amended the boundaries of Bush Forever site 390 within Lot 5131. The process of determining the boundaries of the Urban and Bush Forever areas included consideration of the environmental values of Lot 5131 and the most efficient and viable urban form for the future residential development.

The result of the MRS amendment process was that the majority of Lot 5131 was retained as Bush Forever to facilitate protection of the Lot's important environmental values. There was recognition that some native vegetation needed to be cleared to facilitate the proposed residential development. An agreement was reached between Perron and the WAPC whereby the Bush Forever site 390 area within Lot 5131, and land that is Bush Forever site 390 area within an adjacent lot, would be provided free of cost to the State to offset the clearing of native vegetation needed to progress the residential development of the Urban zoned land. This land will be protected for conservation.

Given the above this EAR is appropriately focused on the environmental management issues associated with the structure planning phase of the Urban zoned area. There is a particular focus on the interface between the residential area and the revised Bush Forever site 390 area.

1.2 Environmental Assessment Objectives

The objective of this EAR is to provide an overview of the general environmental features of the site, identify the key environmental issues and the potential impacts associated with the proposed development, and measures proposed to manage these impacts.

1.3 Scope of Works

The scope of work includes the following:

- Demonstrate a clear understanding of the key environmental issues relevant to the site
- Provide an overview of the general environmental features of the site through review of existing information, desktop assessment and the results of the biological surveys undertaken
- Identify and map environmental constraints and opportunities associated with the proposed structure plan
- Demonstrate that the proposed change in land use will not result in adverse environmental impacts and instead, will result in a net positive environmental outcome.

2 Legislation

2.1 Environmental

2.1.1 Commonwealth

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the central piece of environmental legislation which protects Matters of National Environmental Significance (MNES). Environmental Assessments under the EPBC Act are undertaken to enable environment and heritage protection and biodiversity conservation. An action should not be undertaken that has, will have or is likely to have a significant impact on any MNES, or other protected matters without a pre-action referral to the Australian Government's Minister for the Environment.

Perron is currently seeking approval under the EPBC Act to clear an area of Banksia Woodland Threatened Ecological Community (TEC) within the Urban zoned area. The clearing of this native vegetation has been referred to the Federal Department of Agriculture, Water, and Environment (AWE) and the clearing was determined to be a Controlled Action which required approval under the EPBC Act. At the time of writing Perron had provided answers to questions raised by AWE in relation to the proposal, including a description of the offsets that are included as part of the project.

2.1.2 State

The *Environmental Protection Act 1986* (EP Act) is the key legislative tool for environmental protection in Western Australia. It is administered by EPA and the Minister for the Environment. Under Part IV of the EP Act, the EPA undertakes environmental impact assessment of development proposal and schemes. The environmental impact assessment process provides an orderly and systematic evaluation of a proposal and its potential impact on the environment. A critical component of the assessment is the consideration of ways in which the proposal, if implemented, could avoid or reduce any potential impact on the environment.

Table 1 provides a summary of the key state legislation and regulations relevant to the site.

Table 1: Key State Legislation

Key Legislation	Responsible Government Agency	Aspect
<i>Aboriginal Heritage Act 1972</i>	Department of Aboriginal Affairs	Archaeological and ethnographic heritage
<i>Biodiversity Conservation Act 2016</i>	Department of Biodiversity Conservation and Attractions	Listing of and protection of native species, threatened species, ecological communities, fauna, critical habitat and threatening processes

Key Legislation	Responsible Government Agency	Aspect
<i>Biosecurity and Agriculture Management Act 2007</i>	Department of Primary Industries and Regional Development	Weeds/pests/diseases
<i>Bush Fires Act 1954</i>	Department of Fires and Emergency Services	Bush fire control
<i>Conservation and Land Management Act 1984</i>	Department of Biodiversity Conservation and Attractions Department of Agriculture	Flora and fauna/habitat/weeds /pests/diseases
<i>Conservation and Land Management Regulations 2002</i>	Department of Biodiversity Conservation and Attractions Department of Agriculture	Flora and fauna/habitat/weeds /pests/diseases
<i>Contaminated Sites Act 2003</i>	Department of Water and Environmental Regulation	Management of contaminated soils and water
<i>Environmental Protection Act 1986</i>	Environmental Protection Authority Department of Water and Environmental Regulation	Part IV – Environmental Impact Assessment Part V – Works Approvals and Licences, Clearing Permits
<i>Environmental Protection (Clearing of Native Vegetation) Regulations 2004</i>	Department of Water and Environmental Regulation	Clearing of native vegetation
<i>Planning and Development Act 2005</i>	Department of Planning, Lands and Heritage	Structure planning and subdivision approval
<i>Rights in Water and Irrigation Act 1914</i>	Department of Water and Environmental Regulation	Governs management of the use, service and health of water and watercourses (including beds and banks) Water licensing is required in all proclaimed areas and for all artesian groundwater wells throughout the state.

The following Table 2 details the key standards, guidelines and State Planning Policies relevant to future urban/residential development of the site.

Table 2: Relevant Policies and Guidelines

Document	Description
<i>EPA Policies and Guidance</i>	
Statement of Environmental Principles, Factors and Objectives (EPA 2016a)	This statement communicates the EPA considers the object and principles of the EP Act, uses environmental factors and objectives to organise and systemise environmental impact

Document	Description
	assessment, taking a holistic view of the environment and considering significance of a proposal.
Environmental Factor Guideline – Flora and Vegetation (EPA 2016b)	Provides guidance to protect flora and vegetation so that biological diversity and ecological integrity are maintained.
Environmental Factor Guideline – Terrestrial Environmental Quality (EPA 2016c)	Provides guidance with the objective to maintain the quality of land and soils so that environmental values are protected.
Environmental Factor Guideline – Terrestrial Fauna (EPA 2016d)	Provides guidance with the objective to protect terrestrial fauna so that biological diversity and ecological integrity at maintained.
Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016e)	Provides technical guidance to ensure adequate flora and vegetation data of an appropriate standard are obtained and used in environmental impact assessment.
Technical Guidance – Terrestrial Fauna Surveys (EPA 2016)	Provides technical on the direction and information on general standards and protocols for terrestrial fauna surveys for environmental impact assessment.
Guidance Statement No. 3: <i>Separation Distances between Industrial and Sensitive Land Uses</i> (EPA 2005)	Provides guidance on the generic separation (buffer) distances between Industrial and Sensitive land uses to avoid conflicts between these land uses.
Guidance Statement No. 33: <i>Environmental Guidance for Planning and Development</i> (EPA 2008)	Provides information and advice to assist land use planning and development processes to protect, conserve and enhance the environment.
WA Environmental Offsets Policy (EPA 2011)	Seeks to protect and conserve environmental and biodiversity values for present and future generations. The policy ensures that economic and social development may occur while supporting long term environmental and conservation values.
Department of Water and Environmental Regulation (DWER) Guidelines	
Assessment and Management of Contaminated Sites Guideline (DER 2014)	Provides guidance on the assessment and management of contaminated sites in Western Australian within legislative framework of the <i>Contaminated Sites Act 2003</i> and the <i>Contaminated Sites Regulations 2006</i> .

2.2 Planning

2.2.1 Metropolitan Region Scheme

The site is currently zoned 'Urban' under the Metropolitan Region Scheme (MRS).

2.2.2 City of Cockburn Town Planning Scheme No.3

The City of Cockburn Town Planning Scheme No. 3 (TPS 3) identifies the site as 'Resource Zone', relating to previous extractive land uses of the site. *The City is in the process of amending TPS 3 to rezone the site from 'Resource' to 'Development'. This is being undertaken via Amendment 151 to TPS 3 and is expected to be finalised by February 2022.*

2.2.3 MRS Amendment

The entirety of Lot 5131 was the subject of an MRS amendment that resulted in the rezoning of the site to Urban from 'Rural – Water Protection'. The MRS amendment also amended the boundaries of Bush Forever site 390 within Lot 5131. The process of determining the boundaries of the Urban and Bush Forever areas included consideration of the environmental values of Lot 5131 and the most efficient and viable urban form for the future residential development. The amendment process also considered:

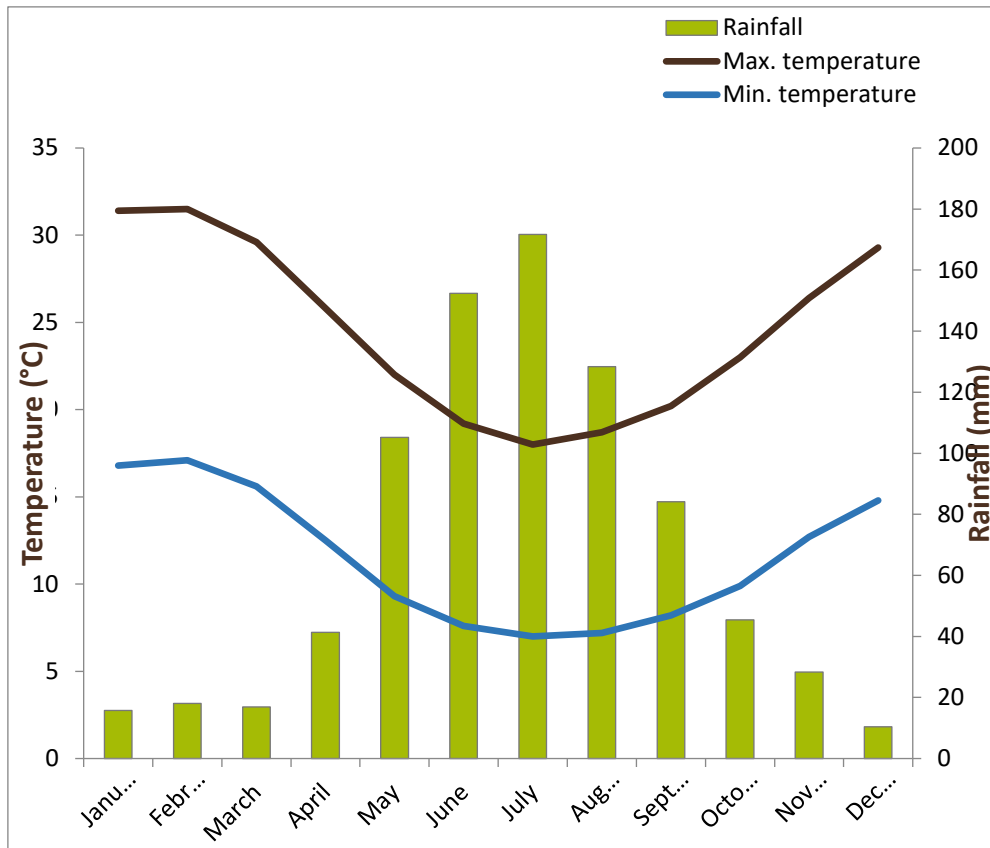
- Impacts, risks and management of Jandakot groundwater resources (existing Priority 2 Source Protection Area)
- Australian Noise Exposure Forecast considerations associated with Jandakot Airport.

The result of the MRS amendment process was that the majority of Lot 5131 remained zoned as 'Rural – Water Protection' and was retained as Bush Forever to facilitate protection of the Lot's important environmental values. There was recognition that some native vegetation needed to be cleared to facilitate the proposed residential development. An agreement was reached between Perron and the WAPC whereby the Bush Forever site 390 area within Lot 5131, and land that is Bush Forever site 390 area within an adjacent lot, would be provided free of cost to the State to offset the clearing of native vegetation needed to progress the residential development of the Urban zoned land. *The Bush Forever portion of Lot 5131 is expected to be reserved for 'Parks and Recreation' under the Metropolitan Region Scheme in due course.*

3 Site Environmental Features

3.1 Climate

The climate of the site is described as warm Mediterranean with warm summers and cold winters. The nearest weather station from the site is Jandakot Aero Station located approximately 1 km northwest of the site (Graph 1). The annual mean maximum temperature for the station is 24.6° and the annual mean minimum temperature is 11.6°. The mean rain days is 108.6 and the average annual rain is 816mm.



Graph 1: Climate Statistics for Jandakot Aero Station (009172) 1972-2021 (BOM 2021).

3.2 Surrounding Land Uses

Surrounding land uses include rural, residential, and conservation reserves. A Bush Forever site (Bush Forever 390) occurs within Lot 5131 and is immediately adjacent. The surrounding land uses are as follows:

- North: To the immediate north of the site is Jandakot Road and dispersed residential dwellings
- East: The Bush Forever site starts on the eastern boundary of the site, which includes a Resource Enhancement Wetland (REW)

- South: The Bush Forever site starts on the southern boundary. A power line transverses the site from east to west near its southern side. There is a Bush Forever site beyond site's southern boundary and on the south east there is an urban area.
- West: The Bush Forever site is on the western site boundary, together with Urban zoned land.

3.3 Topography

The topography is variable across the site and ranges from 29 m Australian Height Datum (AHD) to 41 m AHD. The central portion of the site has been used for sand extraction and therefore the natural landform and elevation has been significantly altered.

3.4 Regional Geology and Soils

The 1:250,000 surface geology profile mapping indicates the geology of the site is typically Bassendean Sand: basal conglomerate overlain by dune quartz sand with heavy mineral concentrations (GSWA, 2008). The site is within the Bassendean System characterised as sand dunes and sandplains with pale deep sand, semi-wet and wet soil (DAFWA, 2012).

Soil subsystem mapping undertaken by the (then) Department of Agriculture and Food WA (DAFWA) has identified the following three soil subsystems within the site (DAFWA, 2006):

- **Bassendean B1 Phase:** Extremely low to very low relief dunes, undulating sandplain with discrete sand rises. Deep, bleached grey sands sometimes with a pale-yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2 m.
- **Bassendean B2 Phase:** Flat to very gently undulating well drained sandplain of the surface. Well to moderately well drained deep bleached grey sands with a pale-yellow B horizon or a weak iron-organic hardpan at 1-2 m.
- **Bassendean B4 Phase:** Broad poorly drained sandplain with deep grey siliceous sands or bleached sands, underlain at depths generally greater than 1.5 m by clay or less frequently a strong iron-organic hardpan.

3.4.1 Acid Sulfate Soils

Acid Sulfate Soils (ASS) mapping undertaken by the DWER indicates that the entire site is mapped as having 'Moderate to Low' risk of ASS within the first 3 m of natural soil surface (DWER, 2021a).

3.5 Hydrogeology

3.5.1 Groundwater

Groundwater and surface water in WA is protected under the *Rights in Water and Irrigation Act 1914* (RIWI Act). Based on groundwater mapping data, the depth of water from ground level to the water table ranges from 2.5 m from the eastern side to up to 12.5 m in the central portion (DWER, 2021b). Ground water salinity across the site is less 250 mg/L.

3.5.2 Public drinking Water Sources

The site is located within the Jandakot Underground Water Pollution Control Area (UWPCA) and is subject to the provisions of the Statement of Planning Policy 2.3 – Jandakot Groundwater Protection Policy (SPP 2.3) and the Water Quality Protection Note 25: Land use compatibility tables for public drinking water source areas (WQPN 25) (DoW 2016a). The site is within the Priority 3 classification (DWER, 2021c) The WQPN 25 sets out the Priority system (DoW, 2016b):

- Priority 1 (P1): areas are defined and managed to ensure there is no degradation of the quality of the drinking water source with the objective of risk avoidance. P1 areas occur within PDWSAs where existing land uses have low risks to PDWSAs.
- Priority 2 (P2): areas are defined and managed to maintain or improve the quality of the drinking water source with the objective of risk minimisation. P2 areas occur within PDWSAs where the land is zoned Rural, and the risks need to be minimised.
- 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 Ground Water PDWSAs where the land is zoned for urban and commercial or light industrial uses.

No wellhead protection or reservoir protection zones exist within or near the site.

3.6 Hydrology

3.6.1 Surface Water

Review of available surface water feature mapping did not identify any surface watercourses, rivers, creeks or streams that intersect the site (DWER, 2021d).

3.6.2 Wetlands

Wetlands of the Swan Coastal Plain have been described and mapped by Hill et al. (1996) and assigned a management category that reflects their condition and environmental value. There are three categories that wetlands are assigned:

- Conservation Category (CCW)
- Resource Enhancement (REW)
- Multiple Use (MUW) depending on their condition and environmental values.

CCWs are those with the highest level of ecological attributes and functions, followed by REWs and then MUWs.

Wetland mapping has identified no wetlands to be occurring within the site. A REW UFI 13328 occurs on the eastern boundary of the site within Bush Forever site 390 (Figure 4).

3.7 Environmentally Sensitive Areas

Environmentally Sensitive Areas (ESAs) are identified and protected under the Environmental Protection (Environmentally Sensitive Areas) Notice 2005. Under the Notice it is an offense to kill or destroy vegetation within an ESA.

Mapping undertaken by the Department of Water and Environmental Regulation (DWER) shows that the site is surrounded by an ESA under clearing regulations. The clearing footprint has been designed not to impact on the surrounding, hence no part of the ESA will be affected by this proposal.

3.8 Conservation Areas

No Regional Parks or Department of Biodiversity Conservation and Attractions (DBCA) Managed Lands intersect the site. There are several DBCA Managed Lands located about 400 m to the north, south and east of the site (DPaW, 2021).

Two Regional Ecological Linkages (No. 46 and 47) intersect the site, connecting the Bush Forever Site 389 to the north with Bush Forever Site 344 and 263 to the south (Figure 3). The retention of native vegetation and fauna habitat within regional ecological linkages aims to reduce the loss of biodiversity and key ecological functions across the southwest (Molly et al. 2009).

3.8.1 Bush Forever Site

The site is nearly surrounded by part of Bush Forever site 390. Bush Forever 390 has been identified as being under the 'Bush Forever Area – Urban, Industrial And Resource Development' category under State Planning Policy 2.8 – Bushland Policy for the Perth Metropolitan Region (WAPC 2010). The Bush Forever site within Lot 5131 will be protected for conservation.

3.9 Flora and Vegetation

3.9.1 Interim Biogeographical Regionalisation of Australia

The site is within the Swan Coastal Plain bioregion and the Perth sub-region (SWA02) of the Interim Biogeographic Regionalisation of Australia (IBRA). The SWA02 sub-region is a low lying coastal plain comprised of colluvial and Aeolian sands, alluvial river flats and coastal limestone rising to duricrusted mesozoic sediments in the east. Outwash plains are extensive only in the south, while a complex series of seasonal wetlands and swamps extends from north to south. Vegetation comprises heath and/or Tuart woodlands on limestone, Banksia and Jarrah-Banksia woodlands on Quaternary marine dunes of various ages, Marri on colluvial and alluvial soils, *Casuarina obesa* on outwash plains, and paperbark (*Melaleuca* spp.) in wetland areas (Mitchell et al. 2002).

3.9.2 Broad Vegetation Types

Mapping of the vegetation of the Perth region of WA was completed on a broad scale by Beard (1981). These vegetation units were re-assessed by Shepherd et al. (2001) to account for clearing in the intensive land use zone, dividing some larger vegetation units into smaller units.

There is one Beard/Shepherd vegetation unit described for the site. The Shepherd et al. (2001) vegetation type is described below and its representation within the region, subregion and local government area is shown in Table 3:

- **Bassendean 1001:** Medium very sparse woodland; Jarrah with low woodland; Banksia and Casuarina.

Table 3: Broad Vegetation Type Representation (Government of Western Australia 2017).

	Pre-European area (ha)	Current extent (ha)	Remaining (%)	Current extent in DPaW Reserves (%)
IBRA Region Swan Coastal Plain	1,501,221.93	578,997.37	38.57	38.47
State-wide				
1001	57,410.23	12,704.45	22.13	13.82
IBRA Bioregion Swan Coastal Plain				
1001	57,410.23	12,704.45	22.13	13.82
IBRA Sub-region SWA 02				
1001	57,410.23	12,704.45	22.13	13.82
Local Government Authority – City of Cockburn				
1001	7,328.29	2,038.39	27.81	14.66

The Environmental Protection Authority's (EPA) Guidance Statement No. 33 – Environmental Guidance for Planning and Development has set out a threshold for the retention of 10% of the pre-existing extent of native vegetation within constrained areas (EPA 2008). The site is constrained as it is within the Perth Metropolitan Region and is adjacent to urban areas. The current extent of Bassendean 1001 association is greater than the 10% threshold (Government of Western Australia 2017).

Vegetation complexes of the Swan Coastal Plain have been mapped by Heddle et al. (1980). The site contains one vegetation complex which relates to the underlying soil profile:

- **Bassendean Complex – Central and South:** Woodland to low woodland and sedgelands. Vegetation ranges from woodland of *Eucalyptus marginata* – *A. fraseriana* – *Banksia* spp. to low woodland of *Melaleuca* species, and sedgelands on the moister sites. This area includes the transition of *E. marginata* to *E. todtiana* near Perth.

3.9.3 Vegetation Associations

A Level 2 Flora and Vegetation Assessment was undertaken of Lot 5131 in September and October 2014 and identified six natural vegetation associations were identified within Lot 5131 and surrounding rural area (360 Environmental 2015; 2018). Of the identified vegetation associations only three are present in the proposed development area (Figure 5). Table 4 shows the vegetation associations within the study area.

Table 4: Vegetation Association Descriptions

Vegetation Association Code	Description
BaEt	Low woodland of <i>Banksia attenuata</i> , <i>Eucalyptus tottiana</i> and <i>Allocasuarina fraseriana</i> over <i>Xanthorrhoea preissii</i> , <i>Macrozamia riedlei</i> , <i>Hibbertia hypericoides</i> , <i>Hibbertia racemosa</i> , <i>Patersonia occidentalis</i> and <i>Desmodium flexuosus</i> .
BaRi	Low open woodland of <i>Banksia attenuata</i> and <i>Banksia ilicifolia</i> over <i>Regelia inops</i> , <i>Xanthorrhoea preissii</i> , <i>Patersonia occidentalis</i> , <i>Schoenus caespitius</i> and <i>Platysace compressa</i> .
Rehab	Tall open shrubland over <i>Adenanthos cygnorum</i> , <i>Kunzea glabrescens</i> , <i>Acacia rostellifera</i> , <i>Calothamnus quadrifidus</i> and <i>Lyginia imberbis</i> .

3.9.4 Vegetation Condition

Vegetation condition ranged from Completely Degraded to Excellent, within the study area. The vegetation mapping is shown in Figure 6 and a representation of the vegetation condition within the development footprint shown in Table 5.

Historical sand extraction has been the primary disturbance within the study area, which has since been rehabilitated. Nevertheless, the rehabilitation has not been successful given the low diversity and density of native species on site. For these reasons, most of the rehabilitation area is in a Degraded to Completely Degraded condition. Invasive weed species and tracks were also commonly noted in the study Area (360 Environmental 2018a).

Table 5: Vegetation Condition and Extent

Condition	Extent (%)
Excellent	19.50
Very Good	0.62
Very Good – Good	0.19
Good	1.12
Degraded	1.01
Degraded – Completely Degraded	37.09
Completely Degraded	40.48

3.9.5 Floristic Community Types

Statistical analysis (multivariate analysis) and data interpretation determined the following Floristic Community Types (FCTs) represented by the vegetation within the site (360 Environmental 2018a):

- **FCT SCP 23a:** Central *Banksia attenuata* – *B. menziesii* woodlands
- **FCT SCP 4:** *Melaleuca preissiana* damplands.

FCT SCP 23a is listed as a sub-community of the Threatened Ecological Community (TEC); Banksia Woodlands of the Swan Coastal Plain (DotEE, 2016a).

3.9.6 Threatened and Priority Ecological Communities

A Level 2 Flora and Vegetation survey and desktop assessment was undertaken to identify any TECs occurring within the site by 360 Environmental in 2018, (360 Environmental 2018a).

The statistical analysis identified vegetation associations BaEt and BaRi has having the most affiliation with the FCT SCP 23a – Central Banksia attenuata – *B. menziesii* woodlands, which is listed as a sub-community of the Banksia Woodlands of the Swan Coastal Plain TEC (DotEE, 2016a).

The FCT has to meet key diagnostic characteristics be considered a TEC. In regard to the presence of the Banksia Woodland TEC, the Approved Conservation Advice for the thresholds state that (DotEE, 2016b):

- Vegetation in Excellent condition should have a minimum patch size of 0.5 ha
- Vegetation in Very Good condition should be a minimum of 1 ha
- Vegetation in Good condition should be a minimum of 2 ha.

Vegetation patches considered Degraded or worse are excluded and not protected under the EPBC Act.

3.9.7 Flora

3.9.7.1 Threatened and Priority Flora

A Level 2 Flora and Vegetation Survey was undertaken for the site on three separate occasions (8 September, 2 October, and 28 October 2014). A total of 98 taxa (including species, subspecies, varieties, and forms) from 76 genera and 33 families were recorded in the site. The commonly occurring families were Myrtaceae (12 taxa), Fabaceae (6 taxa), Orchidaceae (6 taxa), Asteraceae (6 taxa) and Proteaceae (6 taxa) (360 Environmental 2015; 2018a). Two subsequent targeted flora surveys were undertaken in Spring 2016 and 2017 by 360 Environmental.

During the surveys, one Threatened species pursuant to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and gazetted as Declared Rare Flora (DRF) pursuant to the *Wildlife Conservation Act 1950* (WC Act) was identified in the rural zone adjacent to the study area:

- Grand Spider Orchid (*Caladenia huegelii*).

No other Threatened flora species pursuant to the EPBC Act and/or gazetted as DRF under the WC Act were recorded during the surveys. No Priority listed species by the DBCA were recorded during the surveys (360 Environmental 2015; 2018a).

3.9.7.2 Weeds

A total of 11 introduced flora species were observed within the site and surrounding areas. One of these taxa, Arum lily (**Zantedeschia aethiopica*) is listed as Declared under the Biosecurity and Agriculture Management Act 2007 and listed as the Weeds of National Significance (WONS) (Table 6).

Table 6: Weed Species Identified Within the Site and Their Status

Species	Common Name	WONS	Declared under BAM Act 2007*
<i>*Acacia longifolia</i>	Sydney Golden Wattle	No	No
<i>*Aira caryophyllea</i>	Silvery Hairgrass	No	No
<i>*Lysimachia arvensis</i>	Pimpernel	No	No
<i>*Briza maxima</i>	Blowfly Grass	No	No
<i>*Ehrharta brevifolia</i>	Annual Veldt Grass	No	No
<i>*Hypochaeris glabra</i>	Smooth Cats-ear	No	No
<i>*Gladiolus caryophyllaceus</i>	Pink Gladiolus	No	No
<i>*Pelargonium capitatum</i>	Rose Pelargonium	No	No
<i>*Sonchus oleraceus</i>	Sowthistle	No	No
<i>*Ursinia anthemoides</i>	Ursinia	No	No
<i>*Zantedeschia aethiopica</i>	Arum Lily	Yes	s22(2)

3.10 Fauna

360 Environmental undertook a Level 1 Fauna Survey of the site on 8 May 2018 and completed a Black Cockatoo Habitat Assessment within the site (Appendices A and B).

3.10.1 Desktop Assessment

The fauna desktop assessment identified a total of 36 conservation significant vertebrate fauna species (including Priority species), consisting of two reptile species, 29 bird species and five (5) mammal species as potentially occurring within the site (360 Environmental 2018b).

3.10.2 Field Survey

During the field survey 31 species from 22 families were recorded directly (i.e. physical observation) or indirectly (i.e. scats, tracks, bird calls etc). This consisted of 19 bird species, six reptile species, six mammal species and no amphibian species. (360 Environmental, 2018b). These identified species were only located in the rural area adjacent to the proposed clearing site.

3.10.3 Fauna Habitat

A total of two broad fauna habitats was identified within the site (Figure 7):

- **Low Banksia Woodland:** The Low Banksia Woodland fauna habitat was comprised primarily of isolated trees comprised of *Eucalyptus tottiana* and *E. marginata*, over a mid-storey species such as *Banksia attenuata*, *B. menziesii*, *Adenanthos cygnorum diels*, *Allocasuarina fraseriana* and *Nuytsia floribunda* low woodland. The understorey was comprised primarily of *Xanthorrhoea* low shrubs and annual grasses. This fauna habitat was on average classified as being in Excellent condition. (360 Environmental 2018b).

This habitat also contained large fallen logs, moderate levels of woody debris and relatively large amounts of leaf litter (360 Environmental 2018b).

- **Open Regrowth Shrubland:** The Open Regrowth Shrubland fauna habitat was comprised of a tall open shrubland of primarily *Adenanthos cygnorum*, *Kunzea glabrescens*, *Acacia rostellifera*, *Calothamnus quadrifidus* and *Lyginia imberbis* with isolated *Banksia attenuata* and *B. menziesii* throughout.

The understorey was comprised of annual grass weeds, and this fauna habitat was primarily classified as Degraded to completely degraded condition. (360 Environmental, 2018b)

3.10.4 Fauna of Conservation Significance

The 36 conservation significant species retrieved from the database searches were classified as either 'Recorded' during the survey or considered as either 'High', 'Medium' or 'Low' Likelihood of Occurrence within the Survey Area (360 Environmental, 2018 b). The results comprised of:

- Two species of conservation significance were 'Recorded' in the Survey Area:
 - Quenda
 - Rainbow Bee-eater
- Four species of conservation significance are considered to have a 'High' Likelihood of Occurrence within the Survey area:
 - Perth Slider
 - Forest Red-tailed Black Cockatoo
 - Carnaby's Black Cockatoo
 - Western brush Wallaby
- Two species of conservation significance are considered to have a 'Medium' Likelihood of Occurrence within the Survey area:
 - Black-striped Snake
 - Baudin's Black Cockatoo.

Of the two species recorded from the survey by 360 Environmental (2018), none were found in the site. Therefore, no fauna of conservation significance were found within the site.

3.10.5 Black Cockatoo Habitat

A Black Cockatoo Habitat Assessment was undertaken by 360 Environmental within the site on 7 December 2017 by an experienced zoologist. The survey considered Carnaby's Cockatoo, Forest Red-tailed Black Cockatoo and Baudin's Cockatoo listed under the EPBC Act.

The survey included an assessment of the potential foraging and breeding habitats within the site for the Black Cockatoos. The results of the survey are provided in Figure 8. During the survey, no Black Cockatoos were heard or observed flying overhead (360 Environmental 2018c).

3.10.5.1 Foraging Habitat

Carnaby's Cockatoos feed on a variety of seeds, nuts and flowers from a range of native and exotic plants. Food plants include a number of *Banksia* species, Pine trees, Marri, Jarrah, *Grevillea*, *Allocasuarina* and *Hakea* species. To a lesser extent they feed on Karri and Sheoak. Baudin's Cockatoos primarily forage in eucalypt forests or woodlands, where they feed on Marri seeds, flowers, nectar and buds. The species also feed on a range of seeds of *Eucalyptus*, *Banksia*, *Hakea* and Pines as well as fruiting apples and pears (Shah 2006; Johnstone & Storr 1998). Forest Red-tailed Black Cockatoos primarily forage on Jarrah, Marri, Sheoak and Blackbutt (Johnston & Storr 1998). A Jarrah-Marri forest makes up 90% of the Forest Red-tailed Black Cockatoos' diet (Cooper et al. 2002). Forest Red-tailed Black Cockatoos would only utilise Jarrah, Marri or Blackbutt species within the site.

The total area of Black Cockatoo foraging habitat identified within the site consist of the following two natural vegetation associations:

- BaEt: Low woodland of *Banksia attenuata*, *Eucalyptus tottiana* and *Allocasuarina fraseriana* over *Xanthorrhoea preissii*, *Macrozamia riedlei*, *Hibbertia hypericoides*, *Hibbertia racemosa*, *Patersonia occidentalis* and *Desmocladius flexuosus*
- BaRi: Low open woodland of *Banksia attenuata* and *Banksia ilicifolia* over *Regelia inops*, *Xanthorrhoea preissii*, *Patersonia occidentalis*, *Schoenus caespititius* and *Platysace compressa*

Evidence of foraging was identified in the form of chewed *Banksia* flower spikes observed at different locations, however, this evidence appeared to be old and did not necessarily indicate current use of the site by Carnaby's Cockatoo. In addition, there was evidence of foraging on *Eucalyptus tottiana* fruit observed at one location near the northern boundary of the site. Although this is potential foraging evidence for the Forest Red-tailed Black Cockatoo, the species was not able to be clearly identified based on the dentition marks left on the *E. tottiana* nuts (360 Environmental 2018b).

3.10.5.2 Breeding Habitat

The Black Cockatoo Habitat Assessment identified three Jarrah trees which are potential breeding trees and have the potential to develop hollows. One tree contained a hollow that was too small to be suitable for Black Cockatoo breeding and one tree containing two hollows with openings greater than 120 mm, although both hollows were occupied by feral bees (360

Environmental, 2018c). However, all the trees identified as potentially breeding sites for black cockatoo are not within the 31ha proposed for development but occur within the rural land surrounding the site.

No Black Cockatoos were heard or observed flying overhead during the survey. In addition, the lack of suitable hollows in potential breeding trees and the lack of recent foraging evidence suggest that the site is not a primary breeding or foraging habitat and may not be extensively utilised by the species (360 Environmental, 2018c).

3.11 Heritage

3.11.1 Aboriginal Heritage

In Western Australia, the *Aboriginal Heritage Act 1972* protects places and objects customarily used by or traditional to the original inhabitants of Australia. A register of such places and objects is maintained under the Act, however, all sites are protected under the Act whether they are registered or not. A search of the Department of Planning, Lands and Heritage's (DPLH) Aboriginal Heritage Inquiry System did not identify any registered Aboriginal Heritage sites within the site. An unregistered site (ID:3301) is found 250 m south east of the site (DPLH, 2021).

3.11.2 European Heritage

A search of the State Heritage Office database determined that no European heritage sites occur within or within 10 km of the site (SHO, 2021).

3.12 Site History

3.12.1 Contaminated Sites

Under the Contaminated Sites Act 2003, contaminated sites must be reported to DWER, investigated and, if necessary, remediated. A search of DWER's Contaminated Sites database has identified no registered contaminated sites within the site. There are three registered contaminated sites within 2 km of the site (Table 7) (DWER 2018c).

Table 7: Contaminated Sites within 2 km Radius of the site

Site Number	Lot Number	Nature of Contamination	Status	Approx. Distance To Site
63450	Lot 88 on Plan 65829 843 Warton Rd, Piara Waters	Unauthorised disposal of wastes has occurred on this site. A targeted asbestos-containing material as well as free fibres and fines are present within soils at the site. No other potential contaminants of concern have been considered. The quality of groundwater at the site is unknown.	Contaminated – remediation required	1.25
3182	Lot 1991 on Diagram 92149	Zinc is present in the soil at concentrations exceeding Ecological Investigation Levels. Soil in workshop and truck lay-down area contains hydrocarbons (such as from petrol/diesel) below a bitumen hardstand at	Remediated for restricted use	1.78

Site Number	Lot Number	Nature of Contamination	Status	Approx. Distance To Site
		concentrations exceeding health-based investigation levels for commercial and industrial sites		
564	Lot 2 on Diagram 34342	No soil contamination remains at the site. Groundwater directly beneath the former refuelling station at the site has slightly elevated lead concentrations.	Remediated for restricted use	1.64

4 Environmental Constraints and Management

4.1 Key Environmental Issues, Factors and Objectives

The potential impacts that may result from implementation of the proposed development and the site's key environmental features are discussed in this section. Management measures based on key legislation, guidelines, and policies are also outlined with the intent to mitigate the potential impacts.

The principles, factors, and objectives used by the EPA in assessing projects have been used in considering the environmental impact posed by the development and how these will be managed. The relevant factors and objectives of this proposal are outlined in Table 8 below and are addressed within this section.

Table 8:EPA Environmental Factors and Objectives

Theme	Factor	Objectives
Land	Flora and Vegetation	To protect flora and vegetation so that biological diversity and ecological integrity are maintained.
	Terrestrial Fauna	To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.
Water	Hydrological Process	To maintain the hydrological regimes of groundwater and surface water so that environmental values are protected.
	Inland Waters Environmental Quality	To maintain the quality of groundwater and surface water so that environmental values are protected.

4.2 Vegetation and Flora

4.2.1 Background

Based on the terrestrial flora and vegetation review, the following conclusions are provided.

No conservation significant flora species under the *Wildlife Conservation Act 1950* (WC Act) and *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) will be directly impacted by the proposed development. The nearest significant flora, the Grand Spider Orchid (*Caladenia huegelii*) was identified more than 10 m away from the proposed urban development boundary and these will be retained within the Bush Forever site 390. The proposed development footprint has been designed to minimise impacting the surrounding Bush Forever site 390 areas, hence the Grand Spider Orchids will not be directly impacted by the development.

Flora and vegetation surveys and subsequent desktop assessment identified the site as containing the Banksia Woodlands TEC. FCT SCP 23a is listed as a sub-community of the TEC. The vast majority of the TEC occurs within Bush Forever 390 and will not be impacted by the

residential development of the site. The TEC to be cleared is located on the western and northern parts of the site (Figure 8).

As described in Section 2.3.3 there was recognition that native vegetation needed to be cleared to facilitate the proposed residential development during the rezoning phase of planning approvals for the development. Agreement was reached between Perron and the WAPC whereby the Bush Forever site 390 area within Lot 5131, and land that is Bush Forever site 390 area within an adjacent lot, would be provided free of cost to the State to offset this native vegetation clearing. Consequently, the issue of clearing the vegetation is beyond the scope of this document, it having already been addressed at the rezoning phase.

4.2.2 Potential Impacts within the Site

The key potential impacts on terrestrial flora and vegetation from future development of the site include:

- Degradation and disturbances of the adjacent Bush Forever 390, including rubbish dumping, and uncontrolled access
- Edge effects on native vegetation within Bush Forever 390 caused by the interaction with urban land uses, causing a decline in vegetation condition
- Dieback diseases
- Introduction and distribution of invasive weed species
- Hydrological changes.

4.2.3 Management Measures

Potential environmental impacts to flora and vegetation within Bush Forever area 390 from the residential development will be addressed through implementation of the following environmental management measures to ensure the environmental objectives for flora and vegetation are met:

- Design of the residential development
- Careful control of the clearing of vegetation within the site during the construction phase
- Control of access between the Bush Forever area and the residential development both during and after the construction phase
- Weed control
- Dieback control and management
- Stormwater management
- Fire management
- Establishment of POS areas will maintain an east west ecological link through the site.

This will ensure the long-term protection and viability of the vegetation and associated flora and fauna retained within the site.

The urban design of the residential component is designed to facilitate protection of the adjacent Bush Forever areas. The structure plan for the site is shown in Figure 3. A road has been designed to provide a clear demarcation between the residential area and the Bush Forever area on the western side of the residential area. The design of the urban form includes the locating of public open space immediately adjacent to the Bush Forever areas in the south that contain the Grand Spider Orchids. This provides an additional buffer between the residential component of the development and the Grand Spider Orchids. It is envisaged that a conservation style fence will extend around the entirety of the Bush Forever area.

4.3 Terrestrial Fauna

4.3.1 Background

The two vast majority of the Black Cockatoo foraging habitat that occurs within Lot 5131 has been retained within the Bush Forever 390 site.

4.3.2 Potential Impacts

Road fauna deaths.

4.3.3 Management Measures

Potential environmental impacts to terrestrial fauna and its habitat can be managed by implementing the following strategies:

- Careful control of the clearing of vegetation within the site during the construction phase
- Control of access between the Bush Forever area and the residential development both during and after the construction phase
- Weed control
- Dieback control and management
- Fire management

These actions will assist in ensuring the areas surrounding the proposed developing site supporting fauna and fauna habitat area will be protected and maintained.

4.4 Hydrological Processes

4.4.1 Background

EPA's Environmental Factor Guideline for Hydrological Processes defines hydrological processes as the occurrence, distribution, connectivity, movement, and quantity of water. Altering hydrological regimes can significantly impact on water dependent ecosystems and other values supported by groundwater and surface water.

The site is hydrologically unconstrained with free draining sandy soils, clearance to groundwater, moderate to low risk of ASS and there are no regional service water features (JDA 2018)

No surface watercourses were identified within the study area.

There are no production wells located within the site and therefore no wellhead protection zones to consider

The site is in the Jandakot Underground Water Pollution Control Area (UWPCA) and is currently classified as Priority 3 (P3) water protection zone. P3 are zoned under Urban under MRS and land use allow development for Urban purposes.

4.4.2 Potential Impacts

Potential impacts to hydrological processes from the proposed development include:

- Groundwater level changes from changes in land use and clearing. Residential development has the potential to increase recharge of rainfall into groundwater through increased surface area of residential roofs, driveways, carparks and roads.
- Increased runoff from hard urban surfaces into surrounding retained environments.
- Pollution from urban surfaces into surrounding environments.

4.4.3 Management Measures

A District Water Management Strategy (DWMS) has been prepared by JDA and demonstrates that the site can support urban development and achieving best practice urban water management outcomes.

The DWMS proposes the following design objectives (JDA, 2018):

- Stormwater Management
- Groundwater Management
- Water Conservation and Sustainability
- Water Quality
- Monitoring

A Local Water Management Strategy (LWMS) has been prepared for the site as part of the Structure Plan approval processes (JDA, 2021). The LWMS will need to be approved by DWER. The LWMS describes how the issues of surface and groundwater management associated with the residential development will be managed. Key issues addressed in this plan include:

- Ensuring that the REW to the east of the site is not impacted by the development
- Ensuring that the adjacent Bush Forever areas to the east of the site are not impacted by the development.

The LWMS focuses on reducing nutrient loads in stormwater and onsite stormwater infiltration. Amended soils and ephemeral bioretention systems are to be used to treat stormwater. No

management of groundwater levels is proposed. All stormwater and groundwater management infrastructure will be located outside of Bush Forever 390 and the 50 m buffer of the REW which occurs on the eastern boundary of the site.

An Urban Water Management Plan (UWMP) will be required as part of the subdivision approval process. This will describe in detail how the water management issues described in the LWMS will be addressed. This will need to be approved by DWER.

4.5 Inland Waters Environmental Quality

4.5.1 Background

EPA's Environmental Factor Guideline for Inland Waters Environmental Quality defines inland waters as groundwater, waterways, wetlands, and estuaries. Water quality can be impacted by both direct discharges of waste and diffuse sources of pollution associated with catchment land uses.

- No wetlands were identified within the study area, but there is an REW which occurs on the eastern boundary of the site within the rural zone
- The site is mapped in P3 priority area which is defined and managed to maintain the quality of the drinking water source for as long as possible with the objective of risk management.

4.5.2 Potential Impacts

Potential impacts to the REW from the proposed urbanisation of the site include:

- Alteration to the water regime
- Habitat modification (invasion of exotic species, clearing, introduction of feral and domestic animals, weed and pathogen introduction or spread)
- Inappropriate recreational use
- Diminished water quality (nutrients, organic compounds, suspended solids, toxic compounds and salinity) as a consequence of discharges.

4.5.3 Management Measures

4.5.3.1 Wetland Conservation

The wetland adjacent to site is zoned 'rural-water protection' under the MRS and is within Bush Forever area 390 and consequently it will be managed for conservation purposes. Conservation of the REW will allow for long-term protection and ongoing management of the wetland and its associated flora and vegetation. In addition, conservation of the REW will allow for continued safe and long-term fauna movement in the landscape.

4.5.3.2 Wetland Buffer Implementation

Under the WAPC's Guideline for the Determination of Wetland Buffer Requirements (2005), the consideration of wetlands is required during a change in land use or proposed development in the immediate vicinity of a wetland where the future land use is likely to conflict with the established wetland management objectives (WAPC, 2005). The provision of a buffer has been identified as providing an important tool in achieving and maintaining the desired values, processes, functions, and attributes of wetlands through the separation of the wetland from adjacent threatening land uses (WAPC, 2005). An appropriate buffer distance from wetlands should be identified to achieve an acceptable planning outcome and should be based on the wetland's management category (WAPC, 2005).

The development has been designed to ensure it avoids significant environmental impacts from the urbanisation of the site. As the residential development is proposed to be within the already previously clear and highly degraded land in the vicinity of the REW, a buffer distance of 50 m is proposed to allow for protection of the REW.

The buffer proposed is designed to ensure there is a balance between sufficient protection between the development and the REW wetland. The implementation of a 50 m buffer will allow the protection of the REW from direct disturbance or change from urbanisation within the site and the buffer will also provide indirect support for the wetland function area.

The LWMS described in Section 4.3.3 details how water management issues will be addressed through urban design. A feature of the design is that public open space is strategically placed along, but outside areas set aside as buffers for the REW. This allows for surface water flows from small rainfall events to be captured, treated, and infiltrated into the ground. This will prevent untreated discharges from low flow events that have the potential to impact on wetland water quality from entering the wetland without treatment.

4.6 Other Environmental Issues and Factors

4.6.1 Acid Sulfate Soils

The site is mapped as being of 'moderate to low risk of ASS'. It is understood that the areas proposed for development will require filling, but the provision of sewer may have the potential to disturb ASS during the construction phase. A Preliminary Site Assessment will be undertaken to assess the presence and extent of ASS in accordance with the DER guidelines. Depending upon the results of the preliminary assessment, and whether ASS will be disturbed in the construction phase of the development, an Acid Sulfate Soil Assessment and Dewatering Management Plan will be prepared.

4.6.2 Contamination

It is considered unlikely that historical land uses have resulted in contamination of the land as the site has only been the subject of sand quarrying. The site is not mapped as a contaminated zone, the nearest contaminated site is 1.25 km away from the study area, (DWER, 2021e).

The DWER mapping shows that the site is not contaminated and is distant from known contaminated sites, therefore no further work is considered necessary to determine the contamination status of the site.

4.6.3 Aboriginal Heritage

4.6.3.1 Potential Impacts

The site does not contain any 'Registered Sites' that are listed under Section 5 of the *Aboriginal Heritage Act 1972*.

4.6.3.2 Management Response

If any future planning approval involves activities that will result in the disturbance of sites, then consent for these activities (and prior to any ground disturbing activities being undertaken) will be sought through Section 18 of the *Aboriginal Heritage Act 1972*.

5 Summary and Conclusion

5.1 Outcome and Key Findings

The footprint of the Urban zoned area which makes up the site has been defined through the MRS amendment process which precedes the current structure planning process. The land within the Urban zoned area will be cleared, earth worked and developed for residential use. The MRS process resulted in the majority of Lot 5131 being retained as Bush Forever to facilitate protection of Lot 5131's important environmental values.

There was recognition that some native vegetation needed to be cleared to facilitate the proposed residential development. An agreement was reached between Perron and the WAPC whereby the Bush Forever site 390 area within Lot 5131, and land that is Bush Forever site 390 area within an adjacent lot, would be provided free of cost to the State to offset the clearing of native vegetation needed to progress the residential development of the Urban zoned land. This land will be protected for conservation. Given the above, this EAR is appropriately focuses on the environmental management issues associated with the structure planning phase of the Urban zoned area.

The urban design of the residential component is designed to facilitate protection of the adjacent Bush Forever areas. The structure plan for the site is shown in Figure 2. A road has been designed to provide a clear demarcation between the residential area and the Bush Forever area on the western side of the residential area. The design of the urban form includes the locating of public open space immediately adjacent to the Bush Forever areas in the south that contain the Grand Spider Orchids (Figure 2). This provides an additional buffer between the residential component of the development and the Grand Spider Orchids. It is envisaged that a conservation style fence will extend around the entirety of the Bush Forever area.

The development has been designed to ensure it avoid impacts to the REW to the east of the site. The proposed residential development is within cleared and highly degraded land. A buffer distance of 50 m is proposed between the development and the REW to allow for protection of the REW. The buffer is designed to ensure there is a balance between sufficient protection between the development and the REW wetland.

An LWMS (JDA, 2021) details how water management issues will be implemented through urban design. A feature of the design is that public open space is strategically placed along, but outside areas set aside as buffers for the REW. This allows for surface water flows from small rainfall events to be captured, treated, and infiltrated into the ground. This will prevent untreated discharges from low flow events that have the potential to impact on wetland water quality from entering the wetland without treatment.

Other environmental issues associated with the construction phase of the development such as controlling access to the Bush Forever area and the management of ASS will be addressed during the subdivision phase.

5.2 Conclusions

In conclusion none of the key environmental issues identified in this EAR pose a significant constraint to future residential development of the site. Avoidance of important environmental assets during the rezoning phase has resulted in the development having limited potential impact.

Where the environment could possibly be impacted environmental management measures are proposed to avoid or mitigate these impacts. Those issues not addressed through the structure planning process will be addressed in detail in the subdivision approval phase accordingly.

6 Limitations

This report is produced strictly in accordance with the scope of services set out in the contract or otherwise agreed in accordance with the contract. 360 Environmental makes no representations or warranties in relation to the nature and quality of soil and water other than the visual observation and analytical data in this report.

In the preparation of this report, 360 Environmental has relied upon documents, information, data and analyses (“client’s information”) provided by the client and other individuals and entities. In most cases where client’s information has been relied upon, such reliance has been indicated in this report. Unless expressly set out in this report, 360 Environmental has not verified that the client’s information is accurate, exhaustive or current and the validity and accuracy of any aspect of the report including, or based upon, any part of the client’s information is contingent upon the accuracy, exhaustiveness and currency of the client’s information. 360 Environmental shall not be liable to the client or any other person in connection with any invalid or inaccurate aspect of this report where that invalidity or inaccuracy arose because the client’s information was not accurate, exhaustive and current or arose because of any information or condition that was concealed, withheld, misrepresented, or otherwise not fully disclosed or available to 360 Environmental.

Aspects of this report, including the opinions, conclusions and recommendations it contains, are based on the results of the investigation, sampling and testing set out in the contract and otherwise in accordance with normal practices and standards. The investigation, sampling and testing are designed to produce results that represent a reasonable interpretation of the general conditions of the site that is the subject of this report. However, due to the characteristics of the site, including natural variations in site conditions, the results of the investigation, sampling and testing may not accurately represent the actual state of the whole site at all points.

It is important to recognise that site conditions, including the extent and concentration of contaminants, can change with time. This is particularly relevant if this report, including the data, opinions, conclusions and recommendations it contains, are to be used a considerable time after it was prepared. In these circumstances, further investigation of the site may be necessary.

Subject to the terms of the contract between the Client and 360 Environmental Pty Ltd, copying, reproducing, disclosing or disseminating parts of this report is prohibited (except to the extent required by law) unless the report is produced in its entirety including this page, without the prior written consent of 360 Environmental Pty Ltd.

7 References

- 360 Environmental, 2015. Level 2 Flora and Vegetation Survey of Lot 131 Jandakot Road, Banjup. Prepared for Perron Developments. West Leederville.
- 360 Environmental, 2018a. Addendum for Lot 131 Jandakot Road, Treeby – Threatened Ecological Communities and Threatened Flora. Prepared for Perron Developments. West Leederville.
- 360 Environmental, 2018b. Lot 131 Jandakot Road, Treeby – Level 1 Fauna Survey. Prepared for Perron Developments. West Leederville.
- 360 Environmental, 2018c. Lot 131 Jandakot Road, Treeby – Black Cockatoo Habitat Assessment. Prepared for Perron Developments. West Leederville.
- 360 Environmental, 2018d. Lot 131 Jandakot Road, Treeby – Environmental Assessment Report. Prepared for Perron Developments. West Leederville.
- Beard, J.S. 1972-80. Vegetation Survey of Western Australia: The Vegetation of the Perth Area, Western Australia. Perth: Vegmap Publications.
- Beard, J. S. 1990. Plant Life of Western Australia. New South Wales: Kangaroo Press Pty Ltd.
- Bureau of Meteorology (BoM) 2021. Weather and Climate Data, accessed [28/04/2021] from <http://www.bom.gov.au/climate/data-services/>
- Commonwealth of Australia 2001. National Targets and Objectives for Biodiversity Conservation 2001-2005, AGPS, Canberra.
- Department of Aboriginal Affairs (DAA) Aboriginal Heritage Inquiry System, accessed [27/04/2021] from <http://maps.dia.wa.gov.au/AHIS2/>
- Department of Agriculture and Food Western Australia (DAFWA) 2017. Western Australian Organism List accessed [27/04/2021] from <https://www.agric.wa.gov.au/bam/western-australian-organism-list-waol>, Government of Western Australia.
- Department of Agriculture and Food Western Australia (DAFWA). 2012. Soil Subsystems of Western Australia, GIS dataset, Government of Western Australia.
- Department of Environment and Energy (DoEE) 2017. Protected Matters Search Tool, accessed [insert date] from <http://www.environment.gov.au/webgis-framework/apps/pmst/pmst.jsf> , Commonwealth of Australia.
- Department of Food and Agriculture Western Australia (DAFWA). 2012. Soil Subsystems of Western Australia, GIS dataset, Government of Western Australia.
- Department of Parks and Wildlife (DPaW) 2017. Geomorphic Wetlands, GIS dataset, Government of Western Australia.
- Department of Parks and Wildlife (DPaW) 2021. DPaW Managed Lands, GIS Dataset, Government of Western Australia.

Department of Planning (DoP) 2021. Bush Forever Sites, GIS Dataset, Government of Western Australia.

Department of Planning (DoP) 2017. *State Planning Policy 2.3: Jandakot Groundwater Protection Policy*. Western Australian Planning Commission and Government of Western Australia.

Department of Planning, Lands and Heritage (DPLH). 2018. *Aboriginal Heritage Inquiry System*, available from <http://maps.dia.wa.gov.au/AHIS2/>. Government of Western Australia.

Department of Water and Environment Regulation (DWER) 2021a. Environmentally Sensitive Areas (ESA), GIS Dataset, Government of Western Australia.

Department of Water and Environment Regulation (DWER) 2021b. Acid Sulfate Soils (ASS), GIS dataset, Government of Western Australia

Department of Water and Environmental Regulation (DWER), 2021c. Public Drinking Water Source Areas. GIS Dataset. Government of Western Australia.

Department of Water and Environmental Regulation (DWER), 2021d. Perth Groundwater Map. Available at <https://maps.water.wa.gov.au/#/webmap/gwm>. Government of Western Australia.

Department of Water and Environmental Regulation (DWER), 2021e. Clearing Permit System Map. Accessed from <https://cps.der.wa.gov.au/>. Government of Western Australia.

Environment Protection Authority (EPA) 2008. Guidance Statement No. 33, Environmental Guidance for Planning and Development, Government of Western Australia.

Government of Western Australia. 2015. 2015 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report). Current as of June 2015. WA Department of Parks and Wildlife, Perth.

Heddl, E.M., Loneragan, O.W. and Havel, J.J., 1980. 'Vegetation of the Darling System, Department of Environment and Conservation (south of Moore River)', Department of Environment and Conservation.

Hill, A.L., Semeniuk C.A., Semeniuk, V. & Del Marco, A. 1996. Wetlands of the Swan Coastal Plain: volume 2 B : wetland mapping, classification and evaluation, wetland atlas, Government of Western Australia.

JDA Consultant Hydrologists (JDA), 2018. Lot 131 Jandakot Road, Treeby (Banjup) – District Water Management Strategy, Draft Report, June 2018. Prepared for Perron Developments Pty Ltd.

Molly, S., Wood, J., Hall, S., Wallrodt, S and Whisson, G. 2009. South West Regional Ecological Linkages Technical Report. A Level 2 Flora and Vegetation Survey of Proposed Sand Mining Area at Lot 467 Warton Road. Prepared by RPS Environmental.

Mitchell, D., Williams, K., Desmond, A. 2002. Swan Coastal Plain 2 (SWA2 – Swan Coastal Plain subregion) in A Biodiversity Audit of Western Australia's 53 Biogeographic Subregions in 2002. Department of Parks and Wildlife (DPaW), Government of Western Australia.

Perth Biodiversity Project (PBP) 2008. Perth Regional Ecological Linkages GIS Dataset, Government of Western Australia.

Shepherd, D. P., Beeston, G. R., and Hopkins, A. J. M. 2001. Native Vegetation in Western Australia (Technical Report 249). Perth: Department of Agriculture.

State Heritage Office (SHO) 2021. State Register of Heritage Places. Available at <http://inherit.stateheritage.wa.gov.au/public>. Department of Planning, Lands and Heritage. Government of Western Australia.

Western Australian Planning Commission (WAPC) 2005. Guideline for the Determination of Wetland Buffer Requirements. Government of Western Australia.

Western Australian Planning Commission (WAPC), 2008. Better Urban Water Management guidance. Government of Western Australia.

Western Australian Planning Commission (WAPC), 2010. State Planning Policy 2.8 – Bushland Policy for the Perth Metropolitan Region

Western Australian Planning Commission (WAPC) 2017. State Planning Policy 2.3, Jandakot Groundwater Protection. Government of Western Australia.

Western Australian Planning Commission (WAPC), 2018. Metropolitan Peel Sub-regional Planning Framework. Government of Western Australia.

Figures



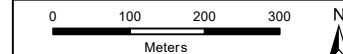
Legend

- Survey Area
- Cadastral Lines

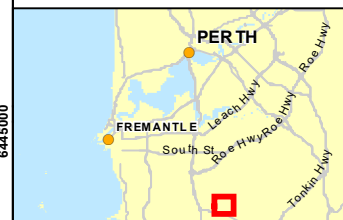
- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
 - LOCALITY MAP SOURCED LANDGATE 2020
 - OTHER DATA SOURCED LANDGATE 2020
 - AERIAL PHOTOGRAPHY SOURCED LANDGATE 2020
 (© Western Australian Land Information Authority 2020)
 Prepared by

SLIP ENABLER

360 environmental
 10 Bermondsey St West Leederville, 6007 WA
 t(08) 93 88 8360
 f(08) 93 81 2360
 www.w360environmental.com.au



LOCALITY MAP

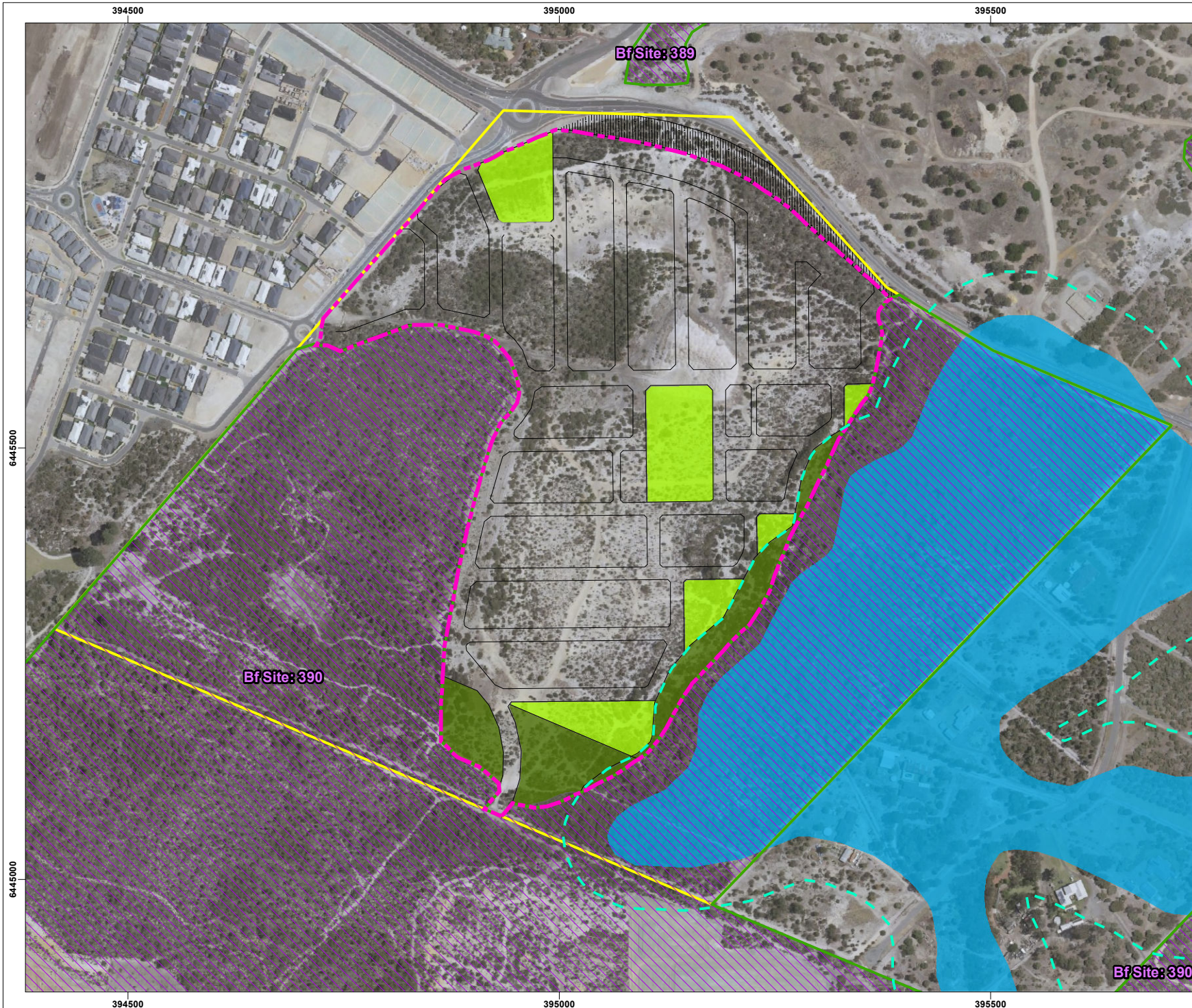


PROJECT ID 4588		DATE 30/04/2021	
HORIZONTAL DATUM AND PROJECTION GDA2020 MGA Zone 50			
CREATED LF	CHECKED VM	APPROVED SB	REVISION 0

Perron Development Pty Ltd
 Lot 5131 Jandakot Road Treeby

Lot 5131 Jandakot Rd Treeby
 Environmental Assessment Report

Figure 1
 Location of Lot 5131

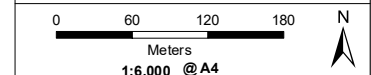


- ### Legend
- Survey Area
 - Cad-RR
 - H-Rd Wdg
 - N-WAPC
 - Development Footprint
 - Bush Forever Areas
 - Public Open Space
 - Public Open Space - Restricted
 - Geomorphic Wetlands**
 - Resource Enhancement Category
 - 50m Buffer to Wetland

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
 - LOCALITY MAP SOURCED LANDGATE 2020
 - OTHER DATA SOURCED LANDGATE 2020
 - AERIAL PHOTOGRAPHY SOURCED LANDGATE 2020
 (© Western Australian Land Information Authority 2020)

SLIP ENABLER

360 environmental
 a 10 Bermondsey St, West Leederville, 6007 WA
 t (08) 9388 8360
 f (08) 9381 2360
 w www.360environmental.com.au

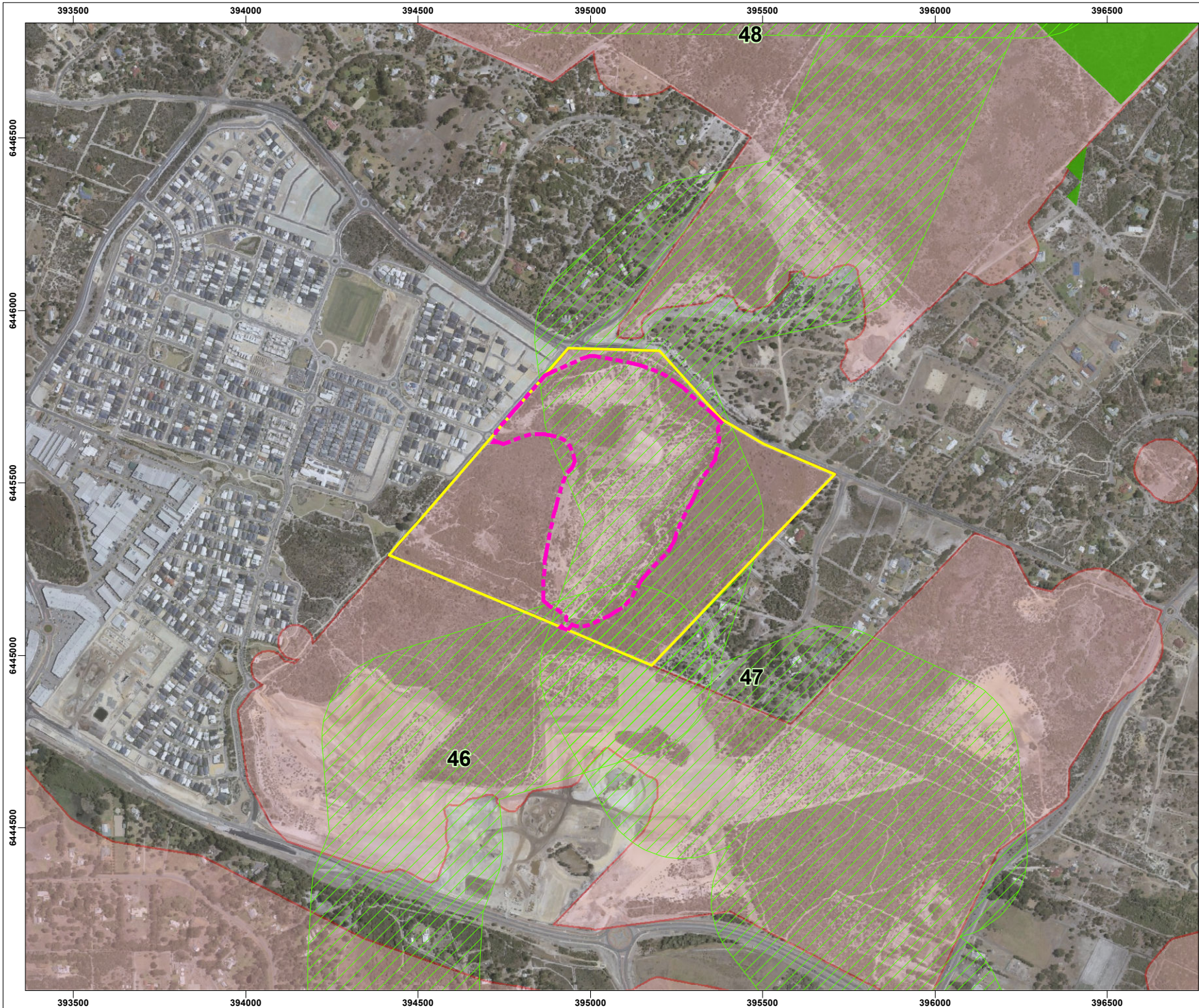


5000	PROJECT ID 4588		DATE 17/05/2021	
	HORIZONTAL DATUM AND PROJECTION GDA2020 MGA Zone 50			
	CREATED LF	CHECKED VM	APPROVED SB	REVISION 0

Perron Development Pty Ltd
 Lot 5131 Jandakot Road Treeby

Lot 5131 Jandakot Rd Treeby
 Environmental Assessment Report

Figure 2
 Development Footprint



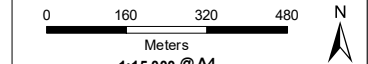
Legend

- Development Footprint
- Survey Area
- Regional Ecological Linkage
- Environmentally Sensitive Areas
- DBCA Managed Land

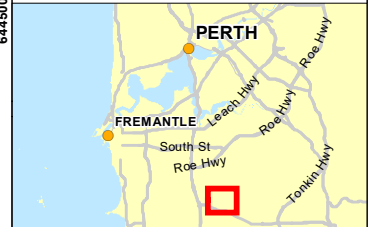
- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2020
- OTHER DATA SOURCED LANDGATE 2020
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2020
(© Western Australian Land Information Authority 2020)

SLIP ENABLER

360
environmental
a 10 Bermondsey St, West Leederville, 6007 WA
t (08) 9388 8360
f (08) 9381 2360
w www.360environmental.com.au



LOCALITY MAP



PROJECT ID	DATE
4588	17/05/2021

HORIZONTAL DATUM AND PROJECTION
GDA2020 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
LF	VM	SB	0

Perron Development Pty Ltd
Lot 5131 Jandakot Road Treeby

Lot 5131 Jandakot Rd Treeby
Environmental Assessment Report
Figure 3

Conservation and
Environmentally Sensitive Areas



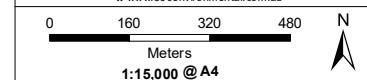
- Legend**
- Survey Area
 - Development Footprint
 - Hydrography**
 - Drain - major
 - Swamp
 - Area Subject to Inundation
 - Geomorphic Wetlands**
 - Conservation Category
 - Resource Enhancement Category
 - Multiple Use Category

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2020
- OTHER DATA SOURCED LANDGATE 2020
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2020
(© Western Australian Land Information Authority 2020)

SLIP ENABLER

360
environmental

a 10 Bermondsey St, West Leederville, 6007 WA
t (08) 9388 8360
f (08) 9381 2360
w www.360environmental.com.au



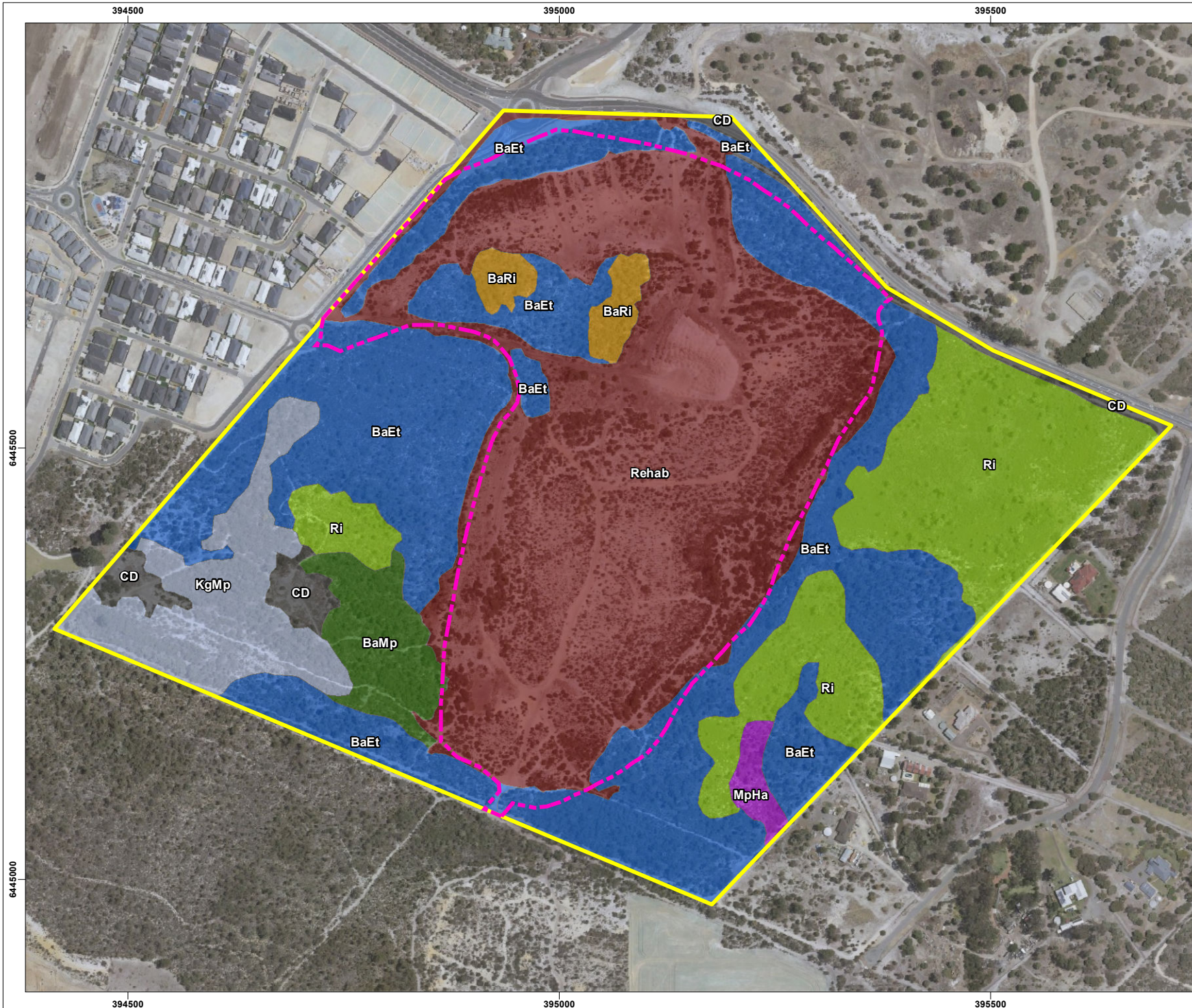
6444500

PROJECT ID 4588		DATE 17/05/2021	
HORIZONTAL DATUM AND PROJECTION GDA2020 MGA Zone 50			
CREATED LF	CHECKED VM	APPROVED SB	REVISION 0

Perron Development Pty Ltd
Lot 5131 Jandakot Road Treeby

Lot 5131 Jandakot Rd Treeby
Environmental Assessment Report

Figure 4
Hydrography and Wetlands

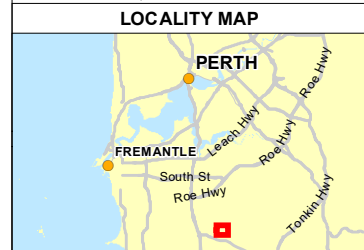
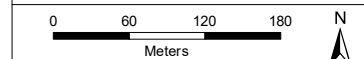


- ### Legend
- Survey Area
 - Development Footprint
 - Vegetation Associations**
 - BaEt
 - BaMp
 - BaRi
 - KgMp
 - MpHa
 - Ri
 - Rehab
 - CD

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
 - LOCALITY MAP SOURCED LANDGATE 2020
 - OTHER DATA SOURCED LANDGATE 2020
 - AERIAL PHOTOGRAPHY SOURCED LANDGATE 2020
 (© Western Australian Land Information Authority 2020)

SLIP ENABLER

360
 environmental
 a 10 Bermondsey St, West Leederville, 6007 WA
 t (08) 9388 8360
 f (08) 9381 2360
 w www.360environmental.com.au

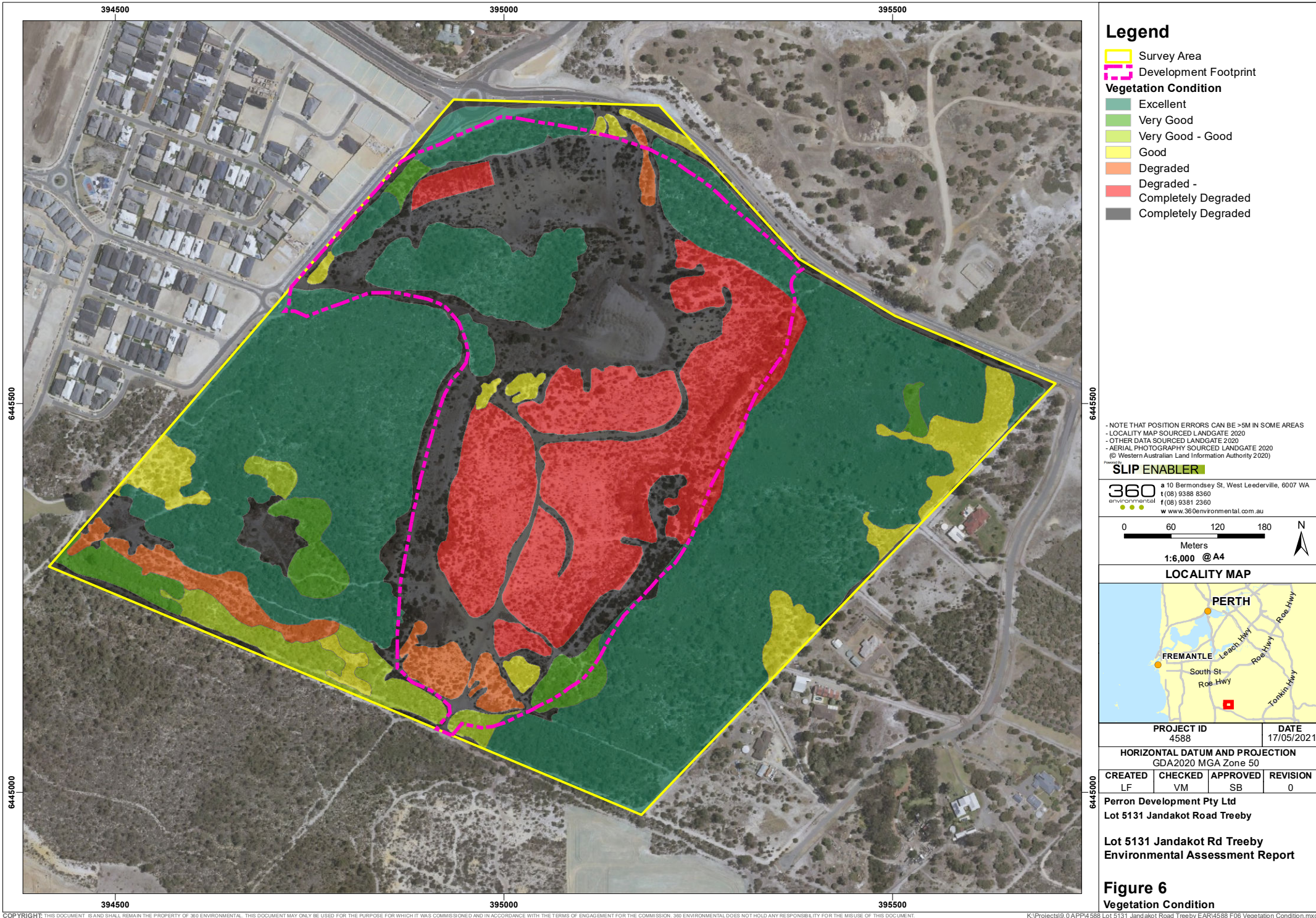


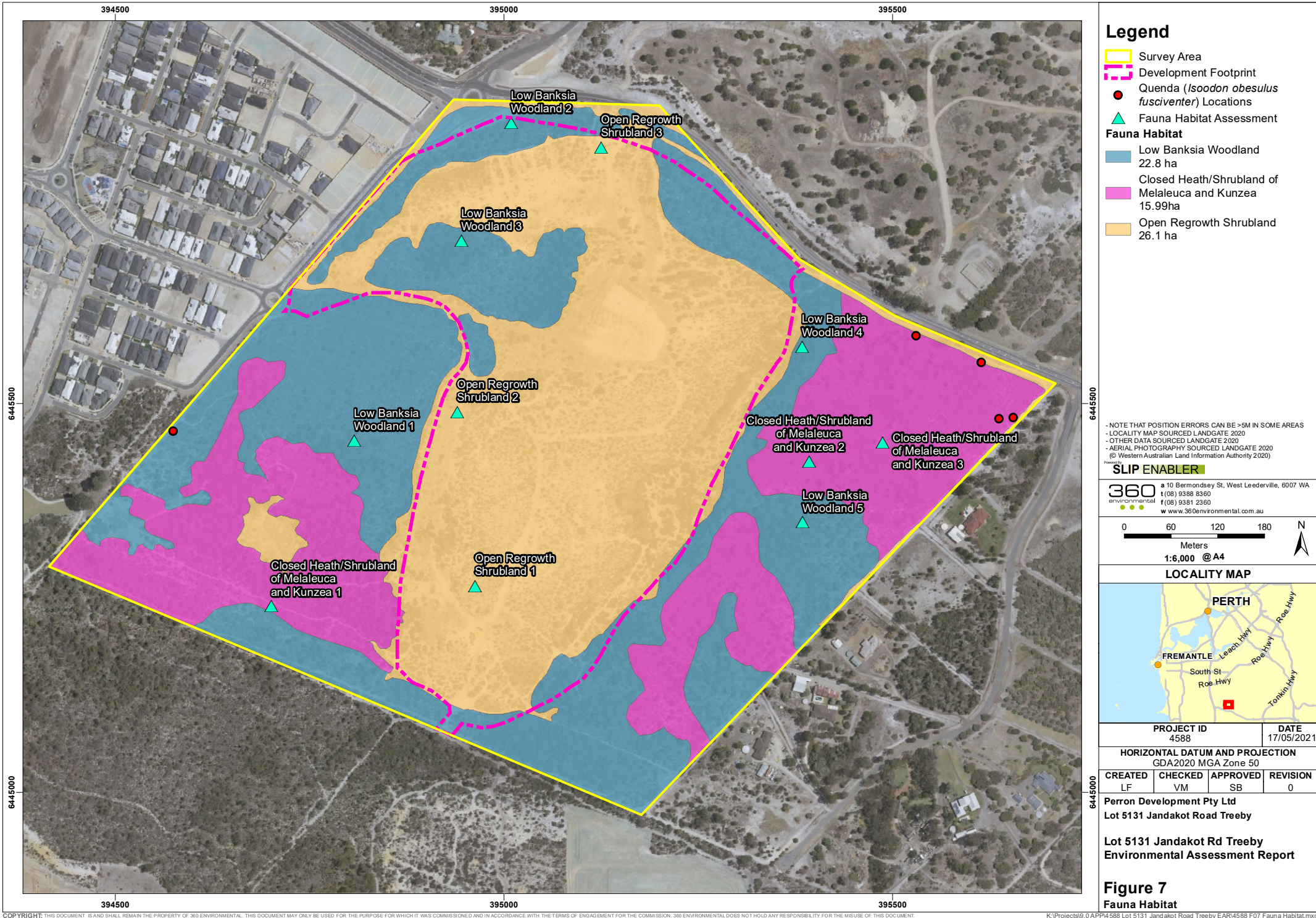
PROJECT ID 4588		DATE 17/05/2021	
HORIZONTAL DATUM AND PROJECTION GDA2020 MGA Zone 50			
CREATED LF	CHECKED VM	APPROVED SB	REVISION 0

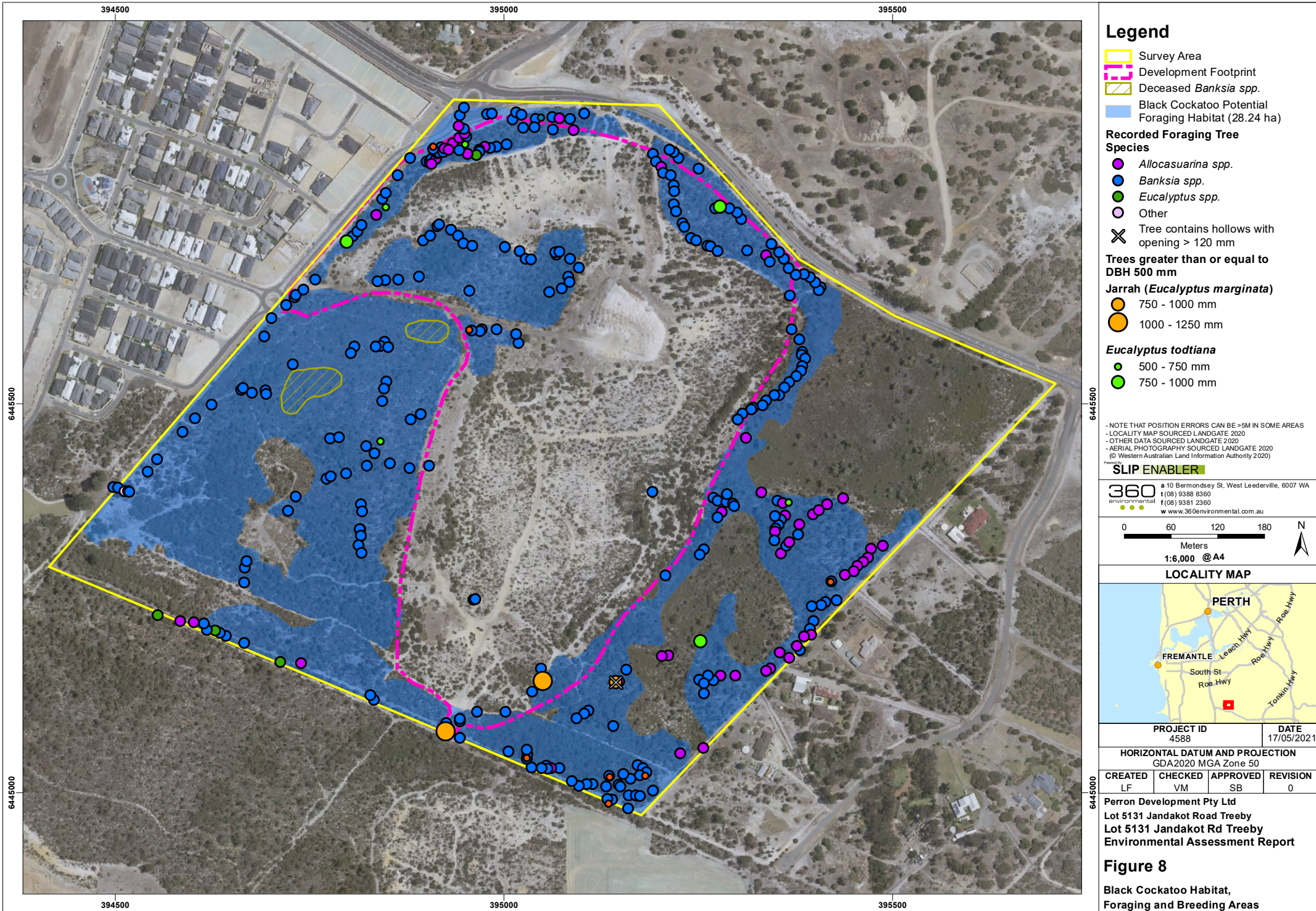
Perron Development Pty Ltd
 Lot 5131 Jandakot Road Treeby

Lot 5131 Jandakot Rd Treeby
Environmental Assessment Report

Figure 5
Vegetation Associations







Legend

- Survey Area
- Development Footprint
- Deceased *Banksia* spp.
- Black Cockatoo Potential Foraging Habitat (28.24 ha)

Recorded Foraging Tree Species

- Allocasuarina* spp.
- Banksia* spp.
- Eucalyptus* spp.
- Other
- Tree contains hollows with opening > 120 mm

Trees greater than or equal to DBH 500 mm

Jarraah (*Eucalyptus marginata*)

- 750 - 1000 mm
- 1000 - 1250 mm

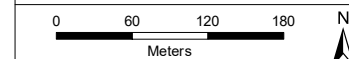
Eucalyptus totidiana

- 500 - 750 mm
- 750 - 1000 mm

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- LOCALITY MAP SOURCED LANDGATE 2020
- OTHER DATA SOURCED LANDGATE 2020
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2020
(© Western Australian Land Information Authority 2020)

Presented by **SLIP ENABLER**

360 environmental
a 10 Bermondsey St, West Leederville, 6007 WA
t (08) 9388 8360
f (08) 9381 2360
www.360environmental.com.au



LOCALITY MAP



PROJECT ID	DATE
4588	17/05/2021

HORIZONTAL DATUM AND PROJECTION	
GDA2020 MGA Zone 50	

CREATED	CHECKED	APPROVED	REVISION
LF	VM	SB	0

Perron Development Pty Ltd
Lot 5131 Jandakot Road Treeby
Lot 5131 Jandakot Rd Treeby
Environmental Assessment Report

Figure 8

Black Cockatoo Habitat,
Foraging and Breeding Areas

360

environmental



10 Bermondsey Street West Leederville WA 6007 **t** (+618) 9388 8360 **f** (+618) 9381 2360
PO BOX 14, West Perth WA 6872

w 360environmental.com.au **e** admin@360environmental.com.au

360 Environmental Pty Ltd

● people ● planet ● professional