360 environmental

Treeby District Structure Plan

Environmental Assessment Report

Prepared for:

Perron Developments Pty Ltd

December 2017

people • planet • professional

Document Reference	Revision	Prepared by	Reviewed by	Admin Review	Submitted to Client	
					Copies	Date
1405AB	A INTERNAL DRAFT	RHa	KC & SB	HT	1 Electronic (email)	30/05/2016
1405AB	B CLIENT DRAFT	RHa	CLE	-	1 Electronic (email)	1/06/2016
1405AC	C CLIENT FINAL	KC	-	HT	1 Hardcopy 1 Electronic (email)	30/06/2016
1405AD	C CLIENT FINAL	KC	SB	HT	1 Hardcopy 1 Electronic (email)	08/07/2016
1405AE	E CLIENT FINAL	KC	SB	AT	1 Hardcopy 1 Electronic (email)	07/09/2016
1405AF	F CLIENT FINAL (Incorporating Council Recommendations)	KC		TM	1 Electronic (email)	19/10/2017
1405AG	G CLIENT FINAL (Incorporating Council Recommendations)	KC		SH	1 Electronic (email)	05/12/2017

Executive Summary

360 Environmental Pty Ltd (360 Environmental) has been engaged by Perron Developments Pty Ltd (Perron) to prepare an environmental assessment report (EAR) to support the preparation and submission of the Treeby District Structure Plan (DSP) on behalf of the City of Cockburn. The DSP area includes approximately 461 ha within the City of Cockburn. The DSP covers landholdings bounded by Warton Road, Jandakot Road, Solomon Road, and Armadale Road, Banjup ('the study area').

The Treeby DSP has been identified by the City of Cockburn as a key initiative for 2016. This initiative has been the result of recent urban development within the Study Area and changes to the metropolitan strategic planning framework over the locality of Banjup.

The purpose of the EAR is to;

- Review a number of environmental assessments that have been undertaken over the Study Area;
- Identify the key environmental issues relevant to the DSP;
- Demonstrate the proposed change in land use will not result in adverse environmental impacts; and
- Recommend appropriate management responses to facilitate and guide future development and local structure planning within the Study Area.

Key Environmental Issues

Bush Forever

A large portion of the Study Area has been historically cleared and disturbed for sand quarrying operations. Approximately 95% of Bush Forever is proposed to be retained as part of future development. However, 10.5 ha within Lot 131 is proposed to be developed for residential purposes, of which approximately 40% (4.2 ha) is comprised of vegetation condition that is mapped as being ''Completely Degraded'. Additionally, approximately 47% of the Bush Forever area that is proposed to be developed has been previously cleared as a result of past sand quarrying activities and poorly rehabilitated (4.9 ha).

It is important to note that within Lot 131 approximately 1.8 ha (that is not currently in Bush Forever) is proposed to be included within the Public Open Space, of which approximately 90% (1.6 ha) is comprised of vegetation that is mapped as being in 'Excellent' condition.

Most of the vegetation remaining within the Study Area forms part of Bush Forever Site 390. In accordance with SPP 2.8, Bush Forever Site No. 390 falls under the 'Bush Forever Area (BFA) - Urban, industrial and resource development' site implementation category. The policy recognises that regionally significant bushland in this category is constrained by existing commitments, approvals and policies. Therefore, development

proposals should seek to achieve a reasonable balance between conservation and development or resource extraction through a negotiated outcome which has regard for the specific conservation values involved (WAPC 2010).

Given the above any proposed MRS rezoning of areas within the DSP that may result in unavoidable impacts on regionally significant bushland within Bush Forever Site No. 390 will be the subject of an impact assessment being undertaken. The impact assessment will be done in accordance with the process outlined in Appendix 1 of SPP 2.8 and the framework provided in Figure A of this report.

The primary purpose of this impact assessment will be to inform:

- The development of a statement of environment effect (guided by Appendix 1 of SPP 2.8);
- The development of a Bush Forever offsets package that will provide a net environmental outcome; and
- Assist in any future negotiated outcome over the final boundary for Bush Forever Site No. 390.

The provision of a Bush Forever offsets package will lead to a positive net environmental outcome. There are opportunities to provide an offset package through the addition of remnant vegetation (outside of Bush Forever) on site, purchase of vegetated land and the rehabilitation of land in the immediate vicinity to achieve an appropriate offset ratio, which will be determined through the application of Appendix 4 of SPP 2.8 and in consultation with the Department of Planning and the Office of the EPA..

Conservation Significant Flora

One conservation significant flora species has been found on site, *Caladenia huegelii* that is Threatened under the *Wildlife Conservation Act 1950* (WC Act) and *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). There are no *Caladenia huegelii* within Bush Forever Site 390 that within areas proposed to be cleared and all known *Caladenia huegelii* within Bush Forever Site 390 are to be retained.

Conservation Significant Fauna

The Study Area has been assessed as containing suitable habitat for a number of conservation significant fauna, including the Carnaby's, Baudin's and Forest Red-tailed Black Cockatoos.

The proposal to develop Lot 4 of the site has been referred to the Federal Department of Environmental under the EPBC Act 1999. As a result the proposal attracted a "not a controlled action" level of assessment, meaning the project is considered not to significantly impact on matters of national environmental significance such as black cockatoos.

Jandakot Underground Water Pollution Control Area

The Study Area forms part of the Jandakot Underground Water Pollution Control Area (JUWPCA). The majority of the Study Area is classified as P2 and the eastern portion of the site is classified as a Priority 1 (P1) area under the UWPCA.

The western portion of the Study Area (Calleya Estate) was originally classified as a Priority 2 (P2) area; however the Department of Water (DoW) formally endorsed the area to be reclassified to Priority 3 (P3) for urban development as it was demonstrated that the drinking water source will be protected.

Lot 1 (previously Lot 821) has recently been rezoned to 'Urban' under the MRS. During the MRS Amendment submission period, the DoW advised that following the WAPC's determination to rezone the site to 'Urban', the DoW would reclassify the site from a P2 to a P3 protection status and may recommend mitigation measures are applied to the development.

Provided the MRS rezoning process concludes that it is acceptable to rezone land to 'Urban' or 'Urban deferred', land proposed to be developed for residential housing can be reclassified from P2 to P3. The remaining areas proposed to become 'Urban' within the Study Area meet these requirements due to previous clearing and disturbance and the presence of the Calleya Estate that is zoned 'Urban'. Furthermore, the WAPC identified a substantial portion of the Study Area as 'Urban Investigation' and 'Urban Expansion' in the Draft Metropolitan Perth and Peel Sub-regional Planning Framework (WAPC 2015b). This indicates that the WAPC would consider more intensive development within the current P2 areas proposed to be rezoned to 'Urban'.

Furthermore, the following initiatives will ensure potential risks to the drinking water source are minimised:

- Extension of deep sewer to all lots;
- Implementation of water sensitive urban design principles including at-source stormwater infiltration, rain gardens and water harvesting;
- Preservation of large areas of existing native vegetation and wetland;
- Future urban design with incorporates the current trend for smaller lot sizes with reduced landscaping and irrigation areas (thereby reducing fertiliser and pesticide use);
- An on-going monitoring programme; and
- Exclusion of high risk land uses from the development area (e.g. service station).

Environmental Outcomes

Based on the high-level review undertaken, the following key environmental issues are identified:

- Terrestrial flora and vegetation;
- Terrestrial fauna; and
- Hydrological process.

Future development, in accordance with the DSP, will deliver the following key environmental outcomes:

- Provision of regional and local POS areas will result in establishing a consolidated, highly manageable and substantially sized reserve within the Study Area;
- Provision of a Bush Forever offsets package, which will lead to a net positive environmental outcome;
- Linear east-west open space along the south of Lot 131 and north of Lot 4 will connect with the state-owned 98 ha Bush Forever reserve located in the western portion of the site;
- Retention of the 17.5 ha of wetland and Bush Forever landholding in the eastern portion of Lot 131 provides a north-south connection in addition to the east-west connection established along the southern boundary;
- Development and implementation of an Open Space Masterplan and subsequent environmental management plans (i.e. Vegetation Management Plan, Wetland Management and Bushfire Management Plan) will ensure the long-term management and viability of the proposed conservation areas; and
- Application of water management initiatives and a framework to the guide future development of the site to ensure water sensitive urban design is achieved (i.e. LWMS and UWMP).

Other environmental issues (such as wetlands, acid sulfate soils, potential contamination etc) are capable of being resolved (i.e. avoided or managed) through site-specific investigations and detailed engineering drainage design.

Therefore, a key conclusion of this environmental assessment report is that, based on the review undertaken and the environmental outcomes proposed by the DSP and future land use planning, none of the key environmental issues pose a significant constraint to future residential development of the Study Area.

Table of Contents

List of Tables

List of Figures (within report)

List of Figures

List of Appendices

1 Introduction

1.1 Location

360 Environmental Pty Ltd (360 Environmental) has been engaged by Perron Developments Pty Ltd (Perron) to prepare an environmental assessment report (EAR) to support the preparation and submission of the Treeby District Structure Plan (DSP) on behalf of the City of Cockburn. The DSP area includes approximately 461 ha in the City of Cockburn.

The DSP covers landholdings bounded by Warton Road, Jandakot Road, Solomon Road, and Armadale Road, Banjup that is approximately 17.7 km south east of the Perth CBD (Figure 1) ('the study area'). The lots included in the DSP boundary are shown on Figure 1.

1.2 Planning Context

1.2.1 Draft Perth and Peel @ 3.5 Million Sub-Regional Planning Framework

The draft Perth and Peel @ 3.5 million suite of strategic land use planning documents aim to accommodate 3.5 million people by 2050. The WAPC identified a substantial portion of the Study Area as 'Urban Investigation' and 'Urban Expansion' in the Draft Metropolitan Perth and Peel Sub-regional Planning Framework (WAPC 2015b).

1.2.2 Draft Perth and Peel Green Growth for 3.5 million

In response to the draft Perth and Peel Sub-Regional Frameworks, the draft Perth and Peel Green Growth Plan for 3.5 Million (draft Green Growth Plan) has been prepared. The public submission period recently ended.

The draft Green Growth Plan proposes (DPC 2016):

- To secure upfront Commonwealth environmental approvals and streamline State environmental approvals for development required to support growth to 3.5 million people; and
- Provide protection of bushland, rivers, wildlife and wetlands through implementation of Strategic.

Much of the Study Area is identified for urban development and is consistent with the draft Perth and Peel at 3.5 Million Sub-Regional Frameworks which describes much of the site as Urban Investigation. However, there is some inconsistency over Lot 131 and it is noted that the boundary for the urban areas to be largely based on the Bush Forever boundary (Bush Forever Site 390).

An important conclusion of the environmental work done to date is that the distribution and condition of the native vegetation on the site does not correspond with the Bush Forever mapping. Conformance to the current Bush Forever boundary will result in an

area that will be impractical to manage from a conservation perspective. Furthermore, the current boundary will also result in a highly compromised urban development form, undermining some of the benefits of master planned development and integration of land use, environmental and transport planning in this location.

Therefore, a critical element of the proposed DSP and future land use planning will be to achieve an outcome which balances the key conservation values of the Study Area with the planning, social and economic considerations for the general area.

1.2.3 State Planning Policy 2.8: Bushland Policy for the Perth Metropolitan Region

The WAPCs *State Planning Policy 2.8: Bushland Policy for the Perth Metropolitan Region* (SPP 2.8) aims to ensure bushland protection and management issues are appropriately addressed and integrated with broader land use planning and decision-making by providing a policy and implementation framework for regionally significant bushland within the Perth Metropolitan Region (WAPC 2010).

SPP 2.8 recognises the protection and management of significant bushland areas as an integral part of the planning process and while doing so, it also seeks to integrate and balance wider environmental, social and economic considerations (WAPC 2010).

In accordance with SPP 2.8, Bush Forever Site 390 falls under the 'Bush Forever Area (BFA) - Urban, industrial and resource development' site implementation category. The policy recognises that regionally significant bushland in this category is constrained by existing commitments, approvals and policies. Therefore, development proposals should seek to achieve a reasonable balance between conservation and development or resource extraction through a negotiated outcome which has regard for the specific conservation values involved (WAPC 2010).

Therefore, any proposed MRS rezoning of areas within the DSP that may result in unavoidable impacts on regionally significant bushland within Bush Forever Site No. 390 will result in an impact assessment being undertaken. The impact assessment will be done in accordance with the process outlined in Appendix 1 of SPP 2.8 and the framework provided overleaf (Figure A).

The primary purpose of this impact assessment will be to inform

- The development of a statement of environment effect (guided by Appendix 1 of SPP 2.8);
- The development of a Bush Forever offsets package that will provide a net environmental outcome; and
- Assist in any future negotiated outcome over the final boundary for Bush Forever Site No. 390.

The provision of a Bush Forever offsets package will lead to a positive net environmental outcome. There are opportunities to provide an offset package through the addition of remnant vegetation (outside of Bush Forever) on site, purchase of vegetated land and the rehabilitation of land in the immediate vicinity to achieve an appropriate offset ratio,

which will be determined through the application of Appendix 4 of SPP 2.8 and in consultation with the Department of Planning and the Office of the EPA..

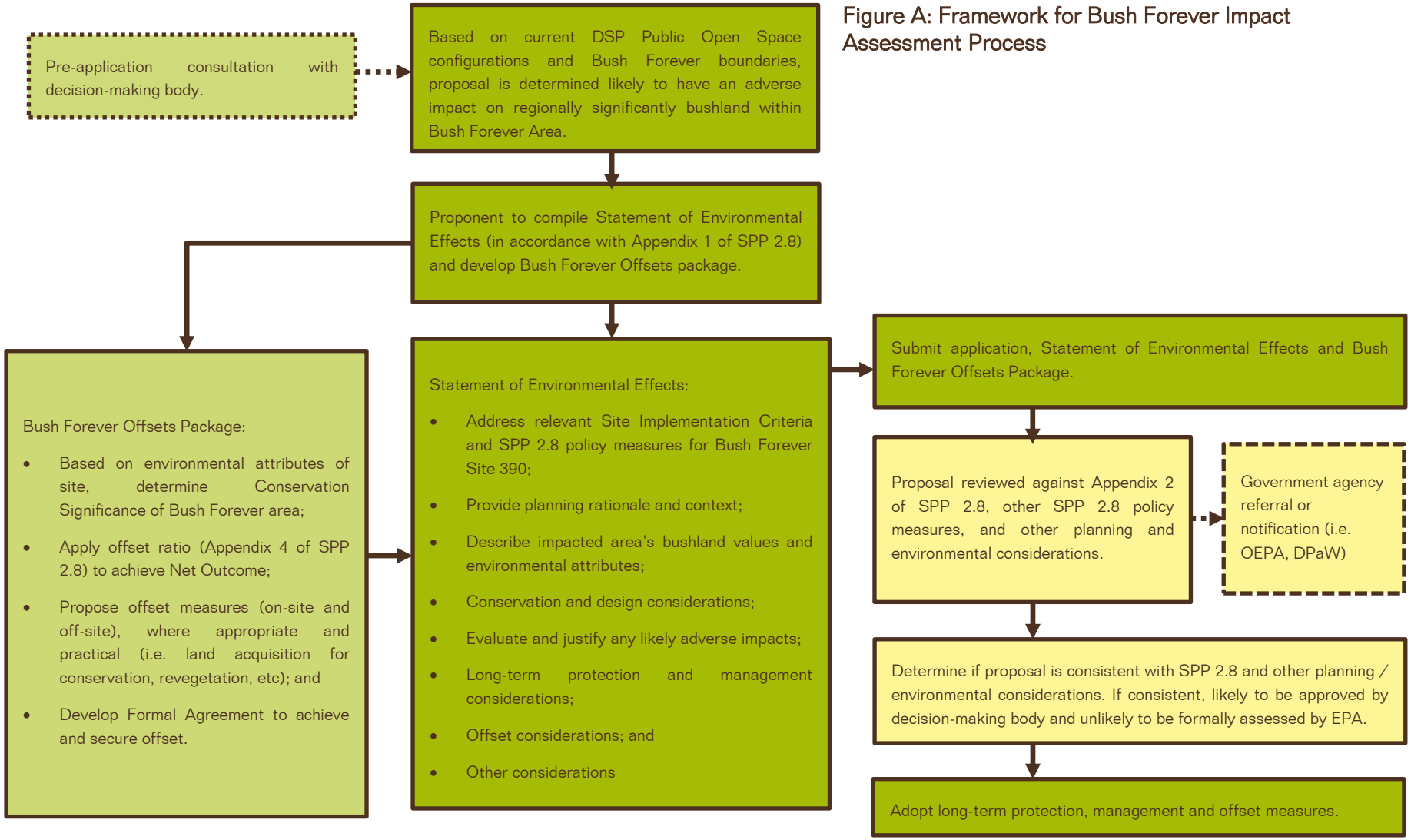


Figure A: Framework for Bush Forever Impact Assessment Process

1.3 Treeby District Structure Plan

The Treeby DSP has been identified by the City of Cockburn as a key initiative for 2016. This initiative has been the result of recent urban development within the Study Area and changes to the metropolitan strategic planning framework over the locality of Banjup.

1.3.1 Key Characteristics

The draft DSP consists of an existing regional reserve, the approved Calleya estate, a rural residential precinct and four potential development sites (Appendix A).

The draft DSP key site and proposal characteristics are summarised in Table 1.

Table 1: Key characteristics of the Treeby District Structure Plan

ASPECT	DESCRIPTION
Project Location	The DSP area is approximately 17.7 km south-east of the Perth CBD

DSP Context	Total DSP Area – 460 ha (approx.)
	The DSP consists of the following land uses:
	• Existing regional reserve – 118.5 ha
	• Approved residential development (Calleya Estate) – 105.9 ha
	• Existing Rural Residential precinct – 30 ha (approx.)
	• Four potential development sites:
	  ○ Lot 1 Armadale Road – 20.4 ha
	  ○ Lot 2 Armadale Road – 3.2 ha
	  ○ Lot 4 Armadale Road – 58.8 ha
	  ○ Lot 131 Jandakot Road – 64.8 ha
	• Proposed additions to the regional reserve:
	  ○ Lot 4 Armadale Road – 4 ha (approx.)
	  ○ Lot 131 Jandakot Road – 33 ha (approx.)
	• Primary regional roads
	• Primary schools
	• Neighbourhood / Local Centre
	• Active and local public open space
	• Powerline easement

ASPECT	DESCRIPTION
Responsible Authority	City of Cockburn

1.3.2 Objectives

In order to provide an effective planning framework for future development within the Study Area, the draft DSP has been prepared. The DSP establishes a framework to co-ordinate current and future land uses as well as the delivery of infrastructure.

The overarching objectives of the DSP will be to:

- Provide a high level strategic, spatial planning framework to coordinate the development of land and provision of district level services within the Urban Precinct;
- Establish the basic road network and interconnectivity across the precinct (including access from Armadale Road and Jandakot Road);
- Establish the basic structure / location of district open space and conservation areas;
- Establish the location and provision of school sites;
- Identify potential commercial nodes and the basic land use allocation through the remainder of the area; and
- Guide the preparation and coordination of future local structure planning.

1.4 Local Structure Plans in the Study Area

1.4.1 Calleya Estate

The Calleya Estate Local Structure Plan (LSP) area is zoned 'Development' under the *City of Cockburn Town Planning Scheme No. 3* (TPS No. 3) and 'Urban' under the Metropolitan Region Scheme (MRS). This Estate consists of Lot 9014 (previously Lot 132) Fraser Road, Lot 9016 (previously Lot 9002) Jandakot Road and 9012 (previously Lot 9004) Armadale Road, Banjup. It is approximately 144 ha in size and covers the former Banjup sand quarry site.

This LSP area is proposed to be redeveloped into a residential estate by Stocklands and will include community and educational facilities, and pedestrian connections. The LSP was endorsed by the Western Australian Planning Commission (WAPC) in October 2013. An amendment to the LSP, which primarily consisted of design reconfigurations and an increase in dwelling density, was endorsed by the WAPC in March 2016.

1.4.2 Lot 1 (Previously Lot 821)

Lot 1 on Plan 407384 (previously Lot 821) is zoned 'Urban' under the MRS. The Housing Authority has prepared a LSP to facilitate development of Lot 1 for residential housing.

1.5 Past Environmental Assessments and Approvals

1.5.1 Environmental Assessment and Studies

A number of environmental assessments have been undertaken over the Study Area. The environmental studies undertaken within the Study Area (based on the Lot numbers at the time of report being prepared) are listed below:

- Targeted Flora and Vegetation Survey for Lots 132, 9002 and 9004 Armadale Road, Banjup by RPS in 2010;
- Flora and Vegetation Survey for Lots 1 and 868 Armadale Road, Banjup in 2010;
- Level 2 Flora and Vegetation Survey of Lot 4 Armadale Road, Banjup by ENV Australia in 2013;
- Level 2 Flora and Vegetation Survey of Lot 131 Jandakot Road, Banjup by 360 Environmental in 2015;
- Level 2 Flora and Vegetation Survey of Lot 467 Jandakot Road, Banjup by Brian Morgan on behalf of RPS in 2011;
- Level 1 Flora and Vegetation Survey and Fauna Survey for Lot 821 Armadale Road, Banjup by PGV Environmental in 2012;
- Targeted Carnaby's Black Cockatoo and Graceful Sun Moth Fauna Surveys for Lots 1 and 868 and Lots 132, 9002 and 9004 Armadale Road, Banjup by RPS in 2010;
- District Water Management Strategy (DWMS) for Lots 1, 132, 9002, 9004, 132 Armadale, Banjup by Emerson Stewart Consulting in 2011;
- Local Water Management Strategy (LWMS) for Lots 9004 Armadale Road, Lot 9002 Jandakot Road and Lot 132 Fraser Road, Banjup by Emerson Stewart Consulting in 2013;
- DWMS for Lot 821 Armadale Road, Banjup by Hyd2o in 2013;
- DWMS for Lots 2 and 4 Armadale Road, Banjup by JDA Hydrology Consultants in 2015;
- EAR for Lots 1, 868, 132, 9002 and 9004 Armadale Road, Banjup;
- EAR for Lots 2 and 4 Armadale Road, Banjup by 360 Environmental in 2014;
- EAR Lot 821 Armadale Road, Banjup by PGV Environmental in 2012; and

- Environmental Pre-Referral Document for Sand Extraction for Lot 467 Jandakot Road and Lot 140 Armadale Road by RPS in 2013.

1.5.2 Environmental Approvals

The Calleya Estate and Lot 1 Armadale Road (the very south-western Lot) was referred to the Environmental Protection Authority (EPA) as part of the MRS rezoning to 'Urban' (MRS Amendment 1221/41). The MRS amendment was referred to the EPA for its consideration. In September 2011, the EPA advised the scheme amendment did not require formal assessment and no public advice was given.

Lot 1 (previously Lot 821) was referred to the EPA as part of the MRS rezoning to 'Urban' (MRS Amendment 1289/57). The MRS amendment was referred to the EPA for its consideration. In May 2015, the EPA advised the scheme amendment did not require formal assessment and that it had based its decision on the following:

- Remnant vegetation along the south western and southern boundaries being retained as well as the area of remnant vegetation on the eastern side of the site, containing *Caladenia huegelii*; and
- The District Water Management Strategy for the site has been approved by the Department of Water and the proposed amendment is in accordance with the Draft State Planning Policy No. 23 – Jandakot Groundwater Protection.

Lot 4 Armadale Road was referred under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) in 2013 for potential impacts on Matters of National Environmental Significant (MNES). The proposed clearing for residential development of Lot 4 (excluding the Bush Forever) received 'not a controlled action' on 16 December 2016 (Appendix B).

1.6 Purpose of this Report

The purpose of this environmental assessment is to:

- Demonstrate a clear understanding of the key environmental issues relevant to the Study Area and the draft DSP;
- Provide an overview of the general environmental features of the Study Area through review of existing information and desktop assessment;
- Identify and map the environmental constraints and opportunities associated with the DSP and Study Area;
- Reference past environmental assessments and environmental approvals within the Study Area;
- Demonstrate the proposed change in land use will not result in adverse environmental impacts;

- Develop and recommend appropriate environmental implementation mechanisms to be incorporated into the DSP and guide future rezoning and local structure planning within the Study Area; and
- Identify any further technical studies that may be required to support future local structure planning within the Study Area.

2 Key Environmental Legislation and Policies

2.1 State Legislation

2.1.1 Environmental Protection Act 1986

The *Environmental Protection Act 1986* (EP Act) is the key legislative tool for environmental protection in Western Australia. It is administered by the 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.

Any future rezoning within the DSP area will be referred and assessed by the EPA in accordance with Section 48 of the EP Act and the *Planning and Development Act 2005*.

2.1.2 Relevant Legislation and Regulations

Future development within the DSP area will be required to comply with the requirements of other relevant state legislation and regulations. Table 2 provides a summary of the key state legislation and regulations relevant to the future residential development.

Table 2: Key State Legislation

Key Legislation	Responsible Government Agency	Aspect
Aboriginal Heritage Act 1972	Department of Aboriginal Affairs	Archaeological and ethnographic heritage
Aboriginal Heritage Regulations 1974	Department of Aboriginal Affairs	Archaeological and ethnographic heritage
Agricultural and Related Resources Protection Act 1976	Department of Agriculture	Weeds and feral animals
Bush Fires Act 1954	Department of Fires and Emergency Services	Bush fire control
Conservation and Land	Department of Park and	Flora and fauna / habitat /

KEY LEGISLATION	RESPONSIBLE GOVERNMENT AGENCY	ASPECT
Management Act 1984	Wildlife Department of Agriculture	weeds / pests / diseases
Conservation and Land Management Regulations 2002	Department of Park and Wildlife Department of Agriculture	Flora and fauna / habitat / weeds / pests / diseases
Contaminated Sites Act 2003	Department of Environment Regulation	Management of contaminated soils and water
Environmental Protection Act 1986	Environmental Protection Authority Department of Environmental Regulation	Part IV – Environmental Impact Assessment Part V – Works Approvals and Licences
Environmental Protection (Clearing of Native Vegetation) Regulations 2004	Department of Environmental Regulation	Clearing of native vegetation
Environmental Protection (Noise) Regulations 1997	Department of Water and Environmental Regulation	Noise emissions
Planning and Development Act 2005	Department of Planning	Structure planning and subdivision approval.
Public Health Act 2016	Department of Health	Provides a framework for the regulation of public health.
Rights in Water and Irrigation Act 1914	Department of Water	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

KEY LEGISLATION	RESPONSIBLE GOVERNMENT AGENCY	ASPECT
		throughout the state.
Wildlife Conservation Act 1950	Department of Parks and Wildlife	Wildlife conservation and protection

2.1.3 Relevant Standards, Guidelines and Policies

Future development within the DSP is subject to compliance with applicable standards and guidelines developed by the State's regulators to assist proponents and the public to understand the minimum requirements for environmental protection. The following table details the key standards, guidelines and state planning policies relevant to future residential development.

Table 3: Relevant Standards, Guidelines and Policies

DOCUMENT	DESCRIPTION
EPA Guidance Statements	
Guidance Statement No. 3: *Separation Distances between Industrial and Sensitive Land Uses* (EPA 2005)	Provides advice on the use of generic separation distances (buffers) between industrial and sensitive land uses to avoid conflicts between incompatible land uses.
Guidance Statement No. 6: *Rehabilitation of Terrestrial Ecosystems* (EPA 2006)	Provides guidance to ensure the return of biodiversity in rehabilitated areas by increasing the quality, uniformity, and efficiency of standards and processes for rehabilitation of native vegetation in Western Australia and to allow more effective monitoring and auditing of outcomes.
Guidance Statement No. 33: *Environmental Guidance for Planning and Development* (EPA 2008)	Provides information and advice to assist land use planning and development processes to protect, conserve and enhance the environment. Describes the processes the EPA may apply under the EP Act to land use planning and development in Western Australia, and the environmental impact assessment process applied by the EPA to schemes.
Guidance Statement No. 41: *Aboriginal Heritage*	Provides guidance on the EPA's position on the assessment of Aboriginal heritage and information that the EPA will consider when assessing proposals

DOCUMENT	DESCRIPTION
Assessment (EPA 2004b)	where Aboriginal heritage is a relevant environmental factor.
Guidance Statement No. 51: *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA 2004c)	Provides guidance and information on the EPA's expected standards and protocols for terrestrial flora and vegetation surveys to environmental consultants and proponents.
Guidance Statement No. 55: *Implementing Best Practice in Proposals submitted to the Environmental Impact Assessment Process* (EPA 2003)	Provides guidance on the EPA's position on the use of best practice to protect the environment, and the approach that the EPA will take when assessing best practice implementation in proposals.
Guidance Statement No. 56: *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia* (EPA 2004d)	Provides guidance and information on the EPA's expected standards and protocols for terrestrial flora and vegetation surveys to environmental consultants and proponents.
EPA Bulletins	
Environmental Protection Bulletin No. 1: *Environmental Offsets* (EPA 2014b)	Clarifies how the EPA will consider offsets through the environmental impact assessment process.
Environmental Protection Bulletin No. 16: *Minor or preliminary works and investigation work* (EPA 2011b)	Clarifies what information a proponent needs to submit to the EPA if it wants the EPA's consent to undertake minor or preliminary works.
State Planning Policies	
State Planning Policy 2.3: *Jandakot Groundwater Protection Policy* (WAPC 2003)	Provides guidance to ensure development over the Jandakot public groundwater supply mound is compatible with the long term us of the groundwater for human consumption.

DOCUMENT	DESCRIPTION
State Planning Policy 2.8: *Bushland Policy for the Perth Metropolitan Region* (WAPC 2010)	Provides a policy and implementation framework that will ensure bushland protection and management issues in the Perth Metropolitan Region are appropriately addressed and integrated with broader land use planning and decision making.
State Planning Policy 2.9: *Water Resources* (WAPC 2006)	Provides clarification and additional guidance to planning decision-makers for consideration of water resources in land use planning strategy.
State Planning Policy 3.7: *Planning in Bushfire Prone Areas* (WAPC 2015)	Provides guidance on the implementation of effective risk-based land use planning and development to preserve life and reduce the impact of bushfire on property and infrastructure.
State Planning Policy 4.1 (Draft): *State Industrial Buffer (Amended)* (WAPC 2009a)	The policy applies state wide, to planning decision-making, and proposals which seek to provide for new industrial areas and uses, and essential infrastructure, sensitive land uses in proximity to existing industrial areas.
State Planning Policy 5.3: Land Use Planning in the Vicinity of Jandakot Airport (WAPC 2017)	This policy applies to land in the vicinity of Jandakot Airport, which is, or may be in the future affected by aircraft noise associated with the movement of aircraft. The policy measures apply to land within the 20 Australian Noise Exposure Forecast (ANEF) contour and frame area.
State Planning Policy 5.4: *Road and Rail Transport Noise and Freight Considerations in Land Use Planning* (WAPC 2009b)	The policy aims to promote a system in which sustainable land use and transport are mutually compatible.

2.2 Commonwealth Legislation

2.2.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) protects Matters of National Environmental Significance (MNES), and is administered by

the Commonwealth Minister of the Environment. If an action is likely to have a significant impact on any MNES a referral to the Commonwealth Department of Energy and Environment (DoEE) is required.

Future development of the site will be required to consider undertaking a significant impact test against the Commonwealth Significant Impact Guidelines 1.1 – Matters of National Environmental Significance prior to determining whether to refer a proposal to the Commonwealth.

3 Existing Environment

3.1 Climate

The closest official Bureau of Meteorology (BoM) weather station currently operating is Jandakot Aero Station, which is located approximately 3 km north-west of the Study Area. The climate is identified as warm Mediterranean, with mean minima of approximately 6.7°C during July and mean maxima of 31.7°C during February (BoM 2016). Rainfall totals approximately 824.3 mm per annum (BoM 2016).

3.2 Zoning

The western portion of the site known as the Calleya Estate area is zoned 'Urban' under the MRS and 'Development' under the TPS (Figure 2). Lot 1 to the south-west of the Calleya Estate is zoned 'Urban' under the MRS, and 'Urban Deferred' under the TPS.

Lot 1 on Plan 407384 (previously Lot 821) has recently been zoned 'Urban' under the MRS and 'Resource' under the TPS.

The remainder of the site is a mix of 'Rural-Water Protection' and 'Parks and Recreation' under the MRS and 'Resource' and 'Region Reserve- Parks and Recreation' under the TPS (Figure 2). The Parks and Recreation boundaries under the MRS and TPS align within the site and are also classified as 'water catchment' special areas.

The objective of the 'Rural-Water Protection' zone is to ensure there is no increased risk of contamination of the water source (WAPC 2015a). The use and development of the 'Resource' zoned land must be in accordance with the *Statement of Planning Policy No. 2.3- Jandakot Groundwater Protection Policy*.

A MRS Amendment proposal to rezone Lots 2 and 4 Armadale Road from 'Rural- Water Protection' to 'Urban' will be lodged in the near future. Lot 131 Jandakot Road is also proposed to be rezoned from 'Rural- Water Protection' to 'Urban' in the near future.

3.3 On-site and Surrounding Land Uses

3.3.1 On-site Land Uses

The site contains three active mining tenements for sand quarries. Information about the current mining tenements within the site is presented in Table 4 below. A number of sand quarries registered through the Department of Mines and Petroleum (DMP), and that are no longer active, previously occurred on the Calleya Estate LSP area, the Housing Authority LSP Area (Lot 1, previously 821), Lot 2 and 4 Armadale Road (DMP 2016). Lot 131 Jandakot Road also contained a sand quarry that was not administered under a mining tenement due to the extraction of raw materials occurring on private land.

Table 4: Information about mining tenements within Study Area (Source: DMP 2016).

Tenement Number	Material Extraction	Lot Number/s	Date of Grant	Tenement Status	Area (ha)	Tenement Expiry
M70/1088	Sand	L467	24/08/2010	LIVE	9	23/08/2031
M70/1142	Sand	L467/ L139	24/08/2010	LIVE	64.9	23/08/2031
M70/357	Sand	L140	11/03/1992	LIVE	16.7	10/03/2034

In addition to the mining tenements for quarrying (as described above in Table 4), Lot 4 is part of the previous Midland Brick, and the Boral Brick works facility. Lots 62 to 75 contain special rural residences, and Lot 614 in the south-eastern corner is Banjup Memorial Reserve.

The remainder of the land consists of bushland and cleared areas that are unused. As a result of past land uses, large portions of the Study Area have been extensively disturbed.

3.3.2 Surrounding Land Uses

Residential housing exists to the south-west of the Study Area. Mixed business and light industrial and Service and Light Industry land uses exist west of the Study Area and the Jandakot Industrial Area exists directly to the west (Figure 3). The land to the north, south and west of the Study Area consists of special rural landholdings and areas reserved for Parks and Recreation. Residential housing also exists as close as 445 m east of the Study Area and outside the Jandakot Underground Water Pollution Control Area (UWPCA). An active sand quarry exists to the north of Lot 131.

The site falls outside of the Water Corporation Waste Water Pump Station odour buffers (Figure 3). Review of the City of Cockburn Intramaps identifies that the only buffers that fall within the Study Area are associated with wellhead protection zones in the north-west, south-west and north-east of the Study Area (Figure 3).

The boundary of Jandakot Airport exists as close as 445 m north of the Study Area. Pursuant to the adopted *State Planning Policy 5.3- Land Use Planning in the Vicinity of Jandakot Airport* (SPP 5.3), the Study Area complies with the policy provisions for residential housing as it sits outside the 'Core Area 20 Australian Noise Exposure Forecast (ANEF)' boundary (Figure 3). The Study Area is within the SPP 5.3 'Frame Area' that identifies residential development as being compatible with.

It should be noted that the ANEF zones shown are from the most recent Jandakot Airport Master Plan (JAH 2014).

3.4 Topography, Landforms and Soils

3.4.1 Topography

The topography of the site ranges from 27 m Australian Height Datum (AHD) in the north-western corner and 28 m AHD in the north-eastern corner to 44 m AHD in the south-eastern corner and north-western corner (Figure 4) (DoW 2015). Much of the Study Area has been used for sand extraction. Therefore, the natural landform and elevation has been significantly altered. The mined areas have been levelled out following completion of extraction.

3.4.2 Landforms and Soils

The Department of Agriculture and Food Western Australia (DAFWA) has mapped the entire site as forming part of the Bassendean System (DAFWA 2012). The Bassendean System is described as occurring on the Swan Coastal Plain from Busselton to Jurien and consists of sand dunes and sand plains with pale deep sand, semi-wet and wet soil (Figure 5).

3.4.3 Acid Sulfate Soils

Acid sulfate soil (ASS) mapping undertaken by the DER indicates that the site is within an area mapped as being of "moderate to low risk of ASS" (DER 2016). Areas mapped as being of "high to moderate risk of ASS" occur as close as 50 m south of the site.

3.5 Hydrology

3.5.1 Groundwater

Review of the Department of Water (DoW) groundwater mapping for Perth using historical minima contours found that the depth to groundwater sits at approximately 15 m below ground level (bgl) in the north-western portion of the Study Area, to 16 m bgl in the north-western portion of Lot 140 and ranges to 2 m bgl in the north-eastern portion of the Study Area (DoW 2016a).

3.5.2 Public Water Supply Areas

The Study Area is located in the Jandakot UWPCA and subject to the provisions of the *Statement of Planning Policy No. 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).

The UWPCA occupies a total area of 7,400 ha, including more than 4,000 ha within the City of Cockburn. The UWPCA was proclaimed in 1975 under the *Metropolitan Water Supply Sewerage and Drainage Act 1909*. Water from the mound is extracted by the Water Corporation as part of the Perth Metropolitan integrated water supply system (IWSS).

The DoW is the lead agency in protecting catchments for water supply in Western Australia. The DoW supports the Australian Drinking Water Quality Guidelines (ADWQG) barrier approach to water quality protection, with catchment management being the first barrier of protection. Subsequent barriers include water storage, treatment and sterilization. The catchment management measures are also supported by Wellhead Protection Zones (WPZ) around public water supply wells (JDA 2016).

WQPN 25 sets out the groundwater catchment 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 the 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 PDWSAs where the land is zoned for urban and commercial or light industrial uses.

WQPN 25 sets out '**protection zones**' that are defined in the immediate vicinity of drinking water extraction points (DoW 2016). Protection zones can be located within P1, P2 or P3 areas. There are two types of protection zones: WPZs defined for groundwater sources; and reservoir protection zones (RPZs) defined for surface water sources.

Three WPZs exist in the north-west, south-west and north-east of the Study Area and a number of wellhead protection zones surround the site (Figure 3) (DoP 2014a). Of these only two fall within the footprint proposed to be developed for residential housing and the wellhead protection zone in Lot 467 will remain undisturbed in public open space (POS).

3.5.2.1 Reclassification of Priority Areas

The '*Draft State Planning Policy 2.3 Jandakot Groundwater Protection Policy*' states that "proposals to rezone land may be supported where they meet the following criteria:

- Large land holdings that were previously cleared and disturbed;
- Land directly adjacent to already developed areas; and
- Land identified as appropriate for more intensive development through strategic planning instruments such as regional or sub-regional structure plan."(DoP 2014a).

The western portion of the Study Area (Calleya Estate) was originally classified as a P2 area; however the DoW formally endorsed the area to be reclassified to P3 for urban development as it was demonstrated that the drinking water source will be protected. The majority of the Study Area is classified as P2 and the eastern portion of the site is

classified as a P1 area under the UWPCA (Figure 6) (DoP 2014a). The Calleya Estate has since been reclassified from P2 to P3 through the State planning process and reflects the amended draft SPP 2.3 (DoP 2014a).

In relation to Lot 1 (previously Lot 821), the site has recently been rezoned to 'Urban' under the MRS. During the MRS Amendment submission period, the DoW advised that following the WAPCs determination to rezone the site to 'Urban', the DoW would reclassify the site from a P2 to a P3 protection status and may recommend mitigation measures are applied to the development. That is, management measures beyond those normally recommended for P3 areas and which reflect the additional risk posed to the drinking water source by the proposed development. Such measures would be addressed in water management strategies/plans at later stages of the planning process.

Provided the MRS rezoning process concludes that it is acceptable to rezone land to 'Urban' or 'Urban deferred', land proposed to be developed for residential housing can be reclassified from P2 to P3. T, The land presents as an important and likely site for progression to an Urban zoning given (JDA 2016):

- Identification of a Study Area within the Draft South Metropolitan Peel Sub Regional Framework and classification of this land within short to medium term development timeframes;
- The proximity of the site to a high order activity centre, railway station and freeway interchange;
- The site represents a logical extension of development east of the developing Calleya Estate;
- A large portion of the site has been cleared and disturbed for sand quarrying operations;
- Service infrastructure within the area can accommodate the additional development; and
- Compliance with the criteria for urbanisation included within draft State Planning Policy 2.3 – Jandakot Groundwater Protection.

The following initiatives will be applied to ensure any potential groundwater impacts arising from urban development are minimised (JDA 2016):

- Extension of deep sewer to all lots;
- Application of water sensitive urban design principles including at-source stormwater infiltration, rain gardens and water harvesting;
- Appropriate road design and treatments to minimise the risk of high speed car collisions (which might result in oil or petrol spillage);
- Provision of lot types which maximise land use efficiency and reduce excessive garden area and hence fertiliser and pesticide use;

- Encourage home purchasers to use native plants for landscaping (which will also reduce fertiliser and pesticide use);
- Use of promotional information to land purchasers aimed at raising awareness of water issues;
- An on-going monitoring programme; and
- Exclusion of high risk land uses from the development area (e.g. service station).

3.5.3 Surface Water and Drainage

The DoW has not classified any parts of the Study Area as being subject to inundation (Figure 7) (DoW 2012). The DoW has identified a number of earth dams within the site; however the ones within the Calleya Estate no longer exist (Figure 7). The earth dams within Lot 4 Armadale Road were previously used as effluent ponds.

Hydrography mapping undertaken by the DoW indicates that no rivers, creeks or streams intersect the site (DoW 2012).

3.5.4 Wetlands

The Department of Parks and Wildlife (DPaW) geomorphic wetland dataset shows that the Study Area contains three Resource Enhancement Wetlands (REWs) and one Conservation Category Wetland (CCW) (Figure 7) (DPaW 2016a). Details of these wetlands are described below:

Table 5: Information about Geomorphic Wetlands within the Study Area

Wetland UFI	Wetland Management Category	Wetland type	Lot No(s) in site
6881	REW	Sumpland	9016
6781	REW	Dampland	9014
13328	REW	Dampland	4, 62-75,131,467
7169	CCW	Dampland	467

Several Multiple Use Wetlands (MUWs), REWs and CCWs surround the Study Area. The site is not listed as a Ramsar site or listed under the Directory of Important Wetlands (DPaW 2014; DoE 2008).

3.6 Terrestrial Flora and Vegetation

3.6.1 Interim Biogeographical Regionalisation of Australia

The Interim Biogeographic Regionalisation for Australia (IBRA) divides Australia into 89 bioregions based on major biological and geographical/ geological attributes (Thackway

& Cresswell 1995). These bioregions are subdivided into 419 subregions, as part of a refinement of the IBRA framework (DSEWPaC 2012).

The site is located in the Perth subregion (SWA02) of the Swan Coastal Plain bioregion (Thackway & Cresswell 1995). The Perth subregion is composed of colluvial and aeolian sands, alluvial river flats and coastal limestone (Mitchell *et al*. 2002). Vegetation can be characterised by heath and/or Tuart woodlands on limestone, Banksia and Jarrah-/ Banksia woodlands on Quaternary marine dunes of various ages and Marri on colluvial and alluvials (Mitchell *et al*. 2002).

3.6.2 Broad Vegetation Types

Mapping of the vegetation of the Perth region of Western Australia 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 Shepherd vegetation mapped within the Study Area. The Shepherd *et al.* (2001) vegetation type is described below, and its representation within the State, Bioregion and subregion is shown in Table 6.

- '**Bassendean_1001**': Medium very sparse woodland; *Eucalyptus marginata* (Jarrah), with low woodland; *Banksia* & *Casuarina* (Shepherd *et al*. 2001).

Table 6: Broad Vegetation Types within the Study Area and its State and Regional Representation (Government of Western Australia 2014)

	Pre-European area (ha)	Current extent (ha)	Remaining (%)	Current extent % in IUCN Class I-IV Reserves
Vegetation Types (Beard 1981/ Shepherd *et al*. 2001) in the state				
1001	57,410.23	13,240.22	23.06	1.14
Vegetation Types (Beard 1981/ Shepherd *et al*. 2001) in the Swan Coastal Bioregion				
1001	57,410.23	13,240.22	23.06	1.14
Vegetation Types (Beard 1981/ Shepherd *et al*. 2001) in the Perth Subregion				
1001	57,410.23	13,240.22	23.06	1.14

Vegetation complexes of the Drummond Botanical Subdistrict, in which the Swan Coastal Plain occurs, have been mapped by Heddle *et al*. (1978). Mapping by Heddle *et al*. (1980) is based on the relationship to the landform-soil units determined by Churchward & McArthur (1980). The Study Area contains two Swan Coastal Plain

vegetation complexes which are associated with the underlying soil profile. These are described below and their representation is shown in Table 7:

- 'Bassendean Complex - Central and South' that covers majority of the Study Area: vegetation ranging from woodland of *Eucalyptus marginata - Allocasuarina fraseriana - Banksia spp*. to low woodland of Melaleuca spp. and sedgelands on the moister sites. This area includes the transition of *Eucalyptus marginata* to *Eucalyptus todtiana* in the vicinity of Perth (Heddle *et al*., 1980); and
- **'Southern River Complex'** that covers the eastern portion of the Study Area: open woodland of *Corymbia calophylla*, *Eucalyptus marginata, Banksia spp.* with fringing woodland of *Eucalyptus rudis – Melaleuca rhaphiophylla* along creek beds.

Table 7: Vegetation Complex within the Study Area and its representation in the Swan Coastal Bioregion (LBP 2013)

	Pre-European area (ha)	Current extent (ha)	Remaining (%)	Current extent Secure Tenure Reserves (%)
Bassendean Complex–Central and South	87,392.73	24,206.24	27.70	2.57
Southern River Complex	57,171.55	11,254.99	19.69	2.16

Within constrained areas on the Swan Coastal Plain, the EPA has set a threshold for retention of 10% of the pre-existing extent of native vegetation (EPA 2008). The site is considered to be a constrained area as it is within the Perth metropolitan region and contains, and adjoins, urban areas. There is a reasonable expectation that development will be able to proceed. All the current vegetation extents are greater than the abovementioned 10% threshold.

3.6.3 Vegetation Associations

A number of flora and vegetation surveys have been undertaken over the Study Area. These include the following:

- Targeted Flora and Vegetation Survey for Lots 132, 9002 and 9004 Armadale Road, Banjup by RPS in 2010;
- Flora and Vegetation Survey for Lots 1 and 868 Armadale Road, Banjup in 2010;
- Level 2 Flora and Vegetation Survey of Lot 4 Armadale Road, Banjup by ENV Australia in 2013;
- Level 2 Flora and Vegetation Survey of Lot 131 Jandakot Road, Banjup by 360 Environmental in 2015;

- Level 2 Flora and Vegetation Survey of Lot 467 Jandakot Road, Banjup by Brian Morgan on behalf of RPS in 2011; and
- Level 1 Flora and Vegetation Survey for Lot 821 Armadale Road, Banjup by PGV Environmental in 2012.

Based on a number of surveys, figure 8 shows the vegetation associations identified within the site. A number of Lots within the Study Area have not been surveyed, however these form part of the regional POS areas that will be retained as well as areas not currently proposed for residential development under the draft DSP. Table 8 describes the vegetation associations within each of the Lots surveyed.

Table 8: Vegetation Associations within the Study Area

Map Reference Vegetation Code	Vegetation Association
Lot 4 Armadale Road, Banjup (ENV Australia 2013)	
Ba	*Baumea articulata* population
BaBmEf	Low woodland of *Banksia menziesii* and *B. attenuata* over *Stirlingia latifolia*, *Eremaea fimbriata*, *Allocasuarina humilis*, *Patersonia occidentalis* and *Lyginia imberbis*
BaBm	Low open woodland of *Banksia menziesii* and *B. attenuata* over *Eremaea pauciflora* var. *pauciflora*, *Scholtzia involucrata*, *Stirlingia latifolia* and *Astroloma ciliatum*
Rehab	Planted mixed shrubs of *Kunzea glabrescens*, *Acacia pulchella*, *Adenanthos cygnorum*, *Bossiaea eriocarpa*, *Gompholobium tomentosum* and *Stirlingia latifolia*
MpBi	Low open forest of *Melaleuca preissiana* and *Banksia ilicifolia* over *Dasypogon bromeliifolius*, *Astartea scoparia*, *Lepidosperma squamatum*, *Xanthorrhoea preissii* and *Phlebocarya ciliata*
Lot 131 Jandakot Road, Banjup (360 Environmental 2015)	
BaEt	Low woodland of *Banksia attenuata*, *Eucalyptus todtiana* and *Allocasuarina fraseriana* over *Xanthorrhoea preissii*, *Macrozamia riedlei*, *Hibbertia hypericoides*, *Hibbertia racemosa*, *Patersonia occidentalis* and *Desmocladus flexuosus*.

Map Reference Vegetation Code	Vegetation Association
KgMp	Tall Closed Shrub of *Kunzea glabrescens* with *Melaleuca preissiana* and *Banksia ilicifolia* over open understorey.
Ri	Closed heath of *Regelia inops* with occasional *Melaleuca preissiana* and/or *Banksia ilicifolia* over *Hypocalymma angustifolium*, *Euchilopsis linearis*, *Kunzea glabrescens* and *Lyginia imberbis*.
BaRi	Low Open Woodland of *Banksia attenuata and Banksia Ilicifolia over Regelia inops, Xanthorrhoea preissii, Patersonia occidentalis, Schoenus caespititius and Platysace compressa.*
MpHa	Low Woodland of *Melaleuca preissiana* over Closed Heath of *Hypocalymma angustifolium*, *Astartea scoparia, Pericalymma ellipticum* var. *ellipticum, Hypolaena exsulca* and *Lyginia imberbis.*
BaMp	Low Woodland of *Banksia attenuata, Banksia ilicifolia, Banksia menziesii* and *Melaleuca preissiana* over *Kunzea glabrescens, Hypocalymma angustifolium, Patersonia occidentalis, Dasypogon bromeliifolius* and *Bossiaea eriocarpa*.
Rehab	Tall Open Shrubland of *Adenanthos cygnorum, Kunzea glabrescens, Acacia rostellifera, Calothamnus quadrifidus* and *Lyginia imberbis*.
Lot 1 (Previously Lot 821) Armadale Road, Banjup (PGV Environmental 2012)	
BaBmEmLOW	*Banksia attenuata/Banksia menziesii/Eucalyptus marginata* (Jarrah) Low Open Woodland over *Adenanthos cygnorum* (Woolly Bush) Open Shrubland over *Hibbertia* *hypericoides/Lyginia barbata/ Conostylis aculeata* Closed Low Heath.
BmAfLOW	Banksia menziesii/Allocasuarina fraseriana Low Open Woodland over Adenanthos cygnorum (Woolly Bush) Open Shrubland over Eremaea pauciflora Low Open Heath.

Map Reference Vegetation Code	Vegetation Association
Calleya Estate LSP Area (RPS 2011)	
RR	**Remnant Trees and Rehabilitation Works** There are some remnant native trees within the cleared sand areas as well as some rehabilitation plantings. These include planted *Eucalyptus spp.* including *Eucalyptus conferruminata*, *Eucalyptus camaldulensis*, *Eucalyptus todtiana* and *Callitris preissii* with *Kunzea micrantha*, *Adenanthos cygnorum*, *Melaleuca nesophila*, *Agonis flexuosa*, *Acacia iteaphylla*, *Leschenaultia floribunda* and *Scholtzia involucrata.*
EtEmBaBm	***Eucalyptus todtiana*, *E.marginata* with *Banksia attenuata*, *B. menziesii* and *B. ilicfolia* Open Woodland to Woodland** Open Woodland to Woodland of *Eucaluptus todtiana* and *E. marginata* with *Banksia attenuata*, *B. menziesii* and *B. ilicifolia* over Open Shrubland of *Adenanthos cygnorum*, *Allocasuarina humilis*, *Melaleuca sp*., *Hibberia hypericoides*, *Calytrix sp*., Phlebocarya ciliata, and *Xanthorrhoea preissii* over Open Low Shrubland and Exotic Grassland of *Dasypogon bromeliifolius*, *Patersonia occidentalis* and *Ehrharta calycina.*
Mp	**Scattered *Melaleuca preissiana* over Astartea and Hypocalymma** Dampland with Scattered *Melaleuca preissiana* over Closed Shrubland of *Astartea affinis* and *Hypocalymma angustifolium* over an Open Sedgeland of *Lepidosperma longitudinale*.
Lot 467 Jandakot Road, Banjup (Morgan 2011)	
***Banksia attenuata-Banksia menziesii* low woodlands on dune slopes**	
BaBM	*Banksia attenuata*, *Banksia menziesii*, (*Allocasuarina fraserina*) low woodland over *Allocasuarina humilis* shrubland over *Hibbertia hypericoides*, *Astroloma xerophyllum* low shrubland over *Desmocladus flexuosus*, *Amphipogon turbinatus* open sedgeland/grassland.
***Melaleuca preissiana* mixed woodlands on gentle slopes and flats around the base of the dune.**	
MpAa	*Melaleuca preissiana*, (*Allocasuarina fraseriana*) low open forest over *Xanthorrhoea preissii*, *Astartea affinis* open shrubland over *Hypocalymma angustifolium* scattered low shrubs over *Dasypogon bromeliifolius* open

Map Reference Vegetation Code	Vegetation Association
	herbland to herbland.
MpBmBa	*Melaleuca preissiana*, *Banksia menziesii*, *Banksia attenuata*, (*Nuytsia floribunda, Eucalyptus todtiana*) low woodland over *Xanthorrhoea preissii*, *Adenanthos cygnorum* subsp. *cygnorum* shrubland over *Hibbertia subvaginata* low open shrubland with *Dasypogon bromeliifolius* herbland.
Pericalymma heaths and sedgelands on flats (dampland/palusplain).	
Pe	*Pericalymma ellipticum* closed heath over *Daviesia incrassata* subsp. *incrassata*, *Euchilopsis linearis* scattered low shrubs (*Hypocalymma angustifolium* low shrubland in parts) over *Lyginia imberbis*, *Hypolaena exsulca* very open sedgeland.
Ss	*Acacia pulchella* var. *goadbyi* scattered shrubs over *Hypocalymma angustifolium*, *Pericalymma ellipticum* scattered low shrubs over *Schoenus subfascicularis* closed sedgeland.
AcHa	*Kunzea glabrescens* scattered tall shrubs over *Adenanthos cygnorum* shrubland over *Hypocalymma angustifolium* low open shrubland over *Hypolaena exsulca* very open sedgeland with *Dasypogon bromeliifolius, Phlebocarya ciliata* herbland.

3.6.4 Vegetation Condition

The condition of vegetation in the Study Area ranged from 'Completely Degraded' to 'Excellent' as shown on Figure 9. Historical sand extraction has been the main the cause of disturbance within the Study Area, some of which has since been rehabilitated. However, the rehabilitation has not been very successful given the low diversity and density of native species. For these reasons the majority of the rehabilitation across the site is considered to be in a 'Degraded' to 'Completely Degraded' condition.

3.6.5 Threatened and Priority Flora

A 5km radial DPaW NatureMap flora search and DotE Protected Matters Search Tool (PMST) was undertaken from the centre of the Study Area (Appendix C) (DPaW 2016b; DotE 2016). A DPaW Threatened and Priority Flora Database search using a 5 km buffer was also undertaken in 2013 that is shown on Figure 10 (DPaW 2013).

The NatureMap database identified 15 conservation significant flora species as potentially occurring in the vicinity of the site. Of these, four are classed as Threatened, one as Priority 2, six as Priority 3 and four as Priority 4. The PMST identified eight

Threatened fauna species occurring within 5 km of the site. An assessment of the likelihood of each conservation significant flora species occurring within the site can be found in Appendix D.

One conservation significant flora species has been found on site, *Caladenia huegelii*, which is Threatened under the *Wildlife Conservation Act 1950* (WC Act) and *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Caladenia huegelii is known to have a significant population within the site due to many individuals being identified over numerous surveys. Figure 10 shows known individuals identified in surveys over the Study Area, however the GPS coordinates are not known for all of the specific *Caladenia huegelii* sightings and are therefore not all shown on the Figure.

The following are known locations of *Caladenia huegelii* within the Study Area (Morgan 2011; PGV Environmental 2012; ENV Australia 2013; 360 Environmental 2015):

- Within the pocket of vegetation along the eastern boundary of the Calleya Estate LSP area;
- Along the western boundary of Lot 1 (previously Lot 821);
- Throughout Bush Forever Site 390 in Lot 820 and Lot 4; and
- Within the southern portion of Bush Forever Site 390 in Lot 131.

PGV Environmental (2012) stated that (then) DEC undertook a survey in 2004 and 2005 which identified a substantial population of *Caladenia huegelii* in Bush Forever No. 390 within Lot 820.

Six conservation significant species are considered 'likely' to occur within the Study Area based on suitable habitat being present and records of the species being less than 5 km from the site:

Likely to occur on site

- *Drakaea micrantha* (Threatened under the WC Act and EPBC Act);
- *Cyathochaeta teretifolia* (Priority 3);
- *Phlebocarya pilosissima* subsp. *pilosissmia* (Priority 3);
- *Stylidium paludicola* (Priority 3);
- *Jacksonia sericea* (Priority 4); and
- *Verticordia lindleyi subsp. lindleyi* (Priority 4).

Seven conservation significant species are considered 'unlikely', three are considered 'possible' and two species are considered as 'unknown', with regards to occurring within the site based on suitable habitat being present and records of the species being 5 km from the site.

3.6.6 Threatened Ecological Communities and Priority Ecological Communities

A search of the DPaW Threatened Ecological Community (TEC) and Priority Ecological Community (PEC) identified three State listed TECs, which are also listed under the EPBC Act, and three State listed PECs as occurring within 5 km of the Study Area. The database search determined that no TECs exist within the site (DPaW 2013). The closest TEC to the site is SCP10a that is 3.18 km to the east of the Study Area.

The TEC and PEC communities are:

- FCT SCP08 – Herb rich shrublands in clay pans (Vulnerable [WC Act], Critically Endangered [EPBC Act]);
- FCT SCP10a – Shrublands on dry clay flats (Endangered [WC Act], Critically Endangered [EPBC Act]);
- FCT SCP21c - Low lying *Banksia attenuata* woodlands or shrublands (Priority 3 [DPaW]);
- FCT SCP22 - *Banksia ilicifolia* woodlands (Priority 3[DPaW]);
- FCT SCP24 - Northern Spearwood shrublands and woodlands (Priority 3[DPaW]); and
- Muchea Limestone – Shrubland and woodlands on Muchea Limestone (Endangered [WC Act], Endangered [EPBC Act]).

One PEC buffer was recorded within the north-western portion of the Study Area (Figure 10):

- SCP22: *Banksia ilicifolia* woodlands (Priority 2).

Statistical analysis would need to be undertaken to determine if SCP22 exists within the north-western portion of the site.

Although the database search did not identify "*Banksia* dominated woodlands of the Swan Coastal Plain IBRA region", Banksia woodlands are now all listed as Priority 3 ecological communities and have been nominated to become a federally listed TEC under the EPBC Act. The nomination is currently being assessed by the Department of the Environment (DotE) and the threatened species scientific committee. The key feature of these *Banksia* woodlands is the presence of *Banksia attenuata* and/or *B. menziesii* occurring on deep sands. A number of vegetation associations within the Study Area are likely to be considered Priority 3 based on the presence of *Banksia spp*. (for example BaEt and BaRi within Lot 131 Jandakot Road have recently been considered Priority 3).

None of the flora and vegetation assessments undertaken over the Study Area identified the presence of any TECs or PECs within any vegetation associations, except for the newly listed "*Banksia* dominated woodlands of the Swan Coastal Plain IBRA region".

3.7 Terrestrial Fauna

A number of fauna surveys have been undertaken over the Study Area. These include the following:

- Level 1 Fauna Survey for Lot 821 Armadale Road, Banjup by PGV Environmental in 2012;
- Targeted Carnaby's Black Cockatoo and Graceful Sun Moth Fauna Surveys for Lots 1 and 86; and
- 8 and Lots 132, 9002 and 9004 Armadale Road, Banjup by RPS in 2010.

The fauna survey undertaken for Lot 1(previously Lot 821) identified that the Southern Brown Bandicoot has been spotted in Bush Forever Site No. 390 (PGV Environmental 2012). No conservation significant fauna species were identified during the site visit for this Lot. The fauna survey for the Calleya Estate identified that the site is likely to offer foraging habitat for the Carnaby's Black Cockatoo, however no evidence of their nesting or foraging was noted during the survey (RPS 2011).

3.7.1 Threatened and Priority Fauna

A 5km radial DPaW NatureMap Fauna Search and DotE PMST was undertaken from the centre of the Study Area (Appendix C) (DPaW 2016b; DotE 2016). The NatureMap Report identified four Threatened fauna species, one fauna species listed as Other Specially Protected fauna and one Priority 1 fauna species, one Priority 3 fauna species, three Priority 4 fauna species and two Priority 5 fauna species. It also identified 13 fauna species protected under international agreement as occurring within 5 km of the site.

The PMST identified nine Threatened fauna species and 18 Migratory species as occurring within 5 km of the site.

The DPaW NatureMap database search results are based on recorded occurrences of individuals and are considered more site specific and more accurate than the PMST that often returns modelled distributions of species.

The likelihood of each of the fauna species occurring within the site is shown in Appendix E. The likelihood assessment found that the site is likely to offer suitable habitat for the following fauna species:

- Forest Red-tailed Black Cockatoo (Threatened under the WC Act and EPBC Act);
- Baudin's Black Cockatoo (Threatened under the WC Act and EPBC Act);
- Carnaby's Cockatoo (Threatened under the WC Act and EPBC Act);
- Rainbow Bee-eater (Migratory and Marine under the EPBC Act);
- Perth Slider (Listed as Priority 3 by DPaW); and
- Southern Brown Bandicoot (Listed as Priority 3 by DPaW).

All wetland and marine species have not been considered in the likelihood assessment as the proposed development will not impact on any marine or wetland habitat. The Study Area contains a number of wetlands, however these will be retained with appropriate buffers.

3.8 Conservation Areas and Linkages

3.8.1 Bush Forever Site 390

Remnant native vegetation within Lots 131 and 467 Jandakot Road and Lots 4, 140 and 820 Armadale Road is mapped as being part of Bush Forever Site 390, also known as Fraser Road Bushland, Banjup (Figure 11) (DoP 2014b).

In accordance with SPP 2.8, Bush Forever Site 390 falls under the 'Bush Forever Area (BFA) - Urban, industrial and resource development' site implementation category. The policy recognises that regionally significant bushland in this category is constrained by existing commitments, approvals and policies. Therefore, development proposals should seek to achieve a reasonable balance between conservation and development or resource extraction through a negotiated outcome which has regard for the specific conservation values involved. (WAPC 2010)

3.8.2 Jandakot Regional Park

A DPaW conservation estate 'Jandakot Regional Park' is located within Lot 140 Jandakot Road of the Study Area (Figure 11). Jandakot Regional Park comprises a mosaic of land from the southern end of Jandakot Airport to south of Casuarina Prison. Beeliar Regional Park exists as close as 2.6 km east of the Study Area. A DPaW managed land 'Forestdale Lake Nature Reserve' exists 3.6 km south east of the Study Area (Figure 11).

3.8.3 Regional Ecological Linkages

Remnant native vegetation within the site is part of two regional ecological linkages (No. 46 and 47) which connects Bush Forever Site 389 to the north with Bush Forever Site 344 to the south and Bush Forever Site 344 to the south east. The retention of native vegetation and fauna habitat within the regional ecological linkages aims to reduce the loss of biodiversity and key ecological functions across the South West (Molly *et al*. 2009).

3.9 Cultural Heritage

3.9.1 Aboriginal Heritage

A search of the Department of Aboriginal Affairs (DAA) Aboriginal Heritage Information System (AHIS) identified three 'Other Heritage Places' and no 'Registered Sites' within the Study Area (DAA 2016) (Figure 12). Information about each of the Aboriginal Heritage Places within the Study Area is described below:

- '**Banjup Calsil**': Place ID. 3301 associated with artefacts/scatter. The status of the place is 'Stored Data/Not a Site', which means it has been assessed as not meeting Section 5 of the *Aboriginal Heritage Act 1972*;
- '**Readymix Sandpit 1**': Place ID. 4108 associated with artefacts/scatter. The status of the place is 'Lodged Site', which means it has not been determined whether or not it meets Section 5 of the *Aboriginal Heritage Act 1972*; and
- '**Camp Site**': Place ID. 18752 associated with artefacts/scatter. The status of the place is 'Lodged Site', which means it has not been determined whether or not it meets Section 5 of the *Aboriginal Heritage Act 1972*.

The closest 'Registered Site' is Kraemer Reserve (Place ID: 21811), which is approximately 1.1 km to the south of the Study Area. This site is registered due to its mythological significance. A number of other 'Registered Sites' surround the Study Area as shown on Figure 12.

3.9.2 Non-Aboriginal Heritage

A search of the State Heritage Office database identified the presence of one State Heritage Place in the south-eastern corner of the Study Area (SHO 2016) (Figure 12):

- '**Banjup Memorial Park**': Place No. 10162 listed under the Municipal Inventory. The significance of Banjup Memorial Park is associated with the men from the district who enlisted in World War I. It has social significance for the Returned and Services League (RSL) and the descendants of those men commemorated. Banjup Memorial Park has aesthetic value as a designed small park set within a natural bush area (SHO 2016).

Another State Heritage Place exists directly to the south of the Study Area (Figure 12):

- '**Armadale/Fremantle Rail Armadale Road to Cockburn**': Place No. 24582 listed under the Municipal Inventory. The place has historic value due to the opening of the railway from Perth to Armadale. The selection of Armadale as the point to join the line to Fremantle further opened the district to the transport of its agricultural and timber products and the movement of passengers along the Armadale-Fremantle route (SHO 2016). The place has scientific value as an archaeological research and teaching site due to its potential to expose wider information about railway works associated with the construction of railways in Western Australia at the start of the 20th Century (SHO 2016).

3.10 Potential Contamination

A search of the DER's Contaminated Sites Database did not identify any contaminated sites present within the site (DER 2016). It must be noted that the DER contaminated sites database only shows three of the seven classifications that may be placed on a site. Sites that have been decontaminated; were found not to be contaminated; are possibly

contaminated; and 'reports not substantiated' are not shown on the database. However contaminated sites that require remediation; have a restricted use; or have been remediated for a restricted use are shown on the database.

The closest contaminated site is directly to the east of Warton Road outside of the Study Area (843 Warton Rd, Piara Waters). This contaminated site is listed as 'Contamination-remediation required' due to unauthorised disposal of asbestos wastes (DER 2016).

Another contaminated site occurs approximately 575 m to the west of the Study Area (1001 Prinsep Road, Jandakot). This contaminated site is listed as 'Remediated for restricted use' due to Zinc in the soil exceeding Ecological Investigation Levels and hydrocarbons in the soil exceeding Health-based Investigation Levels for commercial and industrial sites (DER 2016).

The lots within the Study Area that have undergone sand extraction activities have the potential to be contaminated as a result of chemical and hydrocarbon storage and spills. The parts of the Study Area that have undergone contamination investigations are discussed below:

3.10.1 Lot 4 Armadale Road

A Detailed Site Investigation (DSI) was undertaken on Lot 4 by Engtech Risk Consultants (ERC) in 2014. An intensive soil and groundwater investigation was undertaken at the site which concluded that the majority of the site appears to be un-impacted by historical site operations (ERC 2014).

However, the DSI found a number of generally isolated areas of soil contamination, or "hotspots", were found to exist across the southern half of the site extending from near surface impacts to deeper impacts closer to the groundwater (ERC 2014). These impacts are primarily attributed to:

- Former fuel storage infrastructure to the south of the former plant buildings;
- Isolated surface hydrocarbon spills or other minor surface contamination events at random locations across the site; and
- Demolition of the plant itself (residual asbestos containing material) or the presence of historical fill materials that came into contact with asbestos or hydrocarbon contamination during the historical operations of the site.

In addition the two artificial water bodies that exist on site and have previously been used as effluent ponds act as a potential pathway for groundwater contamination.

The previous operator of the site (Boral Pty Ltd) is currently undertaking remediation in consultation with a contaminated sites auditor and the DER. This issue will be managed in consultation with the DER in accordance with the requirements of the *Contaminated Sites Act 2003*. Once the remediation work has been completed by Boral and the site is appropriately classified under the *Contaminated Sites Act 2003* the site will be transferred to Perron.

3.10.2 Calleya Estate LSP Area

RPS undertook a Preliminary Site Investigation (PSI) in 2010 to assess the contamination status of the site. The investigation found the following potential sources of contamination and associated contaminants of concern (RPS 2011):

- Mining and extractive industry- trace metals, hydrocarbons, acids, alkalis and organise flocculants;
- Asbestos Containing Material (ACM)- asbestos;
- Electrical buildings- Polychlorinated biphenyls (PCBs);
- Unknown fill material at sediment pond location- ACM, trace metals, hydrocarbons and pesticides;
- Spent drum- trace metals and hydrocarbon;
- Demolished buildings- ACM and organochlorine pesticides used for termite treatment;
- Demolished waste bund at Washing Plant- trace metals;
- Fertiliser use- trace metals and nutrients; and
- Demolished fuel storage area- hydrocarbons and trace metals.

4 Potential Impacts and Management Measures

4.1 Conservation Areas and Ecological Linkages

4.1.1 Potential Impacts

Based on 360 Environmental's review of the conservation areas and ecological linkages within and adjacent to the Study Area, the following conclusions are provided:

- Remnant native vegetation within Lots 131 and 467 Jandakot Road and Lots 4, 140 and 820 Armadale Road is mapped as being part of Bush Forever Site 390, also known as Fraser Road Bushland, Banjup (Figure 13) (DoP 2014). Bush Forever Site No. 390 is approximately 171.8 ha in area. Of this, the DSP proposes to retain 162. 9 ha (approximately 95%) as POS;
- Approximately 10.5 ha within Lot 131 is proposed to be developed for residential purposes, of which approximately 40% (4.2 ha) is comprised of vegetation condition that is mapped as 'Completely Degraded'. It should be noted that approximately 47% of the Bush forever area proposed to be developed has been previously cleared as a result of past sand quarrying activities and poorly rehabilitated (4.9 ha). Remnant native vegetation within the site forms part of two ecological linkages (No. 46 and 47) which connects Bush Forever Site 389 to the north with Bush Forever Site 344 to the south and Bush Forever Site 344 to the south east; and
- A DPaW conservation estate 'Jandakot Regional Park' is located within Lot 140 Jandakot Road of the Study Area (Figure 11).

In light of the above conclusions, the potential environmental impacts on conservation areas and ecological linkages from future development of the Study Area include:

- Clearing of terrestrial vegetation within Bush Forever Site No. 390;
- Introduction and distribution of weed species;
- Habitat fragmentation;
- Uncontrolled access;
- Bushfire risk as a result of increased human activity within the Study Area; and
- Hydrological changes.

4.1.2 Management Response

4.1.2.1 Public Open Space Allocation and Design

In order to achieve a balance between environmental and planning outcomes for the DSP, the proposed POS areas were derived as a result of the following key considerations:

1. The current Bush Forever mapping includes land that has been historically cleared of native vegetation and quarried for sand and therefore, does not belong in Bush Forever.
2. Application of the current Bush Forever boundary will result in an area that is impractical to manage from a conservation perspective and present a significant risk in terms of bushfire management.
3. From a planning perspective, the current Bush Forever boundary within Lot 131 will also result in a highly compromised urban development form that will undermine some of the benefits of master planned development and integration of landuse, environmental and transport planning in this location.
4. Consolidation of POS with the key objective being to conserve remnant vegetation and conservation significant flora (*Caladenia huegelii*) within the Calleya Estate, Lot 82 and Lot 131 will result in a consolidated and manageable conservation reserve. This establishes not only a highly manageable and substantially sized reserve area, but also creates a rational boundary which allows the integration of development between the Calleya Estate and future development east of the estate. The integration will allow coordinated road connections, joint access to shops and schools and the establishment of a functional neighbourhood district.
5. Linear east-west open space along the south of Lot 131 and north of Lot 4 will connect with the state-owned 98 ha Bush Forever reserve located in the western portion of the site.
6. Retention of the 17.5 ha of wetland and Bush Forever landholding in the eastern portion of Lot 131 provides a north-south connection in addition to the east-west connection established along the southern boundary.
7. Following preliminary consultation with the Department of Planning, the Office of the EPA and the DPaW the proposed POS area within Lot 131 was increased to include an additional 1.8 ha (that is not within Bush Forever), of which approximately 90% (1.6 ha) is comprised of vegetation that is mapped as being in 'Excellent' condition.

4.1.2.2 Bush Forever Impact Assessment Process

In accordance with SPP 2.8, Bush Forever Site No. 390 falls under the 'Bush Forever Area (BFA) - Urban, industrial and resource development' site implementation category. The policy recognises that regionally significant bushland in this category is constrained by existing commitments, approvals and policies. Therefore, development proposals

should seek to achieve a reasonable balance between conservation and development or resource extraction through a negotiated outcome which has regard for the specific conservation values involved (WAPC 2010).

Given the above any proposed MRS rezoning of areas within the DSP that may result in unavoidable impacts on regionally significant bushland within Bush Forever Site No. 390 will result in an impact assessment being undertaken. The impact assessment will be done in accordance with the process outlined in Appendix 1 of SPP 2.8 and the framework outlined in Figure A.

The primary purpose of this impact assessment will be to inform

- The development of a statement of environment effect (guided by Appendix 1 of SPP 2.8);
- The development of a Bush Forever offsets package that will provide a net environmental outcome; and
- Assist in any future negotiated outcome over the final boundary for Bush Forever Site No. 390.

Provision of a Bush Forever offsets package will lead to a positive net environmental outcome. There are opportunities to provide an offset package through the addition of remnant vegetation (outside of Bush Forever) on site, purchase of vegetated land and the rehabilitation of land in the immediate vicinity to achieve an appropriate offset ratio, which will be determined through the application of Appendix 4 of SPP 2.8 and in consultation with the Department of Planning and Office of the EPA.

Please refer to the following sections regarding the proposed management responses specific to terrestrial flora, vegetation, fauna and wetlands, but relevant to the conservation areas and ecological linkages within the Study Area.

4.2 Terrestrial Flora and Vegetation

4.2.1 Potential Impacts

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

- One conservation significant flora species has been found to occur within the Study Area, *Caladenia huegelii,* that is Threatened under the *Wildlife Conservation Act 1950* (WC Act) and *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). The majority of the known population will be retained in Bush Forever, POS and road reserves. The individuals located in the remnant vegetation along Fraser Road will be retained in the future road reserve for Lot 1 (Previously Lot 821). The individuals in Lot 131 will be retained in POS and thus there are no *Caladenia huegelii* within Lot 131 that are proposed to be cleared. All known *Caladenia huegelii* within Bush Forever Site 390 are to be retained. The individuals in

the Calleya Estate (identified by the DPaW database search) appear to be retained in POS along the eastern boundary of the LSP area.

It is likely that only three currently known individuals of *Caladenia huegelii* will be cleared within Lot 4 as a result of developing the DSP area. Three locations of *C. huegelii* occur outside of the Bush Forever site in a small (0.8 ha) patch of remnant vegetation in Lot 4 (Figure 13). The patch of remnant vegetation is approximately five metres above the surrounding landscape due to the extraction of sand around it and is considered to be isolated from other remnant vegetation on a local scale. Given these factors, retaining the patch of remnant vegetation as part of the development is considered to be impractical; and

- None of the Flora and Vegetation assessments undertaken over the Study Area identified the presence of any TECs or PECs within any vegetation associations except for the newly listed Priority 3 "*Banksia* dominated woodlands of the Swan Coastal Plain IBRA region".

Therefore, in light of the above conclusions the key potential environmental impacts on terrestrial flora and vegetation from future development of the Study Area include:

- Clearing of terrestrial vegetation within Bush Forever Site No. 390;
- Impacts on *Caledenia heueglii*;
- Introduction and distribution of weed species;
- Unnecessary clearing;
- Uncontrolled access;
- Bushfire risk as a result of increased human activity within the Study Area; and
- Hydrological changes.

4.2.2 Management Response

Potential environmental impacts to flora and vegetation will be addressed at subsequent stages of planning using the mitigation sequence (i.e. avoidance, minimised, rectify, reduce, offset) and through the implementation of the following environmental management measures:

- Retention of remnant vegetation by placing a substantial portion of Bush Forever Site No.390 within regional and local POS across the DSP area (approximately 95% of Bush Forever 390 is proposed to be retained). However, approximately 10.5 ha within Lot 131 is proposed to be developed for residential purposes, of which approximately 40% (4.2 ha) is comprised of vegetation condition that is mapped as being 'Completely Degraded'. Additionally, approximately 47% (4.9 ha) of the Bush Forever area that is

proposed to be developed has been previously cleared as a result of past sand quarrying activities and poorly rehabilitated;

- Within Lot 131, approximately 1.8 ha (that is not currently within Bush Forever) is proposed to be included within the POS, of which approximately 90% (1.6 ha) is comprised of vegetation that is mapped as being in 'Excellent' condition;
- The proposed POS areas will be fenced off and contain appropriate fire breaks and emergency vehicle access and gates;
- Consideration will be given to ceding the POS areas (for conservation purposes) to the DPaW for conservation in perpetuity. These areas may be added to the Jandakot Regional Park conservation system;
- Establishment of POS areas will maintain an east west ecological link through the Study Area;
- Relocation of individual *Caladenia huegelii* to Jandakot Regional Park or to the POS proposed within the DSP. Advice will be sought from orchid cultivation experts within the WA Botanic Gardens and Parks Authority to determine the most appropriate approach to relocating the orchids;
- Overarching Open Space Masterplan, which will guide and co-ordinate the future management requirements and vesting of regional and local POS areas within the Study Area;
- Vegetation Management Plan;
- Bushfire Management Plan;
- Local Water Management Strategy; and
- Urban Water Management Plan.

It should be noted that a referral of the proposed development was made under the EPBC Act to the Department of the Environment (DotE) in November 2013 due to the proposal to clear three locations of *C. huegelii* within Lot 4, and in relation to the potential for the clearing to impact on black cockatoos. On the 16 December 2013, the proponent received notification from the DotE referral decision received on the referral was 'not a controlled action'. A copy of this correspondence has been provided in Appendix B.

4.3 Terrestrial Fauna

4.3.1 Potential Impacts

Based on the terrestrial fauna review, the following conclusions are summarised:

- One conservation significant fauna, the Southern Brown Bandicoot, has been identified in Bush Forever Site No. 390;

- The fauna survey for the Calleya Estate identified that the site is likely to offer foraging habitat for the Carnaby's Black Cockatoo, however no evidence of their nesting or foraging was noted during the survey;
- The likelihood assessment undertaken as part of the terrestrial fauna review found that the site is likely to offer suitable habitat for the following fauna species:
    - Forest Red-tailed Black Cockatoo (Threatened under the WC Act and EPBC Act);
    - Baudin's Black Cockatoo (Threatened under the WC Act and EPBC Act);
    - Carnaby's Cockatoo (Threatened under the WC Act and EPBC Act);
    - Rainbow Bee-eater (Migratory and Marine under the EPBC Act);
    - Perth Slider (Listed as Priority 3 by DPaW); and
    - Southern Brown Bandicoot (Listed as Priority 3 by DPaW).

The remainder of species identified on site or potentially occurring on site were not considered likely to be impacted due to their ability to move away from disturbances.

Therefore, in light of the above conclusions the key potential environmental impacts on terrestrial fauna from future development of the Study Area include:

- Animal deaths during the clearing process and the destruction of burrows and retreat sites;
- Habitat removal;
- Habitat fragmentation;
- Bushfire risk as a result of increased human activity within the Study Area;
- An increased abundance of introduced species (cats and wild dogs); and
- Road fauna deaths.

4.3.2 Management Response

Potential environmental impacts to terrestrial fauna will be addressed at subsequent stages of planning using the mitigation sequence (i.e. avoidance, minimised, rectify, reduce, offset) and through the implementation of the following environmental management measures:

- Retention of remnant vegetation and fauna habitats by placing a substantial portion of Bush Forever Site No.390 within regional and local POS across the DSP area (approximately 95% of Bush Forever 390 is proposed to be retained). However, approximately 10.5 ha within Lot 131 is proposed to be developed for residential purposes, of which approximately 40% (4.2 ha) is comprised of vegetation condition that is mapped as being 'Completely

Degraded'. It should be noted that approximately 47% (4.9 ha) of the Bush Forever area that is proposed to be developed has been previously cleared as a result of past sand quarrying activities and poorly rehabilitated;

- Within Lot 131, approximately 1.8 ha (that is not currently within Bush Forever) is proposed to be included within the POS, of which approximately 90% (1.6 ha) is comprised of vegetation that is mapped as being in 'Excellent' condition;
- Establishment of POS areas will maintain an east west corridor of connected habitat for fauna;
- Potential impacts to the black cockatoos as a result of clearing within the DSP area will be mitigated by placing a large portion of habitat on site in POS, as well as on-site retention and planting and provision of an offset, if deemed necessary;. It is anticipated that following finalisation of the Green Growth Plan there may be the application of a new approach for environmental offsets. The Green Growth Plan proposes to implement a Conservation Program which will assist the Western Australian Government in meeting the overall conservation outcomes, objectives and commitments for MNES and State environmental values by implementing a range of conservation actions, and establishing environmental offset requirements;
- Overarching Open Space Masterplan, which will guide and co-ordinate the future management requirements and vesting of regional and local POS areas within the Study Area;
- Vegetation Management Plan;
- Undertake Terrestrial Fauna Survey (if required i.e. within areas proposed to be cleared and outside of the existing biological survey areas);
- Terrestrial Conservation Significant Fauna Management Plan (if required); and
- Bushfire Management Plan.

As previously stated, a referral of the proposed development within Lot 4 was made under the EPBC Act to the DotE in November 2013 due to the potential impact to the black cockatoos. On the 16 December 2013, the proponent received notification from the DotE referral decision received on the referral was 'not a controlled action'. A copy of this correspondence has been provided in Appendix B.

4.4 Hydrological Processes

4.4.1 Potential Impacts

Based on the hydrology review, the following conclusions are summarised (JDA 2016):

- The Study Area is hydrologically unconstrained with free draining sandy soils, clearance to groundwater, moderate to low risk of ASS and no regional surface water features;
- The primary constraint to future development is the P1 and P2 water protection zone which covers a portion of the Study Area. Urban development is not a compatible land use within P1 or P2 areas; and
- Should any future MRS amendment process conclude that it is acceptable to rezone the land to 'Urban' or 'Urban deferred' under the MRS, the P2 water protection zone will be reclassified to P3. With certain controls in place, development is compatible with a P3 classification.

The Calleya Estate has been reclassified to P3 and Lot 1 (previously Lot 821) has been recently rezoned to 'Urban' under the MRS and will subsequently be reclassified to P3.W

Potential impacts to hydrology within the Study Area include:

- Groundwater level changes that occur as a result of a change in landuse. Residential development in the site will potentially increase recharge of rainfall into groundwater through increased surface area of residential roofs, driveways, car parks, and roads; and
- The creation of residential gardens and POS areas may lead to a minor increase in the amount of nitrates and phosphates being discharged into the groundwater.

4.4.2 Management Response

Within the Study Area, a number of water management documents have been prepared in accordance with the Better Urban Water Management Guidelines (WAPC 2008). These include:

- DWMS for the Calleya Estate LSP Area by Emerson Stewart Consulting in 2011;
- LWMS for the Calleya Estate LSP Area by Emerson Stewart Consulting in 2013;
- DWMS for Lot 821 Armadale Road, Banjup by Hyd2o in 2013; and
- DWMS for Lots 2 and 4 Armadale Road, Banjup by JDA Hydrology Consultants in 2015.

4.4.2.1 Strategic District Water Management Strategy

A Strategic District Water Management Strategy (SDWMS) has been prepared by JDA Consultant Hydrologists for the DSP area. The SDWMS has been prepared to provide a coordinating framework and guide the key requirements for water sensitive urban design. The SDWMS demonstrates that the Study Area can support urban development and best practice urban water management. (JDA 2016)

To limit any potential impacts associated with urban development the SWDMS lists the following initiatives that will be applied (JDA 2016):

- Extension of deep sewer to all lots;
- Application of water sensitive urban design principles including at-source stormwater infiltration, rain gardens and water harvesting;
- Appropriate road design and treatments to minimise the risk of high speed car collisions (which might result in oil or petrol spillage);
- Provision of lot types which maximise land use efficiency and reduce excessive garden area and hence fertiliser and pesticide use;
- Encourage home purchasers to use native plants for landscaping (which will also reduce fertiliser and pesticide use);
- Use of promotional information to land purchasers aimed at raising awareness of water issues;
- An on-going monitoring programme; and
- Exclusion of high risk land uses from the development area (e.g. service station).

4.4.2.2 Local Water Management Strategy

Furthermore, the above potential impacts to surface water and groundwater will be addressed in further detail through the preparation of a LWMS for each LSP area.

The LWMS will be prepared to meet the following objectives:

- Interpretation of the local geology and hydrogeology to provide the foundation for the above-ground design constraints and opportunities;
- Define the water balance for pre- and post-development scenarios to demonstrate maintenance of rainfall recharge to the Jandakot Mound superficial aquifer;
- Identify groundwater contamination source and pathway risks, and mitigate those risks through planning and engineered design;
- Conceptually design stormwater treatment to prevent impact at stormwater infiltration to groundwater or flood water discharge to Forrestdale Lake;
- Report modelling of contamination risk pathways through surface water and hydrogeology model 'particle tracking' based on the site investigation results, urban development scenarios and stormwater design;
- Outline regional scale water demand conservation strategies;
- Engineering design of contamination controls to operate a 50 year asset life; and

- Promote the utilisation of Water Sensitive Urban Design (WSUD) at or beyond best practice where possible at every stage of the total water cycle management system, recognising that this is a benchmark project.

4.4.2.3 Urban Water Management Plan

An Urban Water Management Plan will be prepared and submitted to support the lodgement of the Subdivision Applications within the DSP area with consultation with the City of Cockburn and DoW in accordance with the Better Urban Water Management Guidelines (WAPC, 2008). The UWMP will include landscaping plans, engineering drawings, the final layout plan and any additional environmental and geotechnical information that is available.

4.5 Wetlands

4.5.1 Potential Impacts

The Study Area contains three REWs and one CCW (Figure 7). Potential impacts to wetlands within the Study Area include:

- Introduction and distribution of weed species;
- Uncontrolled access;
- Changes to wetland hydrology;
- Increase in level of nutrients and pollutants entering wetlands through surface water Runoff from driveways, carparks and roads; and
- Bushfire risk as a result of increased human activity within the Study Area.

4.5.2 Management Response

Potential environmental impacts to terrestrial fauna will be addressed at subsequent stages of planning using the mitigation sequence (i.e. avoidance, minimised, rectify, reduce, offset) and through the implementation of the following environmental management measures:

- Retention of wetlands within regional and local POS areas within the DSP;
- Provision of appropriately sized buffers for the wetlands. These will be defined at Local Structure Planning stage through consultation with the City of Cockburn and the DPaW;
- Overarching Open Space Masterplan;
- Wetland Management Plan;
- Bushfire Management Plan;
- Local Water Management Strategy; and
- Urban Water Management Plan.

It should be noted that the artificial water bodies within the site are not natural wetlands and will be in-filled during the development. Infilling the water bodies would ideally be undertaken in summer when water levels tend to be at their lowest.

4.6 Acid Sulfate Soils

4.6.1 Potential Impacts

The Study Area is mapped by the DER as being of "moderate to low risk of ASS". It is understood that the areas proposed for development will require fill and therefore, it is not anticipated that ASS will be disturbed as part of the proposed construction works.

4.6.2 Management Response

If ASS soil is identified as occurring on site, a Preliminary Site Assessment will be undertaken to determine the presence and extent of ASS in accordance with the DER guidelines. Depending upon the results of the preliminary assessment, an ASS Assessment and Dewatering Management Plan will be prepared. This plan will be approved for implementation by the DER prior to any ground disturbing works continuing.

4.7 Contamination

4.7.1 Potential Impacts

The lots within the Study Area that have undergone sand extraction activities have the potential to be contaminated as a result of chemical and hydrocarbon storage and spills. Contamination studies over parts of the Study Area (Lot 4 and Calleya Estate) have identified contamination relating primarily to fuel, asbestos containing material and trace metals.

4.7.2 Management Response

Boral Pty Ltd is responsible for the ongoing testing and remediation of the isolated hydrocarbon spill on Lot 4 within the Study Area. The previous operator of the site (Boral Pty Ltd) is currently undertaking testing and remediation in consultation with a contaminated sites auditor and the DER and it is considered that this issue will be dealt with in a manner consistent with the requirements of the *Contaminated sites Act 2003*.

It is unknown whether further contamination investigations were undertaken within the Calleya Estate since the PSI in 2010. However, the PSI undertaken within the LSP area recommended that further investigations should be considered to assess the nature, extent and magnitude of contamination (if present) in the soil and groundwater.

It is recommended that a PSI be undertaken at Lot 131 and Lot 1 (previously Lot 821) prior to development to assess the contamination status of the site. Historical land uses may have resulted in contamination of the land.

4.8 Aboriginal Heritage

4.8.1 Potential Impacts

The Study Area does not contain any 'Registered Sites' that are listed under Section 5 of the *Aboriginal Heritage Act 1972*. Aboriginal Place ID: 3301 that covers a substantial portion of the south-eastern part of the site is classified as 'Stored Data/Not a Site' which means it has been assessed as not meeting Section 5 of the *Aboriginal Heritage Act 1972*. The two other Aboriginal Places within the Study Area (ID: 4108 and ID: 3300) area classified as 'Lodged Sites' which means it has not been determined whether or not they meet Section 5 of the *Aboriginal Heritage Act 1972*.

4.8.2 Management Response

The client will liaise with the DAA prior to development to determine any responsibilities under the *Aboriginal Heritage Act 1972*.

In the event that 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*.

4.9 Non-Aboriginal Heritage

4.9.1 Potential Impacts

The State Heritage Place 'Banjup Memorial Park' within the south-eastern portion of the site will not be disturbed as part of the future development as it will be retained within POS.

4.10 Construction Impacts and Management

Construction activities will require management in order to minimise the potential impacts to adjacent residents, retained vegetation, fauna and wetlands.

Potential impacts can include the following:

- Nuisance dust generation during bulk earthworks;
- Potential disturbance of ASS during earthworks and/or installation of services;
- Silt and sediment run-off from uncontrolled run-off during site works;
- Inadvertent damage to trees and other vegetation earmarked for retention;
- Injury and/or death to native fauna; and
- Inappropriate disposal of waste building material and poor housekeeping on building sites leading to windblown litter.

All of these potential impacts are considered to be manageable through appropriate engineering design and appropriate site management practices. Furthermore, management of these potential impacts will be detailed in the Vegetation Management Plan/s and Wetland Management Plan/s for the protection of existing vegetation and wetland areas during construction, and through the provision of standard subdivision approval conditions.

4.11 Surrounding Land Uses and Buffers

4.11.1 Sand Quarry

The site contains three active mining tenements for sand quarries within Lot 467 Jandakot Road and Lot 140 Armadale Road. An active sand quarry also exists to the north of Lot 131. The Draft EPA *Environmental Assessment Guideline for Separation distances between industrial and sensitive land uses* recommends a separation distance of between 300-500 m for sand extraction industries and sensitive land uses based on noise and dust impacts (EPA 2015). As the Study Area is at the early district structure planning stage it is expected that the sand quarries will be closed by the time residential development commences. However, if the sand quarries are still active when this occurs, then appropriate noise and dust studies will be undertaken to ensure future development within the recommended separation distances is environmentally acceptable.

4.11.2 Jandakot Airport

The boundary of Jandakot Airport exists as close as 445 m north of the Study Area (Jandakot Airport Holdings Pty Ltd 2014).

For the purpose of assessing land use planning implication on land surrounding airports, the following types of noise chart indicators are used (Jandakot Airport Holdings Pty Ltd 2014):

- **Australian Noise Exposure Forecast (ANEF)** – It is the official land use planning reference and only one ANEF can be in force at a particular time. Under the Airports Act 1996, the Jandakot Airport's ANEF is required to be updated at least every five years, in conjunction with the Master Plan update;
- **Noise Above Contour (N60/65/70) charts** – These charts calculate the average daily noise events above 60,65 or 70 decibels (dBA). The contours represent the frequency of the expected aircraft noise impact. For the general public, it provides a more readily understood measure of noise exposure.

The ANEF and Noise Above Contour for the Jandakot Airport are shown in the most recent Master Plan (Jandakot Airport Holdings Pty Ltd 2014).

Pursuant to the adopted *State Planning Policy 5.3: Land Use Planning in the Vicinity of Jandakot Airport* (SPP 5.3), the DSP area complies with policy provisions for residential housing as it sits outside the 20 ANEF contour (Figure 13), which is identified as being

'Acceptable' for all building types. Furthermore, the Study Area is within the SPP 5.3 'Frame Area' that residential development is compatible with.

5 Conclusions

Based on the high-level review undertaken, the following key environmental issues are identified:

- Terrestrial flora and vegetation;
- Terrestrial fauna; and
- Hydrological process.

Future development, in accordance with the DSP, will deliver the following key environmental outcomes:

- Provision of regional and local POS areas will result in establishing a consolidated, highly manageable and substantially sized reserve within the Study Area;
- Provision of a Bush Forever offsets package, which will lead to a positive net environmental outcome;
- Linear east-west open space along the south of Lot 131 and north of Lot 4 will connect with the state-owned 98 ha Bush Forever reserve located in the western portion of the site;
- Retention of the 17.5 ha of wetland and Bush Forever landholding in the eastern portion of Lot 131 provides a north-south connection in addition to the east-west connection established along the southern boundary;
- Development and implementation of an Open Space Masterplan and subsequent environmental management plans (i.e. Vegetation Management Plan, Wetland Management and Bushfire Management Plan) will ensure the long-term management and viability of the proposed conservation areas; and
- Application of water management initiatives and a framework to the guide future development of the site to ensure water sensitive urban design is achieved (i.e. LWMS and UWMP).

Other environmental issues (such as wetlands, acid sulfate soils, potential contamination, etc) are capable of being resolved (i.e. avoided or managed) through site-specific investigations and detailed engineering drainage design. Therefore, a key conclusion of this environmental assessment report is that, based on the review undertaken and the environmental outcomes proposed by the DSP and future land use planning, none of the key environmental issues pose a significant constraint to future residential development of the Study Area.

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 Pty Ltd.

Beard, J. S. (1981). Vegetation Survey of WA. (University of WA Press: Perth.)

Bureau of Meteorology (BoM) 2016. *Climate Data Online*. Available from: http://www.bom.gov.au/climate/data/

Churchwood, H. M. and McArthur, W. M. (1980). *Landforms and soils of the Darling System, Western Australia*. In: Atlas of Natural Resources Darling System Western Australia. Department of Conservation and Environment. University of Western Australia Press.

Department of Aboriginal Affairs (DAA) 2016. Aboriginal Heritage Inquiry System. Available from: http://maps.dia.wa.gov.au/AHIS2/

Department of Agriculture and Food Western Australia (DAFWA) 2012. *Soil Landscapes GIS dataset*, Government of Western Australia.

Department of Environment (DoE) 2008. *Directory of Important Wetlands GIS Dataset*, Government of Western Australia.

Department of Environment Regulation (DER). 2016. *Contaminated Sites Database. Government of Western Australia*. Available from: https://secure.dec.wa.gov.au/idelve/css/

Department of Mines and Petroleum (DMP) 2016. *Minedex GIS Dataset*. Government of Western Australia.

Department of Parks and Wildlife (DPaW) 2013. *Threatened and Priority Flora and Ecological Communities Databases*. Purchased GIS Dataset, Government of Western Australia.

Department of Parks and Wildlife (DPaW) 2014. *Ramsar Sites GIS Dataset*, Government of Western Australia.

Department of Parks and Wildlife (DPaW) 2016a. *Geomorphic Wetlands Swan Coastal Plain dataset*, Government of Western Australia.

Department of Parks and Wildlife (DPaW) 2016b. NatureMap: Mapping Western Australia's Biodiversity, Government of Western Australia. Available from: http://naturemap.dpaw.wa.gov.au/default.aspx

Department of Planning (DoP) 2014a. *Draft State Planning Policy 2.3: Jandakot Groundwater Protection Policy*.

Department of Planning (DoP) 2014b. *Bush Forever GIS Dataset*, Government of Western Australia.

Department of Premier and Cabinet (DPC) 2016. *Draft Perth and Peel Green Growthh Plan*, Government of Western Australia.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2012. EPBC Act Referral Guidelines for Three Threatened Black Cockatoo Species, Commonwealth of Australia.

Department of the Environment (DotE) 2016. Protected Matters Search Tool, Australian Government. Available from: http://www.environment.gov.au/webgis-framework/apps/pmst/pmst.jsf

Department of Water (DoW) 2012. Hydrography GIS Dataset, Government of Western Australia.

Department of Water (DoW) 2015. *Topography 5m contours GIS Dataset, Government of Western Australia.*

Department of Water (DoW) 2016a. Perth Groundwater Atlas, Government of Western Australia. Available from http://maps.water.wa.gov.au/#/webmap/gwm

Department of Water (DoW) 2016b. *Water Quality Protection Note 25: Land use compatibility tables for public drinking water source areas.*

ENV Australia 2013. *Level 2 Flora and Vegetation Survey of Lot 4 Armadale Road, Banjup*. Prepared for Perron Developments Pty Ltd.

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

Environmental Protection Authority (EPA) 2015.Draft EPA *Environmental Assessment Guideline for Separation distances between industrial and sensitive land uses*, Government of Western Australia.

Engtech Risk Consultants (ERC) 2014. *Detailed Site Investigation: Former Boral Jandakot Masonary Site*. Prepared for Boral Property Group.

Government of Western Australia 2014. *2014 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report).* Current as of June 2014. WA Department of Parks and Wildlife, Perth.

Heddle EM, Loneragan OW and Havell JJ, 1980. '*Vegetation of the Darling System*', in Atlas of Natural Resources, Darling System, Western Australia, Department of Conservation and Environment, Perth.

Jandakot Airport Holdings Pty Ltd (JAH) 2014. *Jandakot Airport Master Plan 2014*. Available from: http://www.jandakotairport.com.au/corporate/master-plan.html

JDA Consultant Hydrologists (JDA) 2016. Treeby (Banjup) Strategic District Water Management Strategy. Prepared for Perron Developments Pty Ltd.

Local Biodiversity Program (LBP) 2013. *Native Vegetation extent by Vegetation complexes on the Swan Coastal Plain south of Moore River*.

Mitchell, D., Williams, K., & Desmond, A. 2002. *Swan Coastal Plain 2 (SWA2 – Swan Coastal Plain subregion)*. In: J. E. May, & N. L. McKenzie (Eds.), A Biodiversity Audit of Western Australia's 53 Biogeographic Subregions in 2002 (pp. 606-623). Perth: Department of Conservation and Land Management.

Molly, S., Wood, J. Hall, S., Wallrodt, S. & Whisson, G. 2009. South West Regional Ecological Linkages Technical Report. Available from: http://walga.asn.au/AboutWALGA/Policy/SouthWestBiodiversityProject/SouthWestRegionalEcologicalLinkagesTechnicalReport.aspxMorgan, B., 2011. *A Level 2 Flora and Vegetation Survey of Proposed Sand Mining Area at Lot 467, Warton Rd*. Prepared for RPS Environmental.

PGV Environmental 2012. *Environmental Assessment Report for Lot 821 Armadale Road, Banjup*. Prepared for Department of Housing.

RPS 2011. *Environmental Assessment Report for Lots 1, 868, 9002 and 9004 Armadale Road, Banjup*. Prepared for Stockland.

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) 2016. State Heritage Register. Available from http://inherit.stateheritage.wa.gov.au/

Thackway, R., and Cresswell, I.D. 1995. *An Interim Biogeographic Regionalisation for Australia: A framework for setting priorities in the National Reserves System Cooperative Program (Version 4.0).* Canberra: Australian Nature Conservation Agency.

Western Australian Planning Commission (WAPC) 2008. *Better Urban Water Management*, prepared by the Government of Western Australia.

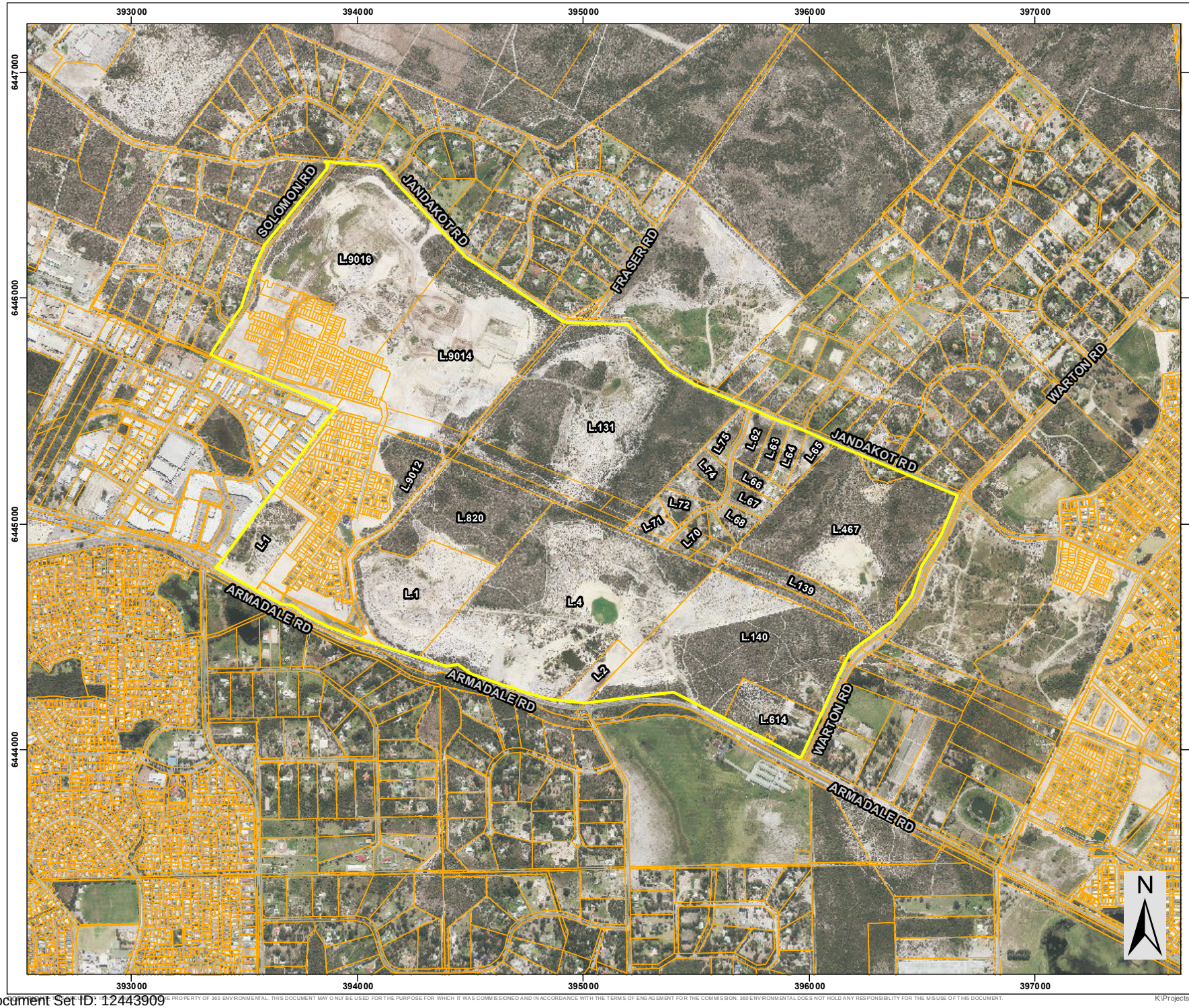
Western Australian Planning Commission (WAPC) 2010. State Planning Policy 2.8: Bushland Policy for the Perth Metropolitan Region, prepared by Government of Western Australia.

Western Australian Planning Commission (WAPC) 2015a. *Zones, reservations and bush forever areas*, Available from: http://www.planning.wa.gov.au/5876.asp, Government of Western Australia.

Western Australian Planning Commission (WAPC) 2015b. *Draft Metropolitan Peel Sub-regional Planning Framework*, prepared by Government of Western Australia.

Western Australian Planning Commission (WAPC) 2017. State Planning Policy 5.3: Land Use Planning in the Vicinity of Jandakot Airport, prepared by Government of Western Australia.

FIGURES



Legend

- District Structure Plan Boundary (461.54 ha)
- Cadastre

NOTE:
L. indicates 'Lot'

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- CADASTRE SOURCED LANDGATE VIA SLIP 6 APRIL 2016
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE SEPT 2015
(© Western Australian Land Information Authority 2015)

Powered by 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

0 200 400 600 800
Meters
1:22,500 @ A4

LOCALITY MAP

PROJECT ID	DATE
1405	06-Apr-16

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

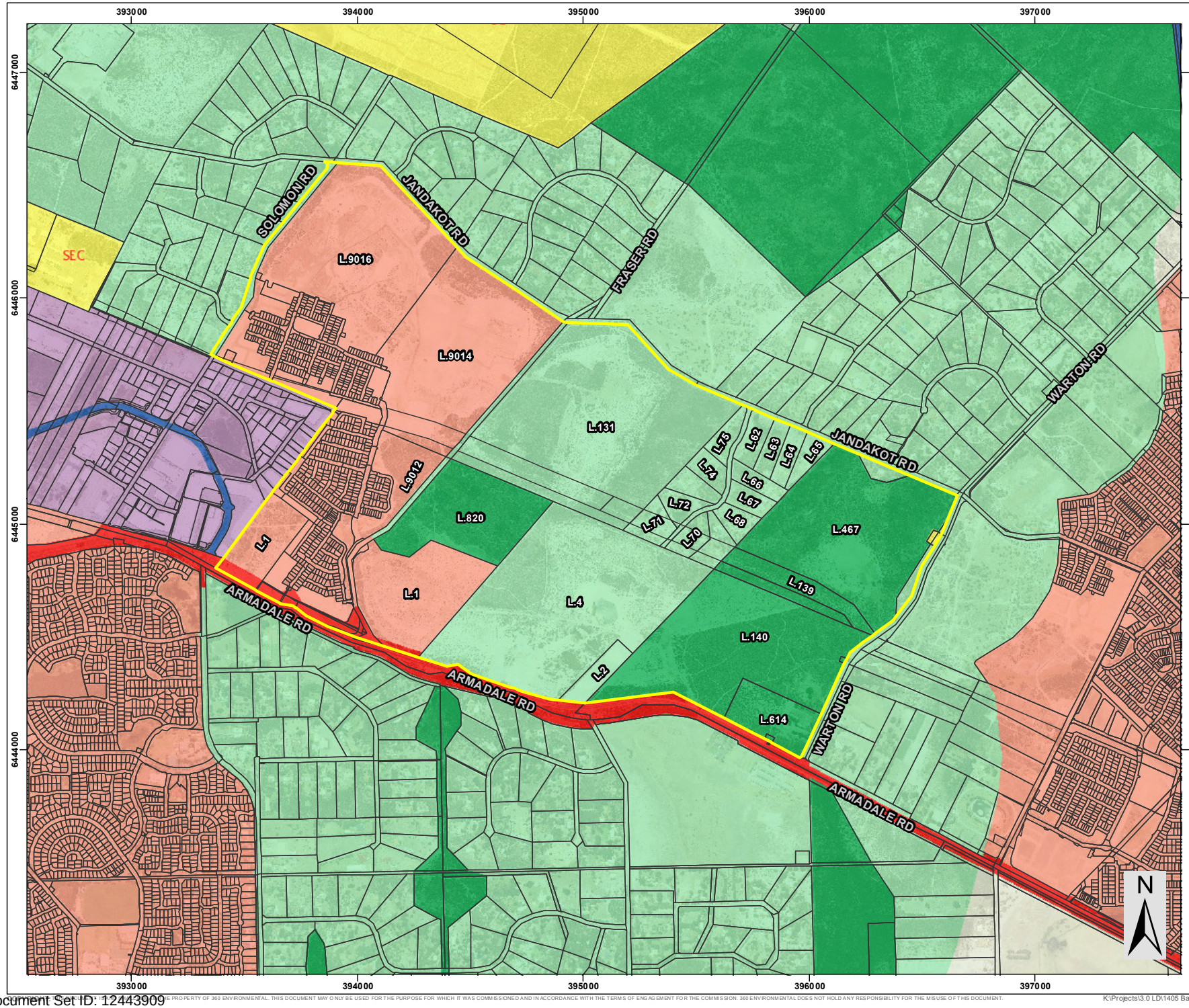
CREATED	CHECKED	APPROVED	REVISION
JJ	KC	SB	0

Perron Developments Pty Ltd
Banjup District Structure Plan

Environmental Assessment Report

Figure 1
Site Location

K:\Projects\3.0 LD\1405 Banjup DSP EAR\Figures\1405 EAR Figure 1 - Site Location.mxd



Legend

DSP Boundary (461.54 ha)

Cadastre

Scheme boundary

NOTE: L. indicates 'Lot'

Reserved Lands

- Parks and recreation
- Resricted public access
- Railways
- Port installations
- State forests
- Water catchments
- Civic and cultural
- Waterways
- Primary regional roads
- Other regional roads
- Public purposes -
  - SEC — *Denoted as follows:* State Energy Commission

Zoning

- Urban
- Urban deferred
- Central city area
- Industrial
- Special Industrial
- Rural
- Rural - water protection
- Private recreation

Notice of Delegation

- Bush Forever Sites

Redevelopment Schemes

- Redevelopment Scheme/ Act Area

- MRS CURRENT AS OF 30 MAY 2016
- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- CADASTRE SOURCED LANDGATE VIA SLIP 6 APRIL 2016
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE FEB 2016 (© Western Australian Land Information Authority 2015)

Powered by 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

0 200 400 600 800 Meters

1:22,500 @ A4

LOCALITY MAP

PROJECT ID	DATE
1405	30-May-16

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

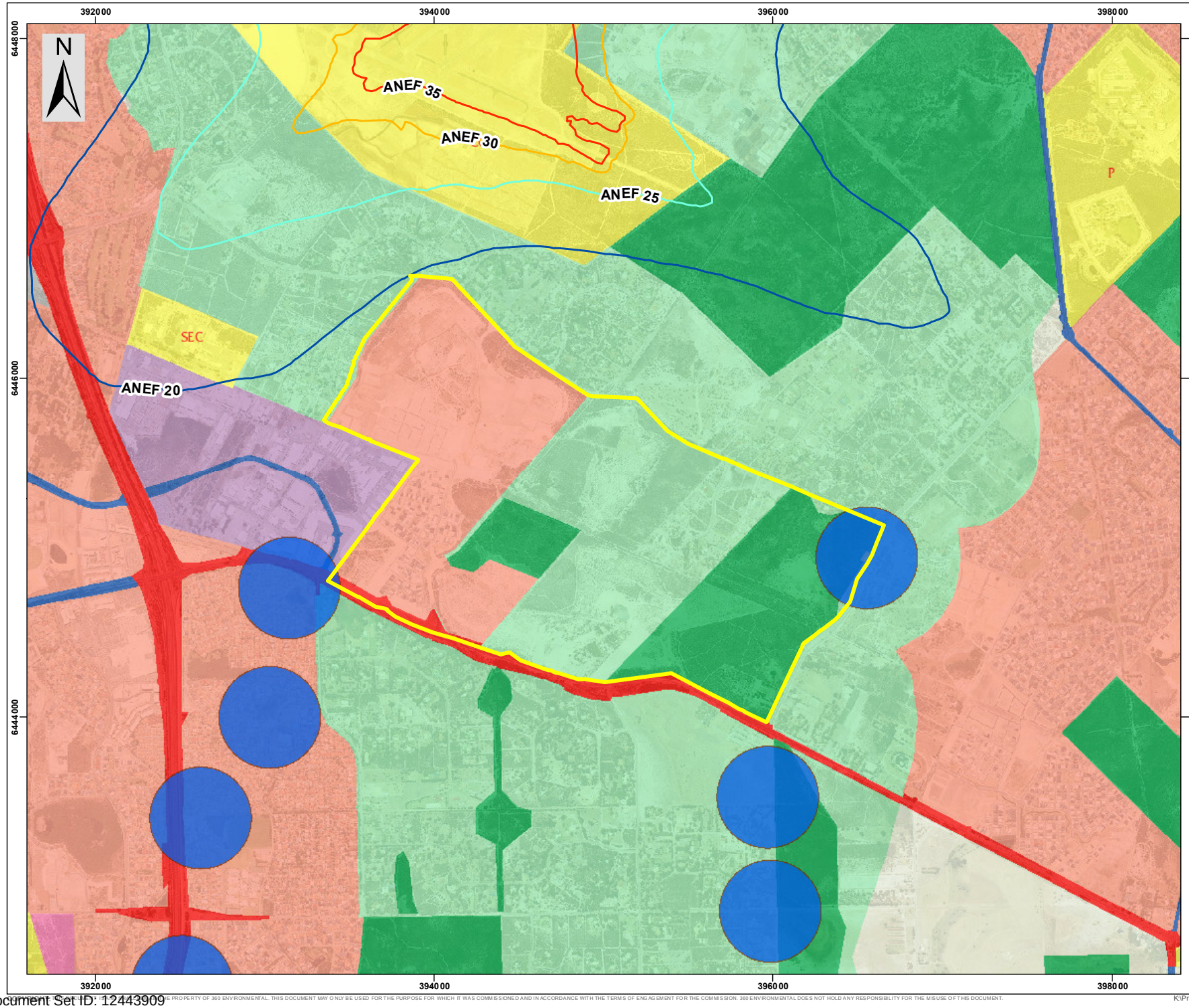
CREATED	CHECKED	APPROVED	REVISION
JJ	KC	SB	0

Perron Developments Pty Ltd
Banjup District Structure Plan

Environmental Assessment Report

Figure 2
Metropolitan Region Scheme

K:\Projects\3.0 LD\1405 Banjup DSP EAR\Figures\1405 EAR Figure 2 - Metropolitan Region Scheme.mxd



Legend

- DSP Boundary (461.54 ha)
- Wellhead Protection Buffer

Jandakot Airport Ultimate Capacity ANEF[1]

- 20 ANEF
- 25 ANEF
- 30 ANEF
- 35 ANEF

MRS Zones and Reserves

- Industrial
- Other regional roads
- Parks and recreation
- Primary regional roads
- Public purposes[2]
- Railways
- Rural
- Rural - water protection
- Urban
- Urban deferred

NOTE:

1. ANEF: Australian Noise Exposure Forecast
2. CG - Commonwealth Government, P - Prison, SEC - State Energy Commission, WSD - Water Authority of WA

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- JANDAKOT ANEF SOURCED FROM JANDAKOT AIRPORT (AIR SERVICES 2014). MRS SOURCED 2015
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE FEB 2016

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

0 200 400 600 800 1,000 1,200

Meters

1:30,000 @ A4

LOCALITY MAP

PROJECT ID	DATE
1405	30-May-16

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
JJ	KC/RH	SB	0

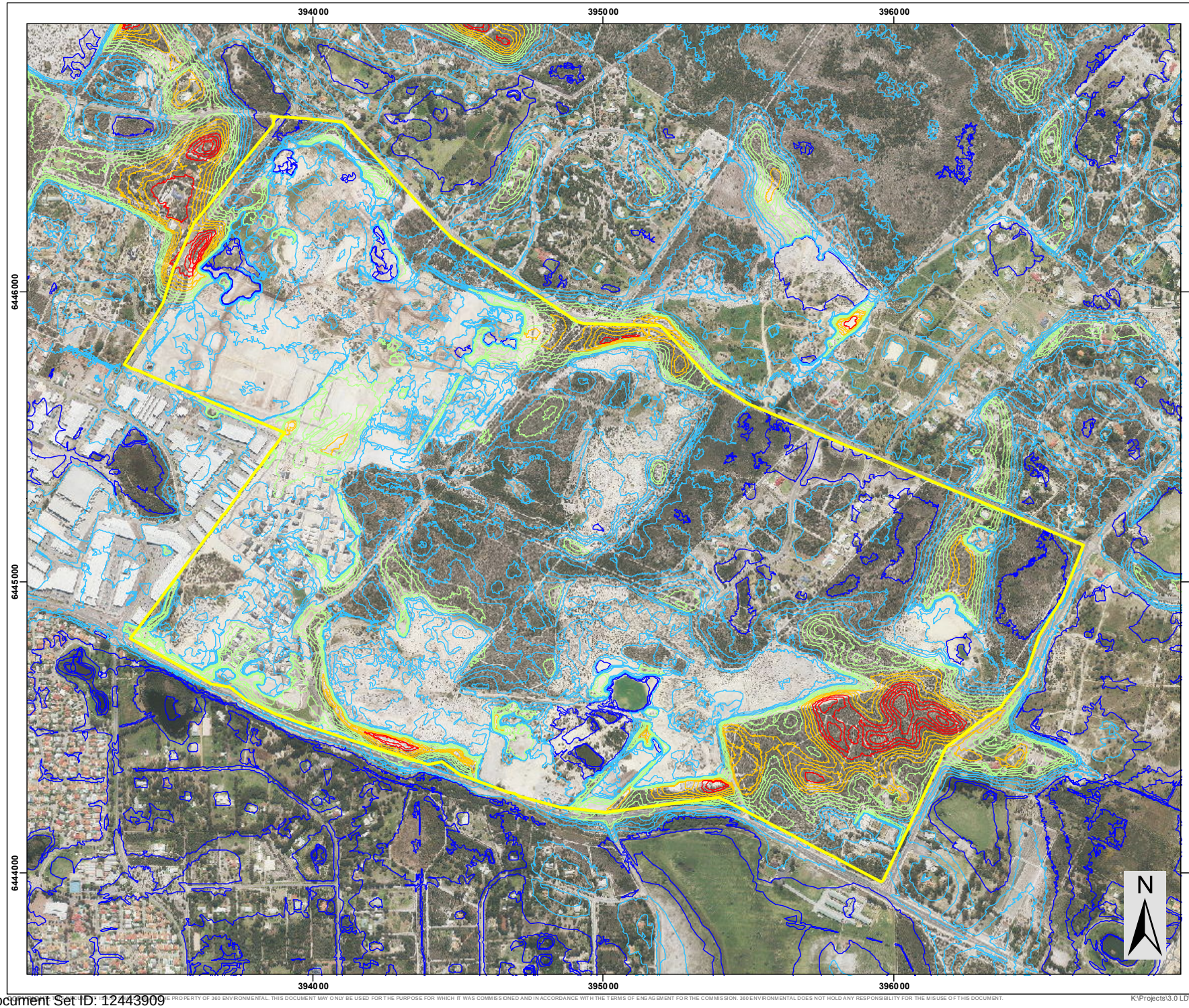
Perron Developments Pty Ltd
Banjup District Structure Plan

Environmental Assessment Report

Figure 3

Surrounding Land Uses and Buffers

K:\Projects\3.0 LD\1405 Banjup DSP EAR\Figures\1405 EAR Figure 3 - Buffers.mxd



Legend

District Structure Plan Boundary (461.54 ha)

Elevation Contours (mAHD)

- 24 - 28
- 28 - 32
- 32 - 36
- 36 - 40
- 40 - 45

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- ELEVATION SOURCED DOW 2015
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE SEPT 2015 (© Western Australian Land Information Authority 2015)

Powered by 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

0 200 400 600
Meters
1:17,500 @ A4

LOCALITY MAP

PROJECT ID	DATE
1405	06-Apr-16

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

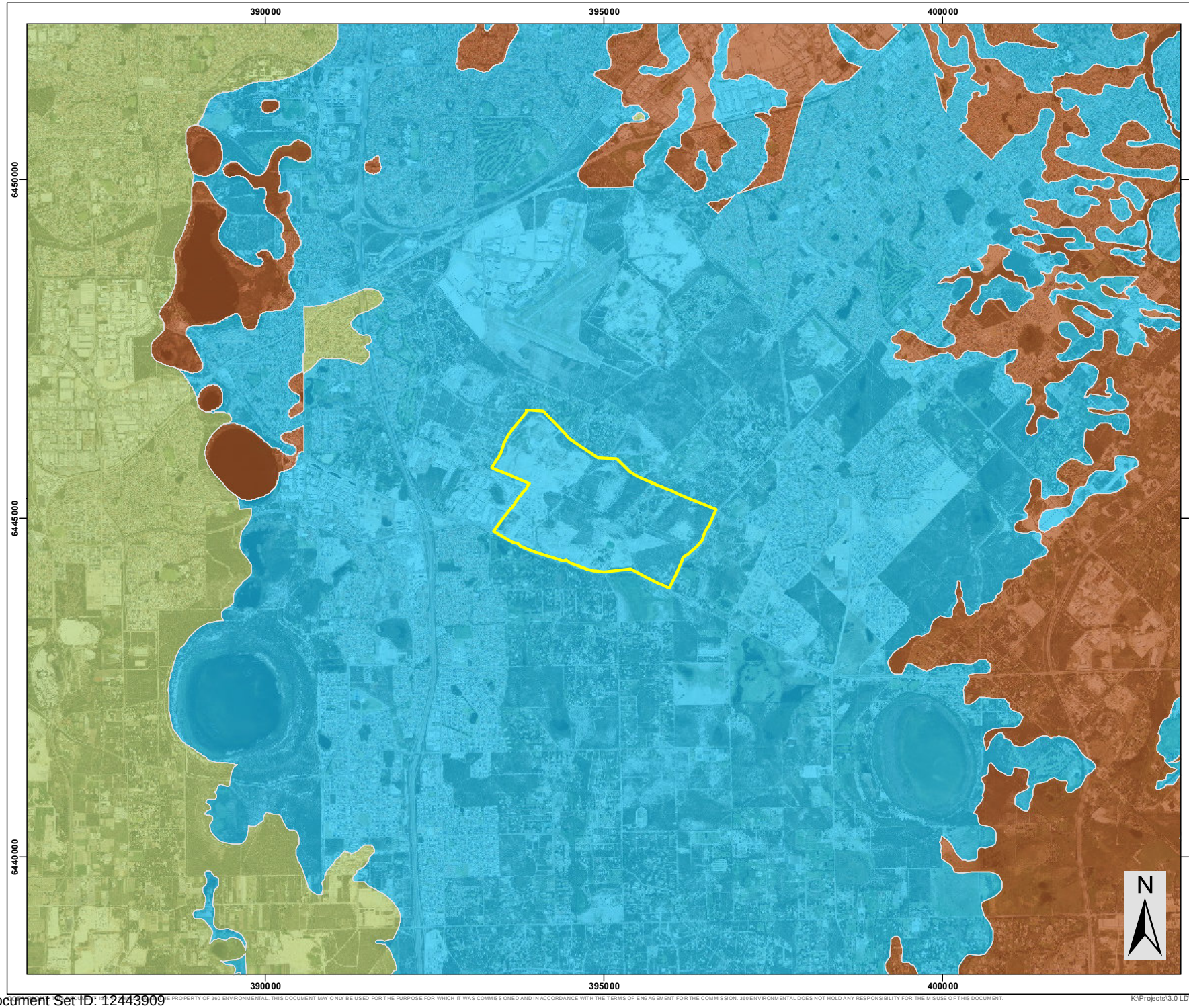
CREATED	CHECKED	APPROVED	REVISION
JJ	KC	SB	0

Perron Developments Pty Ltd
Banjup District Structure Plan

Environmental Assessment Report

Figure 4
Topography

K:\Projects\3.0 LD\1405 Banjup DSP EAR\Figures\1405 EAR Figure 5 - Landforms and Soils.mxd



Legend

District Structure Plan Boundary (461.54 ha)

Soil Landscapes

Bassendean System: Swan Coastal Plain from Busselton to Jurien. Sand dunes and sandplains with pale deep sand, semi-wet and wet soil. Banksia-paperbark woodlands and mixed heaths.

Pinjarra System: Swan Coastal Plain from Perth to Capel. Poorly drained coastal plain with variable alluvial and aeolian soils. Variable vegetation includes Jarrah, marri, wandoo, paperbark sheoaks and rudis.

Spearwood System: Sand dunes and plains. Yellow deep sands, pale deep sands and yellow/brown shallow sands.

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- SOIL LANDSCAPES SOURCED DAFWA 2012
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE SEPT 2015

(© Western Australian Land Information Authority 2015)

Powered by SLIP ENABLER

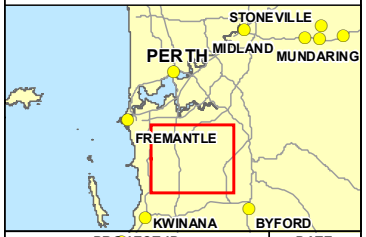
360 environmental
a 10 Bermondsey St, West Leederville, 6007 WA
t (08) 9388 8360
f (08) 9381 2360
w www.360environmental.com.au

0 1,000 2,000 3,000

Meters

1:75,000 @ A4

LOCALITY MAP



PROJECT ID	DATE
1405	06-Apr-16

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

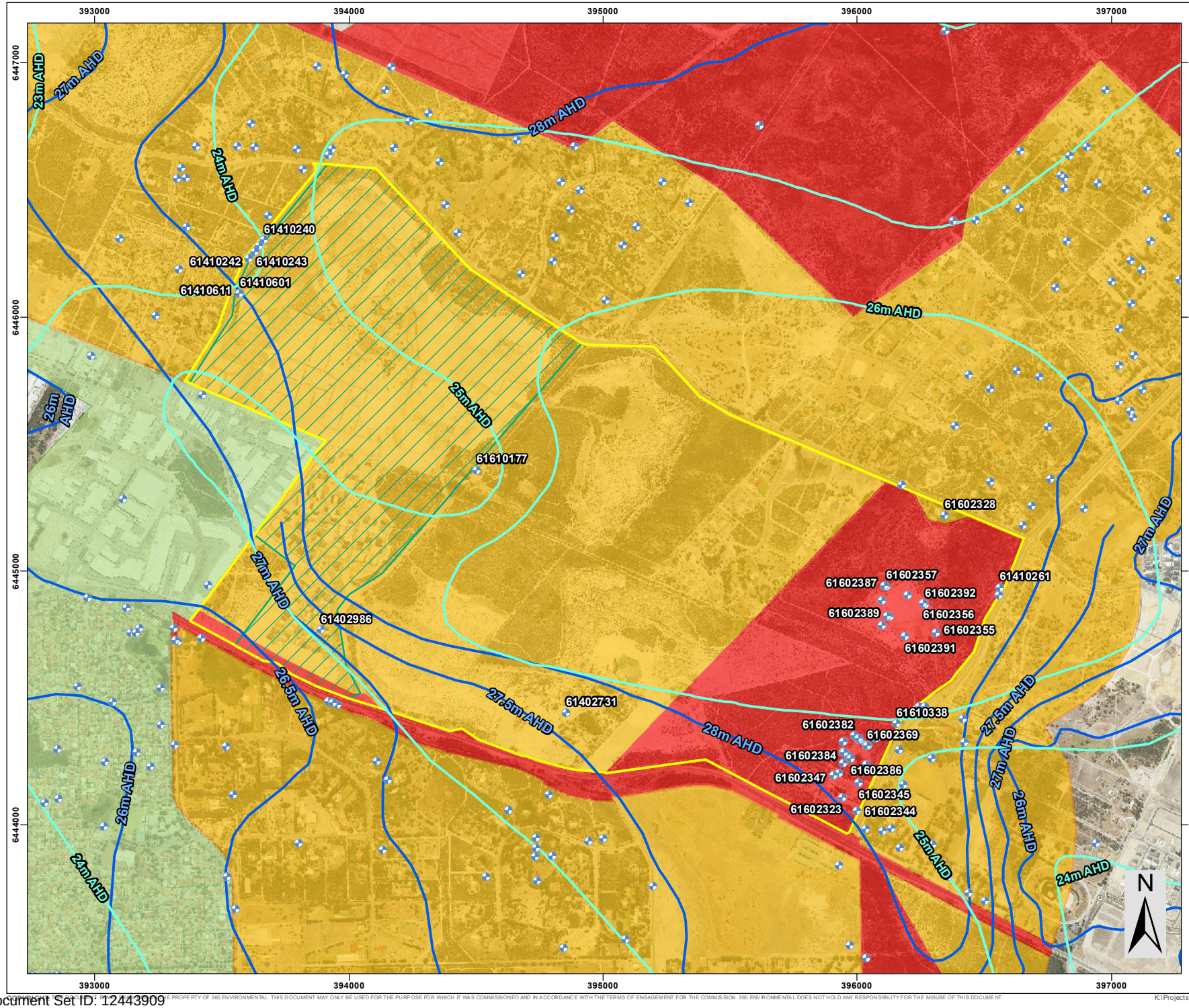
CREATED	CHECKED	APPROVED	REVISION
JJ	KC	SB	0

Perron Developments Pty Ltd
Banjup District Structure Plan

Environmental Assessment Report

Figure 5
Landforms and Soils

K:\Projects\3.0 LD\1405 Banjup DSP EAR\Figures\1405 EAR Figure 5 - Landforms and Soils.mxd



Legend

- District Structure Plan Boundary (461.54 ha)
- Groundwater WIN Bore
- Groundwater Contour (Hist. Max)
- Groundwater Contour (Hist. Min)

Public Drinking Water Source Areas (PDWSA)

- P1 symbology
- P2 symbology
- P3 symbology
- Downgraded to P3 under Draft SPP2.3

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- PDWSA, GW CONTOURS AND WIN BORES SOURCED DOW 2012
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE FEB 2016

Powered by 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

0 200 400 600 800 Meters

1:20,000 @ A4

LOCALITY MAP

PROJECT ID	DATE
1405	25-May-16

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
JJ	KC	SB	0

Perron Developments Pty Ltd
Banjup District Structure Plan

Environmental Assessment Report

Figure 6
Groundwater

K:\Projects\3.0 LD\1405 Banjup DSP EAR\Figures\1405 EAR Figure 5 - Groundwater.mxd

Legend

- District Structure Plan Boundary (461.54 ha)
- Directory of Important Wetlands

Surface Water Features

- Area Subject to Inundation
- Drain - major
- Earth Dam
- Swamp - perennial

Geomorphic Wetlands

- Conservation
- Resource Enhancement
- Multiple Use
- Not Assessed

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- DIWA SOURCED DOTE 2016
- SURFACE WATER FEATURES SOURCED DOW 2012
- GEOMORPHIC WETLANDS SOURCED DPAW JAN 2016
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE FEB 2016

Powered by 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

0 200 400 600 800

Meters

1:20,000 @ A4

LOCALITY MAP

PROJECT ID	DATE
1405	17-May-16

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

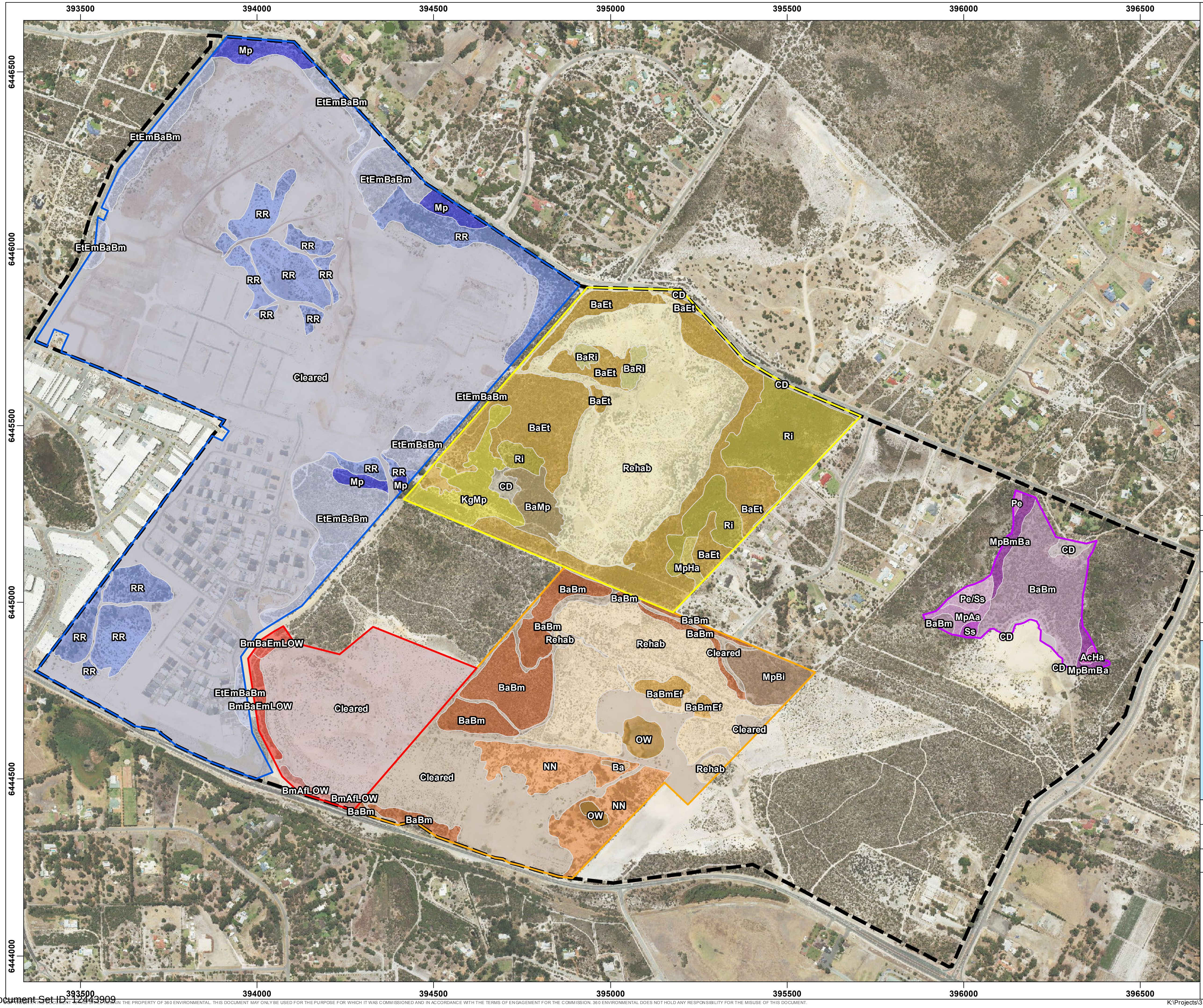
CREATED	CHECKED	APPROVED	REVISION
JJ	KC	SB	0

Perron Developments Pty Ltd
Banjup District Structure Plan

Environmental Assessment Report

Figure 7
Hydrology and Wetlands

K:\Projects\3.0 LD\1405 Banjup DSP EAR\Figures\1405 EAR Figure 6 - Hydrology and Wetlands.mxd



Legend

District Structure Plan Boundary

Survey Areas

- Lot 4 Armadale Road, Banjup
- Lot 467 Jandakot Road, Banjup
- Lot 1 (Previously Lot 821) Armadale Road, Banjup
- Lot 131 Jandakot Road, Banjup
- Calleya Estate LSP Area

Lot 4 Armadale Road

- Ba
- BaBm
- BaBmEf
- MpBi
- NN
- OW
- Rehab
- Cleared

Lot 467 Jandakot Road

- AcHa
- BaBm
- MpAa
- MpBmBa
- Pe
- Pe/Ss
- Ss
- CD

Lot 1 (Previously Lot 821) Armadale Road

- BmAfLOW
- BmBaEmLOW
- Cleared

Lot 131 Jandakot Road

- BaEt
- BaMp
- BaRi
- KgMp
- MpHa
- Ri
- Rehab
- CD

Calleya Estate LSP Area

- EtEmBaBm
- Mp
- RR
- Cleared

- VEGETATION ASSOCIATION SOURCED RPS 2011, RPS 2013, ENV 2013, PGV ENVIRONMENTAL 2013 AND 360 ENVIRONMENTAL 2015, SUPPLEMENTED WITH CURRENT CLEARED EXTENTS (AERIAL IMAGERY FEB 2016)
- LOCALITY MAP SOURCED FROM LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE FEB 2016 (© Western Australian Land Information Authority 2016)

Powered By SLIP ENABLER

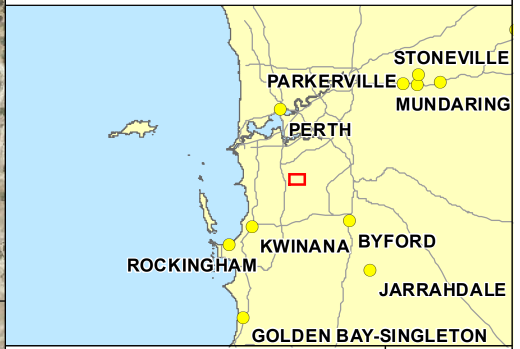
PERRON GROUP

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

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

0 100 200 300 400 500
Meters
1:10,000 @ A3

LOCALITY MAP



PROJECT NO	DATE
1405	24/05/2016

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
JJ	RH	SB	0

Perron Developments Pty Ltd
Banjup District Structure Plan

Environmental Assessment Report

Figure 8
Consolidated Vegetation Units

K:\Projects\3.0 LD\1405 Banjup DSP EAR\Figures\1405 EAR Figure 7 - Vegetation Units.mxd

393500 394000 394500 395000 395500 396000 396500

6446500 6446000 6445500 6445000 6444500 6444000

Legend

District Structure Plan Boundary

Survey Areas

- Lot 1 (Previously Lot 821) Armadale Road, Banjup
- Lot 131 Jandakot Road, Banjup
- Lot 4 (ENV 2013)
- Lot 467 Jandakot Road, Banjup
- Calleya Estate LSP Area

Consolidated Vegetation Condition

- E: Excellent
- VG-E: Very Good to Excellent
- VG: Very Good
- G-VG: Good to Very Good
- G: Good
- G-D: Good to Degraded
- D and D/R: Degraded and/or Degraded/Rehab
- CD-D: Completely Degraded to Degraded
- CD: Completely Degraded
- N/A: Open Water

- VEGETATION ASSOCIATION SOURCED RPS 2011, RPS 2013, ENV 2013, PGV ENVIRONMENTAL 2013 AND 360 ENVIRONMENTAL 2015, SUPPLEMENTED WITH CURRENT CLEARED EXTENTS (AERIAL IMAGERY FEB 2016)
- LOCALITY MAP SOURCED FROM LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE FEB 2016 (© Western Australian Land Information Authority 2016)

Powered by SLIP ENABLER

PERRON GROUP

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

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

0 100 200 300 400 500

Meters

1:10,000 @ A3

LOCALITY MAP

PROJECT NO	DATE
1405	24/05/2016

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

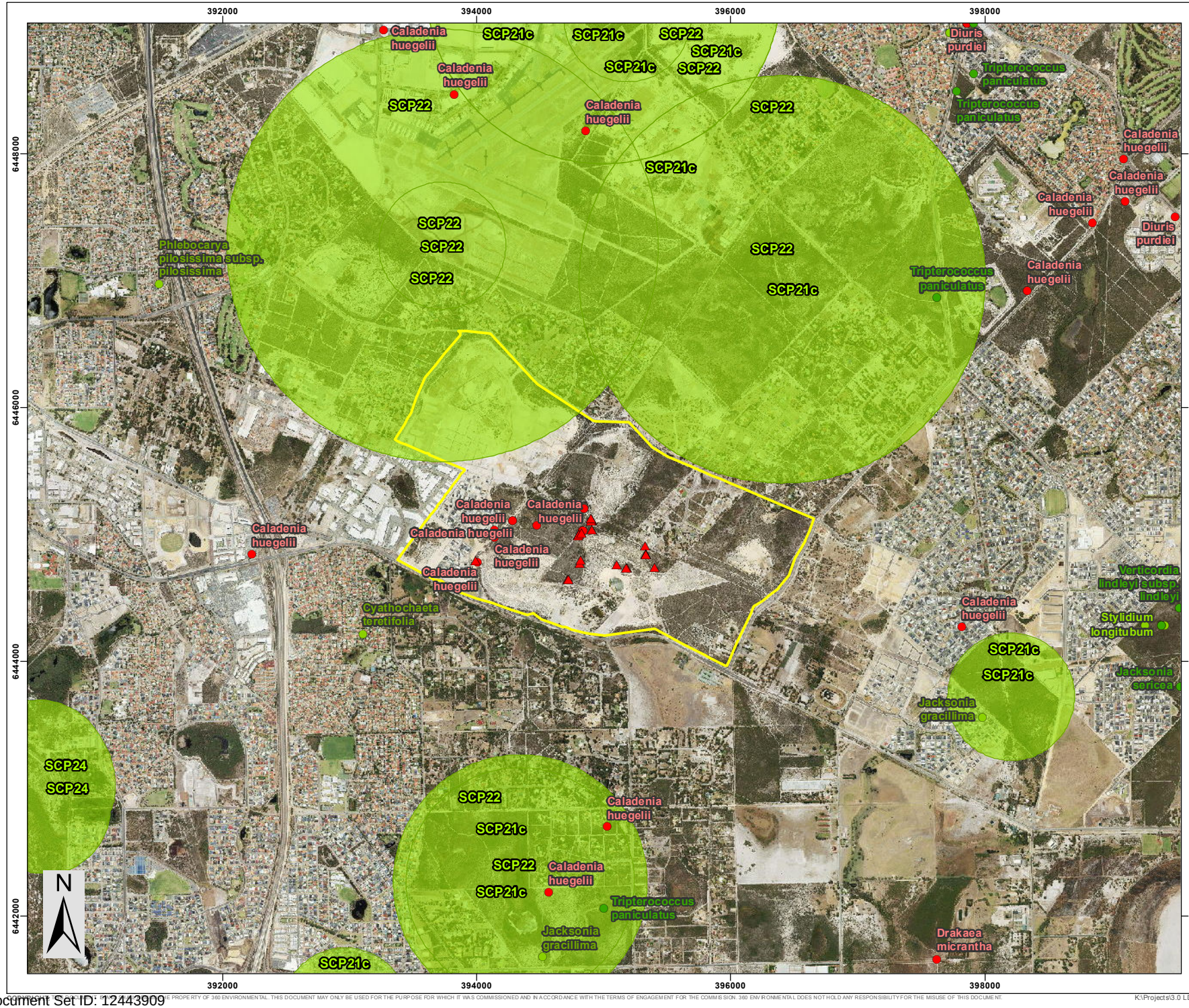
CREATED	CHECKED	APPROVED	REVISION
JJ	RH	SB	0

Perron Developments Pty Ltd
Banjup District Structure Plan

Environmental Assessment Report

Figure 9
Consolidated Vegetation Condition

K:\Projects\3.0 LD\1405 Banjup DSP EAR\Figures\1405 EAR Figure 8 - Vegetation Condition.mxd



Legend

District Structure Plan Boundary (461.54 ha)

Rare and Priority Flora

- Priority 4
- Priority 3
- Priority 2
- Priority 1
- Declared Rare
- *Caladenia huegelii* records (Surveyed)

TECs and PECs

- Priority 4
- Priority 3
- Priority 2
- Priority 1
- Vulnerable
- Endangered
- Critically Endangered

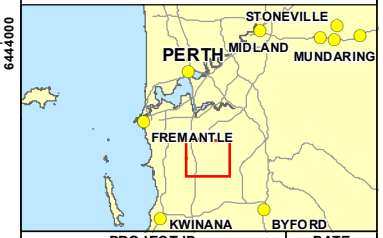
- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- SURVEYED FLORA LOCATIONS SOURCED ENV 2013, 360 ENVIRONMENTAL 2015 AND PGV ENVIRONMENTAL 2013
- FLORA RECORDS PURCHASED FROM DPAW 20 DEC 2013 (REF 36-1213FL)
- TEC AND PEC DATA PURCHASED FROM DPAW 23 DEC 2013
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE FEB 2016 (© Western Australian Land Information Authority 2016)

Powered by 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

0 250 500 750 1,000 1,250 1,500
Meters
1:40,000 @ A4

LOCALITY MAP



PROJECT ID	DATE
1405	24/05/2016

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
JJ	KC	SB	0

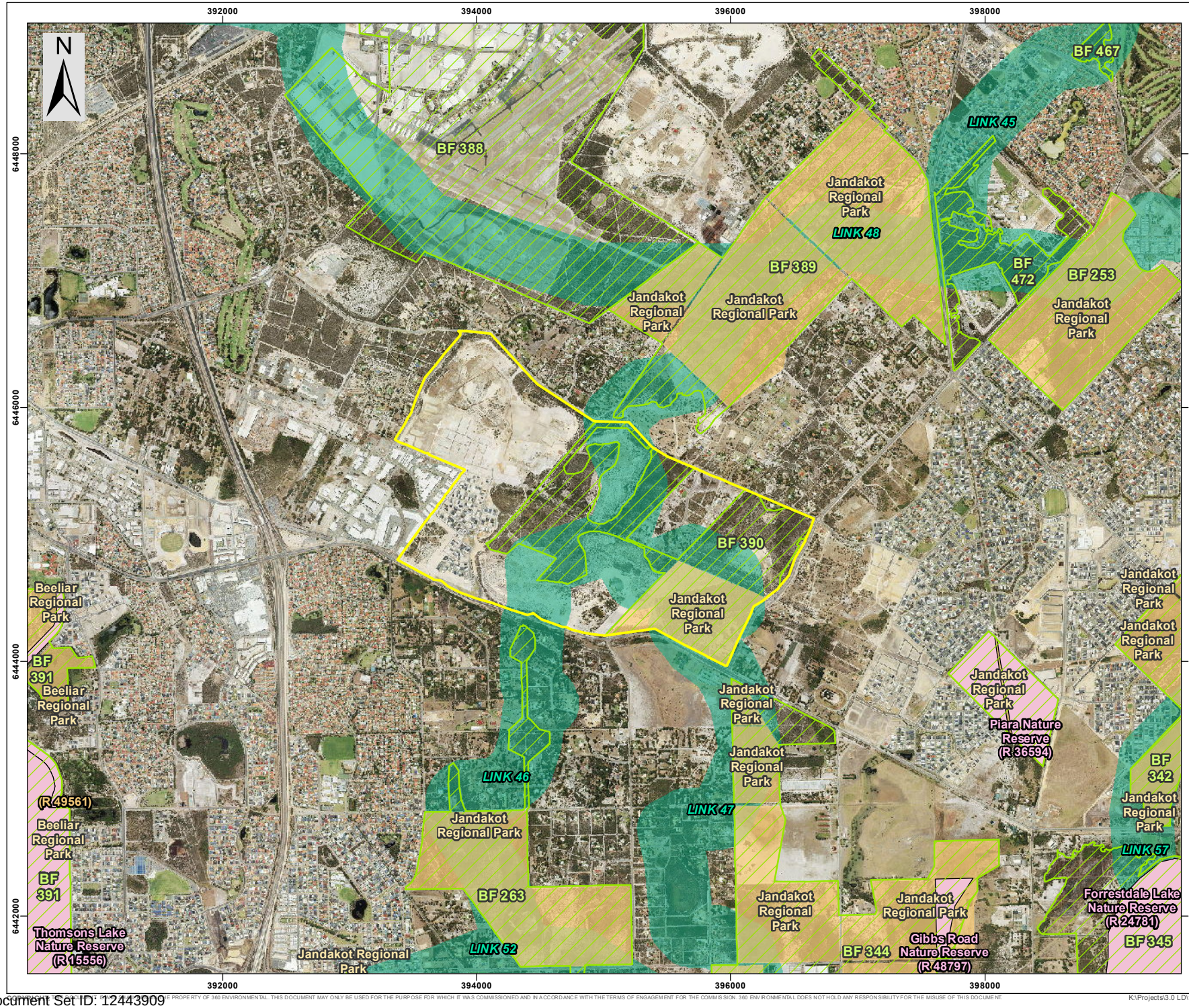
Perron Developments Pty Ltd
Banjup District Structure Plan

Environmental Assessment Report

Figure 10

Threatened and Priority Flora and Ecological Communities

K:\Projects\3.0 LD\1405 Banjup DSP EAR\Figures\1405 EAR Figure 9 - TECPEC and Flora.mxd



Legend

- District Structure Plan Boundary (461.54 ha)
- Bush Forever Sites
- Regional Parks
- Perth Regional Ecological Linkages

DPaW Managed Lands

- Conservation Park
- Nature Reserve

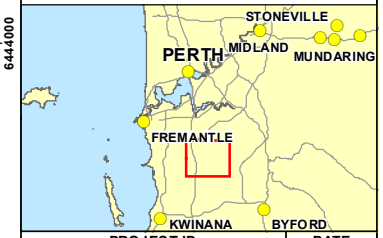
- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- BUSH FOREVER SOURCED DOP 2014
- REGIONAL PARKS SOURCED LANDGATE 2015
- ECOLOGICAL LINKAGES SOURCED PBP 2008 (WALGA)
- DPAW LANDS SOURCED DPAW 2016
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE FEB 2016

Powered by 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

0 250 500 750 1,000 1,250 1,500
Meters
1:40,000 @ A4

LOCALITY MAP



PROJECT ID	DATE
1405	18-May-16

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
JJ	KC	SB	0

Perron Developments Pty Ltd
Banjup District Structure Plan

Environmental Assessment Report

Figure 11
Conservation Areas

K:\Projects\3.0 LD\1405 Banjup DSP EAR\Figures\1405 EAR Figure 10 - Conservation Areas.mxd

Legend

- District Structure Plan Boundary (461.54 ha)
- Municipal Heritage List

Aboriginal Heritage Sites

- Registered Site
- Lodged Site
- Stored Data / Not a Site

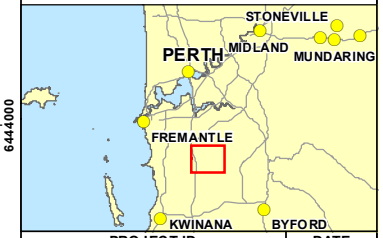
- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- ABORIGINAL HERITAGE SITES SOURCED DAA 2016
- MUNICIPAL LISTING SOURCED INHERIT (SHO) 2016
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE FEB 2016

Powered by 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

0 200 400 600 800 1,000 1,200
Meters
1:30,000 @ A4

LOCALITY MAP



PROJECT ID	DATE
1405	24/05/2016

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

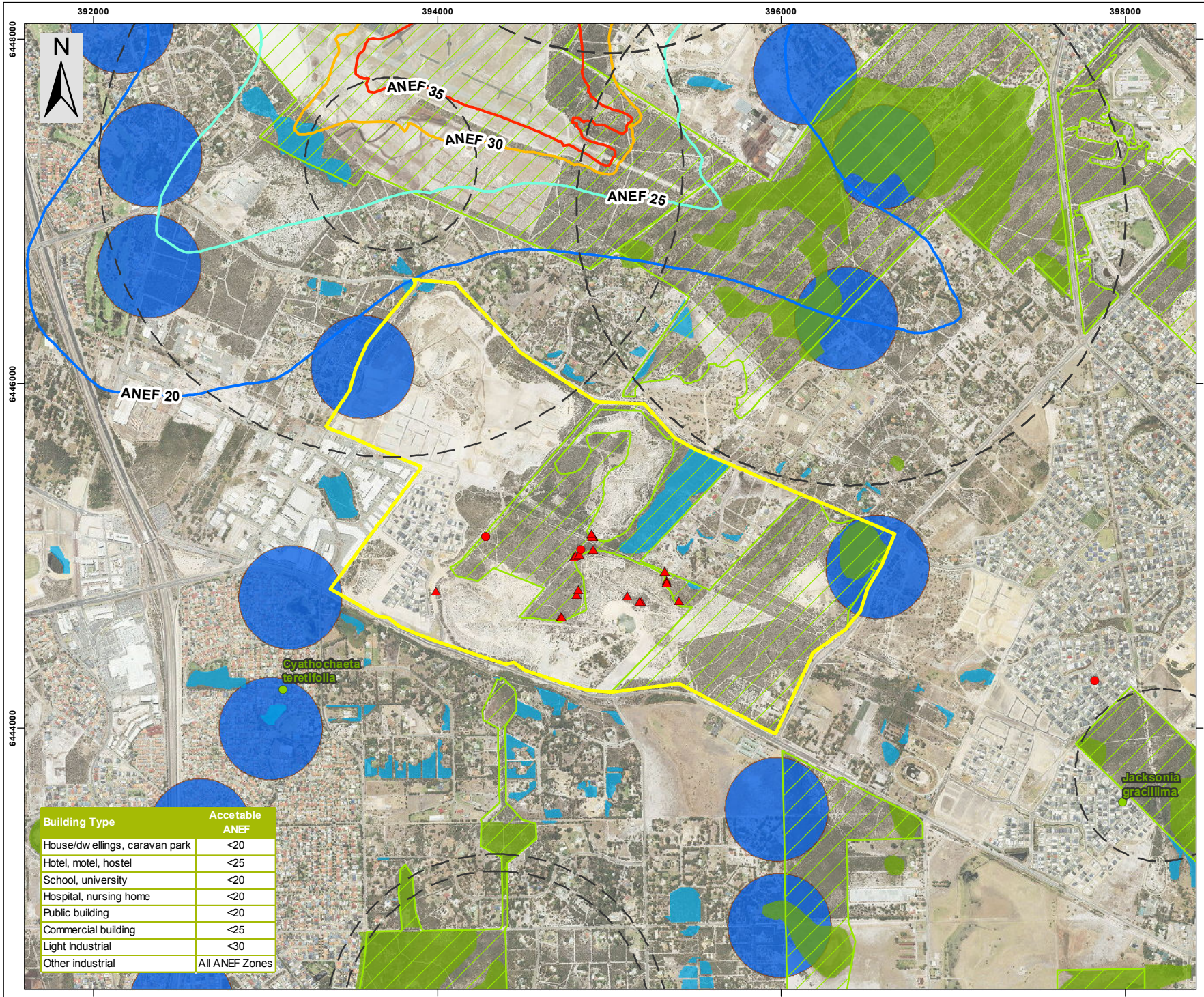
CREATED	CHECKED	APPROVED	REVISION
JJ	KC	SB	0

Perron Developments Pty Ltd
Banjup District Structure Plan

Environmental Assessment Report

Figure 12
Heritage

K:\Projects\3.0 LD\1405 Banjup DSP EAR\Figures\1405 EAR Figure 11 - Heritage.mxd



Building Type	Accetable ANEF
House/dw ellings, caravan park	<20
Hotel, motel, hostel	<25
School, university	<20
Hospital, nursing home	<20
Public building	<20
Commercial building	<25
Light Industrial	<30
Other industrial	All ANEF Zones

Legend

- DSP Boundary (461.54 ha)
- CCW
- REW (With Remant Vegetation)
- PEC Buffers
- Bush Forever Sites
- Wellhead Protection Buffer

Jandakot Airport Ultimate Capacity ANEF [1]

- 20 ANEF
- 25 ANEF
- 30 ANEF
- 35 ANEF

Rare and Priority Flora

- Priority 4
- Priority 3
- Priority 2
- Priority 1
- Declared Rare (*C. huegelii*)
- Known *Caladenia huegelii* records (Surveyed)

NOTE:

1. ANEF: Australian Noise Exposure Forecast

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- JANDAKOT ANEF SOURCED FROM JANDAKOT AIRPORT (AIR SERVICES 2014)
- WETLANDS SOURCED DPAW 2016
- PEC BUFFERS AND FLORA SOURCED DPAW 2013 & SURVEYS (SEE FIGURE 7/8)
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE FEB 2016 (© Western Australian Land Information Authority 2016)

Powered by SLIP ENABLER

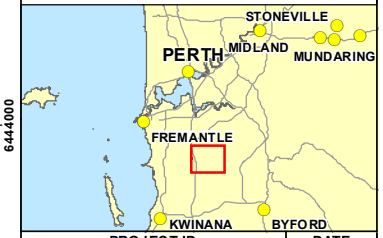
360 environmental
a 10 Bermondsey St, West Leederville, 6007 WA
t (08) 9388 8360
f (08) 9381 2360
w www.360environmental.com.au

0 200 400 600 800 1,000 1,200

Meters

1:30,000 @ A4

LOCALITY MAP



PROJECT ID	DATE
1405	24/05/2016

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
JJ	KC	SB	0

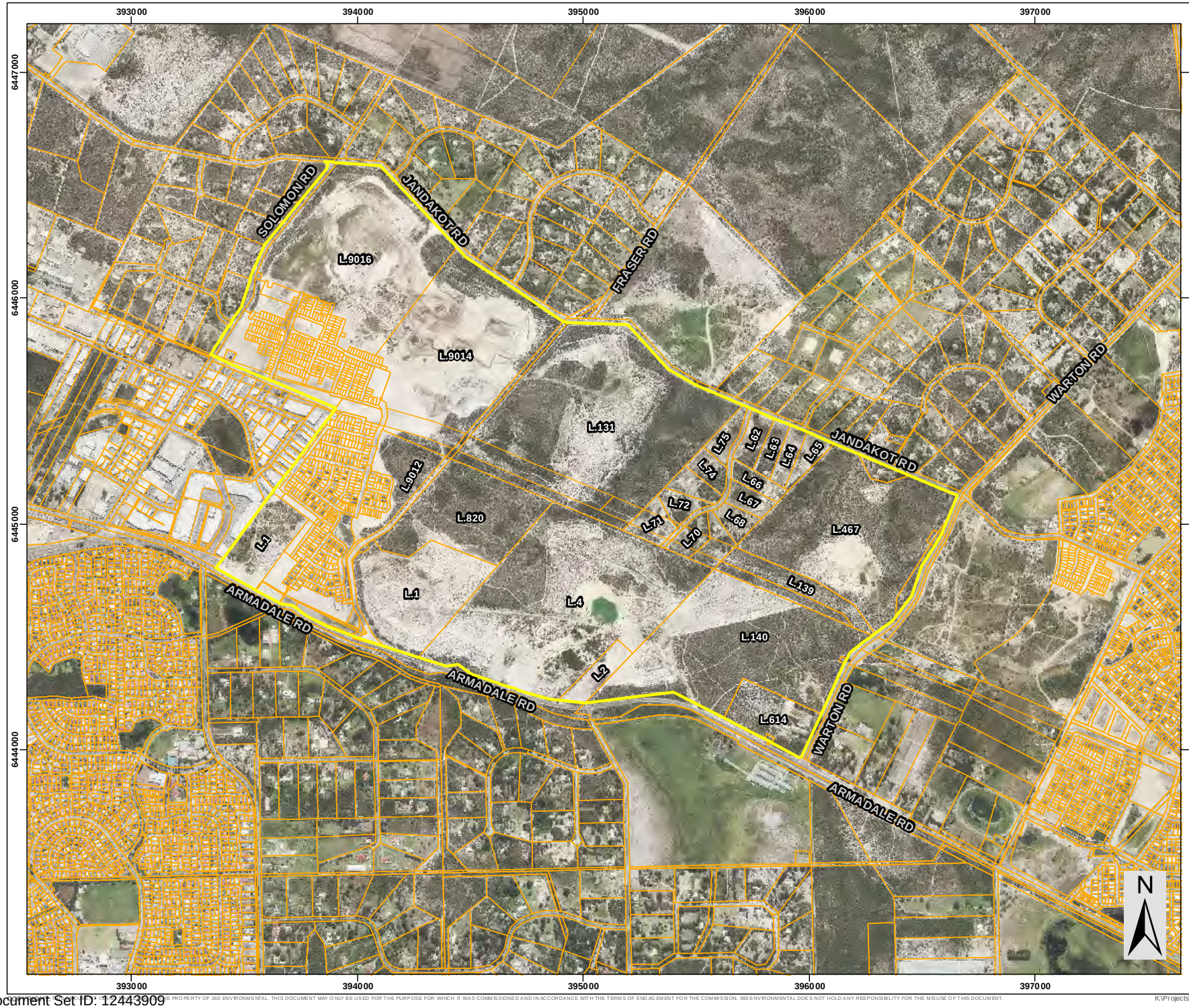
Perron Developments Pty Ltd
Banjup District Structure Plan

Environmental Assessment Report

Figure 13

Environmental Opportunities and Constraints

K:\Projects\3.0 LD\1405 Banjup DSP EAR\Figures\1405 EAR Figure 12 - Opportunities and Constraints.mxd



Legend

- District Structure Plan Boundary (461.54 ha)
- Cadastre

NOTE:
L. indicates 'Lot'

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- CADASTRE SOURCED LANDGATE VIA SLIP 6 APRIL 2016
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE SEPT 2015
(© Western Australian Land Information Authority 2015)

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

0 200 400 600 800
Meters
1:22,500 @ A4

LOCALITY MAP

PROJECT ID	DATE
1405	06-Apr-16

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

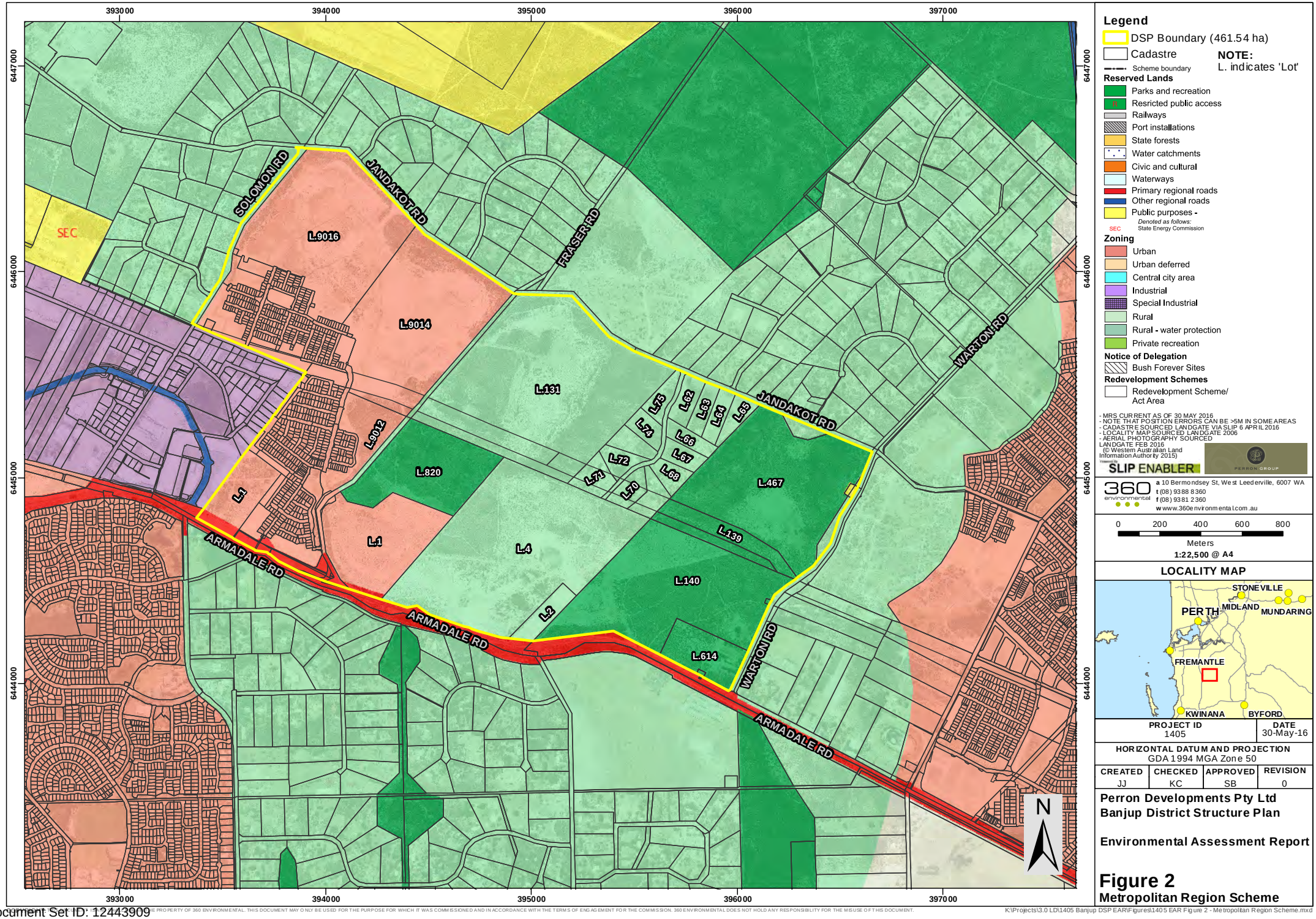
CREATED	CHECKED	APPROVED	REVISION
JJ	KC	SB	0

Perron Developments Pty Ltd
Banjup District Structure Plan

Environmental Assessment Report

Figure 1
Site Location

K:\Projects\3.0 LD\1405 Banjup DSP EAR\Figures\1405 EAR Figure 1 - Site Location.mxd



Legend

DSP Boundary (461.54 ha)

Cadastre

Scheme boundary

NOTE: L. indicates 'Lot'

Reserved Lands

- Parks and recreation
- Resricted public access
- Railways
- Port installations
- State forests
- Water catchments
- Civic and cultural
- Waterways
- Primary regional roads
- Other regional roads
- Public purposes -

Denoted as follows:

SEC State Energy Commission

Zoning

- Urban
- Urban deferred
- Central city area
- Industrial
- Special Industrial
- Rural
- Rural - water protection
- Private recreation

Notice of Delegation

- Bush Forever Sites

Redevelopment Schemes

- Redevelopment Scheme/ Act Area

- MRS CURRENT AS OF 30 MAY 2016
- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- CADASTRE SOURCED LANDGATE VIA SLIP 6 APRIL 2016
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE FEB 2016 (© Western Australian Land Information Authority 2015)

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

0 200 400 600 800

Meters

1:22,500 @ A4

LOCALITY MAP

PROJECT ID	DATE
1405	30-May-16

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

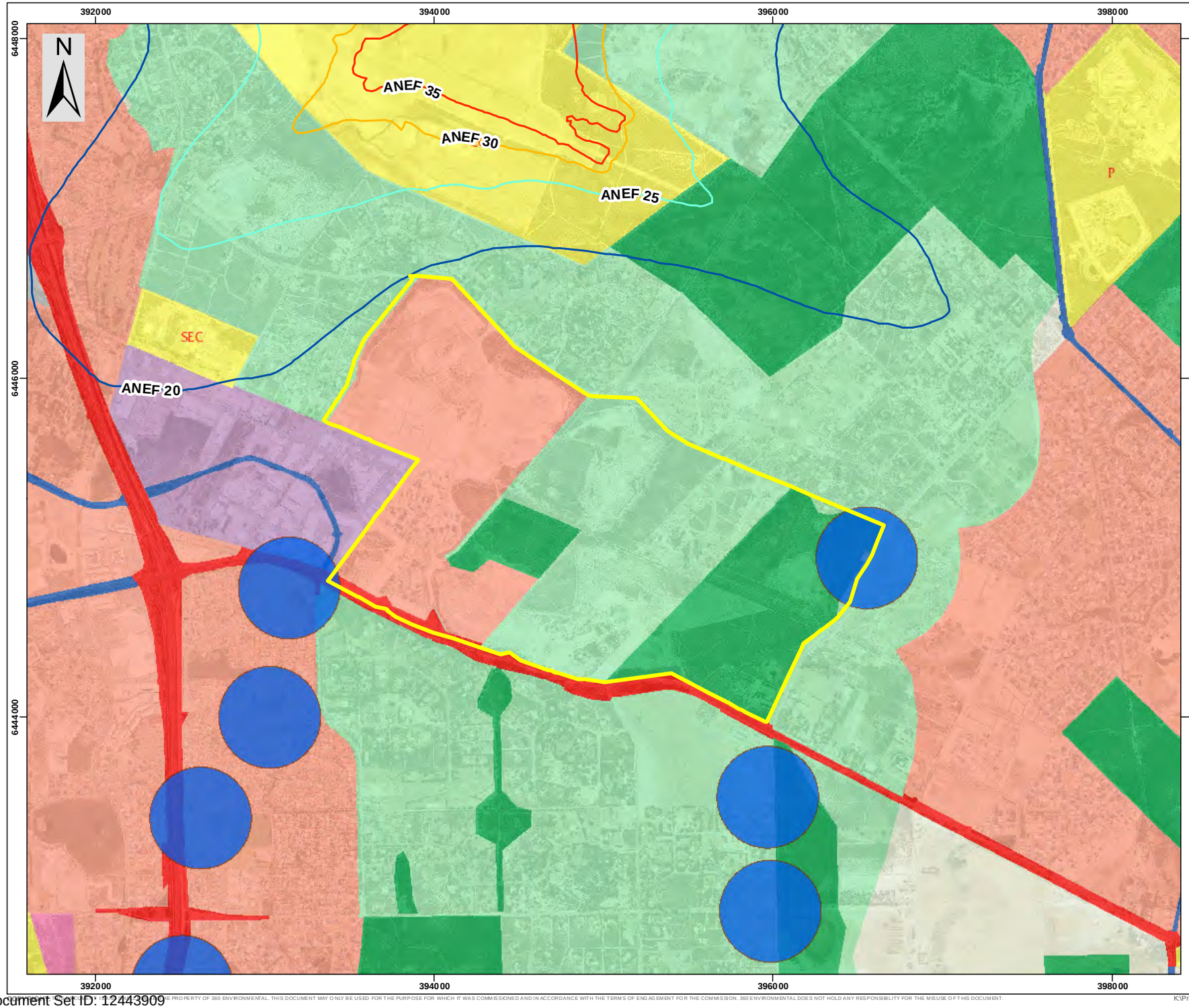
CREATED	CHECKED	APPROVED	REVISION
JJ	KC	SB	0

Perron Developments Pty Ltd
Banjup District Structure Plan

Environmental Assessment Report

Figure 2
Metropolitan Region Scheme

K:\Projects\3.0 LD\1405 Banjup DSP EAR\Figures\1405 EAR Figure 2 - Metropolitan Region Scheme.mxd



Legend

- DSP Boundary (461.54 ha)
- Wellhead Protection Buffer

Jandakot Airport Ultimate Capacity ANEF[1]

- 20 ANEF
- 25 ANEF
- 30 ANEF
- 35 ANEF

MRS Zones and Reserves

- Industrial
- Other regional roads
- Parks and recreation
- Primary regional roads
- Public purposes[2]
- Railways
- Rural
- Rural - water protection
- Urban
- Urban deferred

NOTE:

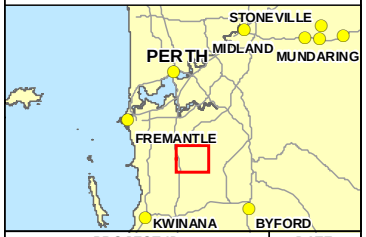
1. ANEF: Australian Noise Exposure Forecast
2. CG - Commonwealth Government, P - Prison, SEC - State Energy Commission, WSD - Water Authority of WA

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- JANDAKOT ANEF SOURCED FROM JANDAKOT AIRPORT (AIR SERVICES 2014). MRS SOURCED 2015
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE FEB 2016
(© Western Australian Land Information Authority 2016)

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

0 200 400 600 800 1,000 1,200
Meters
1:30,000 @ A4

LOCALITY MAP



PROJECT ID	DATE
1405	30-May-16

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

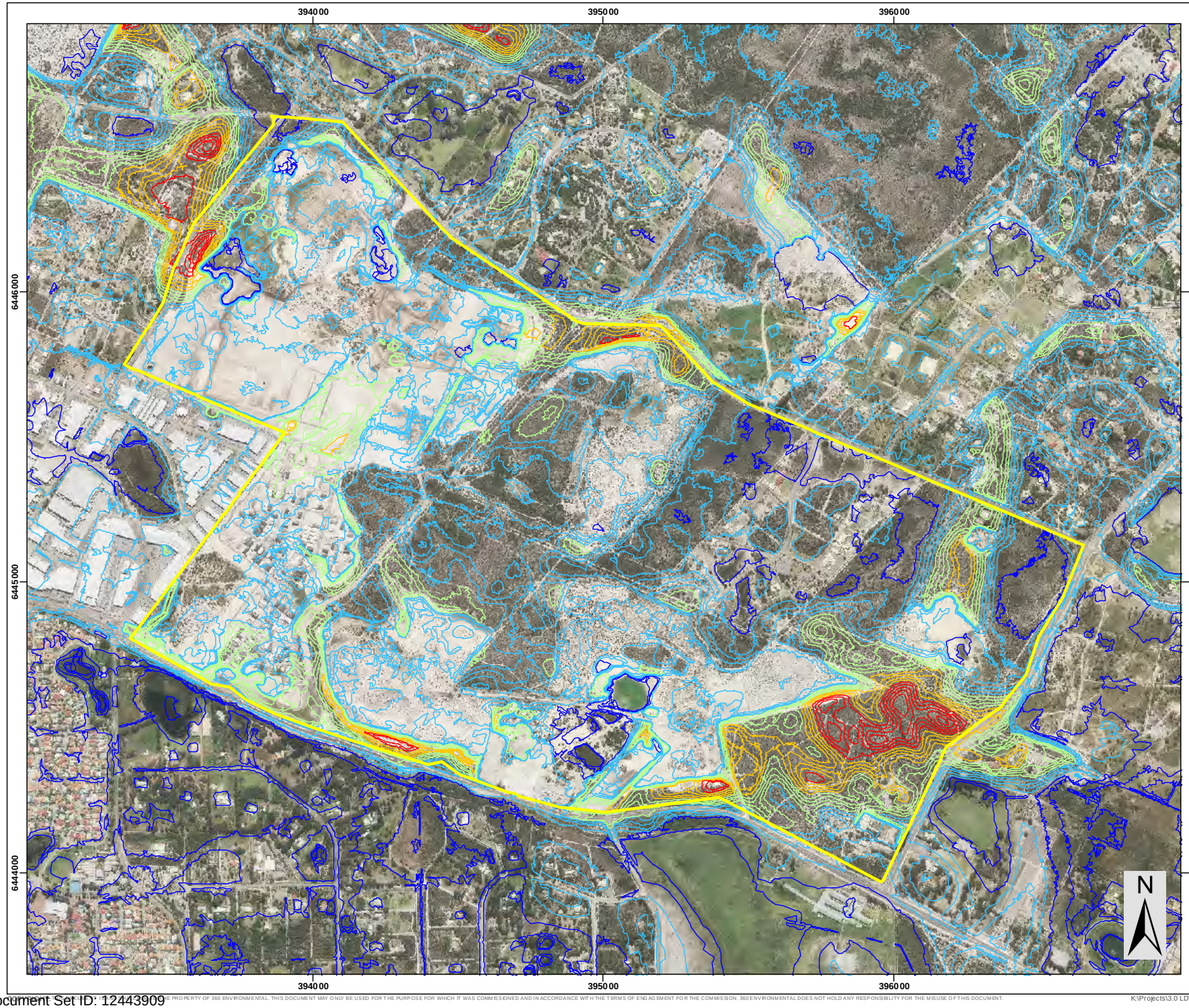
CREATED	CHECKED	APPROVED	REVISION
JJ	KC/RH	SB	0

Perron Developments Pty Ltd
Banjup District Structure Plan

Environmental Assessment Report

Figure 3
Surrounding Land Uses and Buffers

K:\Projects\3.0 LD\1405 Banjup DSP EAR\Figures\1405 EAR Figure 3 - Buffers.mxd



Legend

District Structure Plan Boundary (461.54 ha)

Elevation Contours (mAHD)

- 24 - 28
- 28 - 32
- 32 - 36
- 36 - 40
- 40 - 45

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- ELEVATION SOURCED DOW 2015
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE SEPT 2015

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

0 200 400 600
Meters
1:17,500 @ A4

LOCALITY MAP

PROJECT ID	DATE
1405	06-Apr-16

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

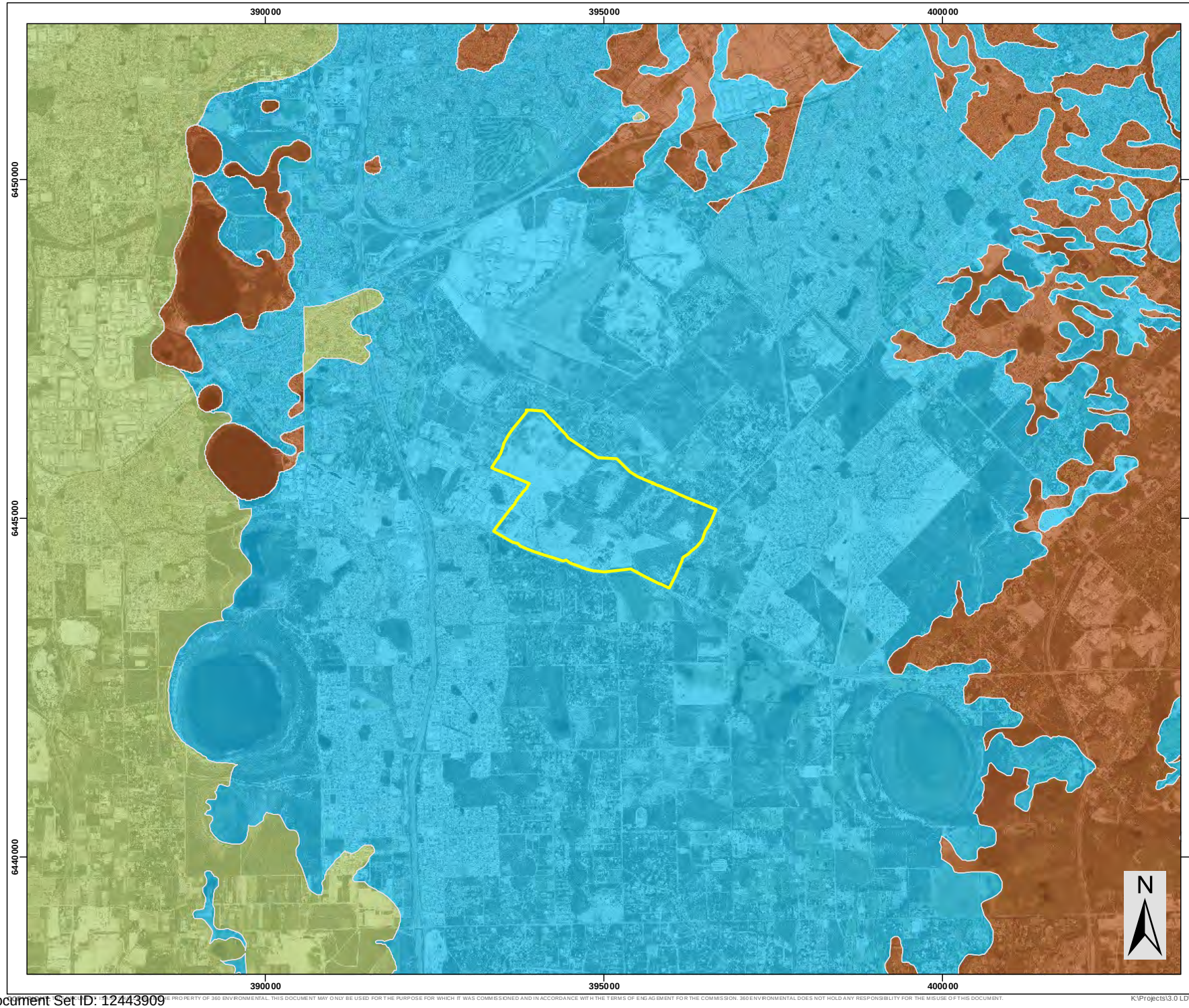
CREATED	CHECKED	APPROVED	REVISION
JJ	KC	SB	0

Perron Developments Pty Ltd
Banjup District Structure Plan

Environmental Assessment Report

Figure 4
Topography

K:\Projects\3.0 LD\1405 Banjup DSP EAR\Figures\1405 EAR Figure 5 - Landforms and Soils.mxd



Legend

District Structure Plan Boundary (461.54 ha)

Soil Landscapes

Bassendean System: Swan Coastal Plain from Busselton to Jurien. Sand dunes and sandplains with pale deep sand, semi-wet and wet soil. Banksia-paperbark woodlands and mixed heaths.

Pinjarra System: Swan Coastal Plain from Perth to Capel. Poorly drained coastal plain with variable alluvial and aeolian soils. Variable vegetation includes Jarrah, marri, wandoo, paperbark sheoaks and rudis.

Spearwood System: Sand dunes and plains. Yellow deep sands, pale deep sands and yellow/brown shallow sands.

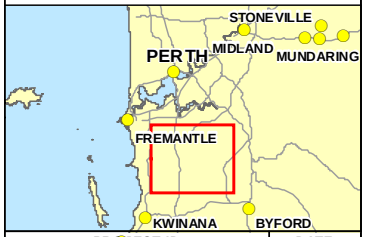
- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- SOIL LANDSCAPES SOURCED DAFWA 2012
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE SEPT 2015

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

0 1,000 2,000 3,000
Meters
1:75,000 @ A4

LOCALITY MAP



PROJECT ID	DATE
1405	06-Apr-16

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

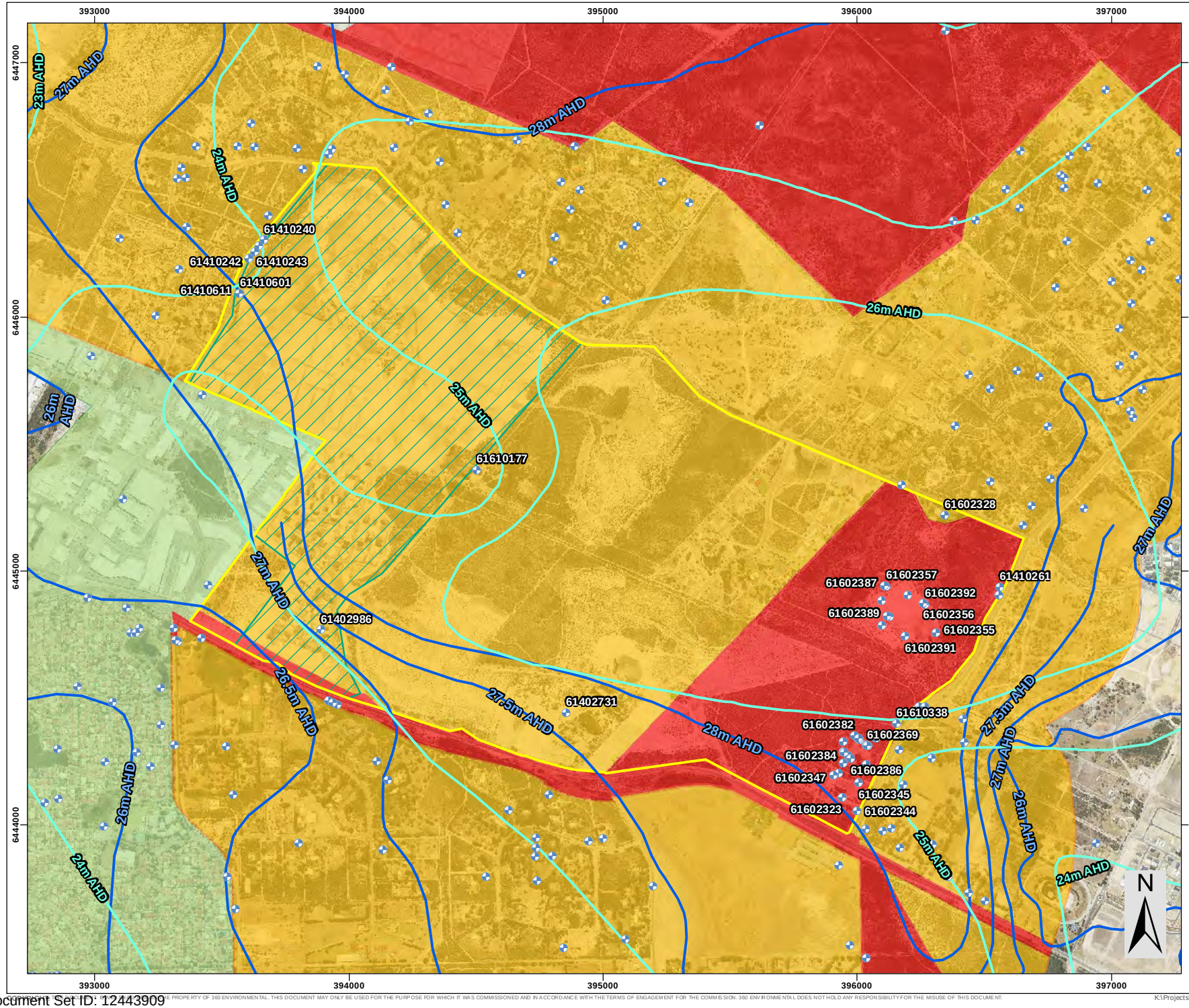
CREATED	CHECKED	APPROVED	REVISION
JJ	KC	SB	0

Perron Developments Pty Ltd
Banjup District Structure Plan

Environmental Assessment Report

Figure 5
Landforms and Soils

K:\Projects\3.0 LD\1405 Banjup DSP EAR\Figures\1405 EAR Figure 5 - Landforms and Soils.mxd



Legend

- District Structure Plan Boundary (461.54 ha)
- Groundwater WIN Bore
- Groundwater Contour (Hist. Max)
- Groundwater Contour (Hist. Min)

Public Drinking Water Source Areas (PDWSA)

- P1 symbology
- P2 symbology
- P3 symbology
- Downgraded to P3 under Draft SPP2.3

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- PDWSA, GW CONTOURS AND WIN BORES SOURCED DOW 2012
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE FEB 2016

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

0 200 400 600 800
Meters
1:20,000 @ A4

LOCALITY MAP

PROJECT ID	DATE
1405	25-May-16

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
JJ	KC	SB	0

Perron Developments Pty Ltd
Banjup District Structure Plan

Environmental Assessment Report

Figure 6
Groundwater

K:\Projects\3.0 LD\1405 Banjup DSP EAR\Figures\1405 EAR Figure 5 - Groundwater.mxd

Legend

- District Structure Plan Boundary (461.54 ha)
- Directory of Important Wetlands

Surface Water Features

- Area Subject to Inundation
- Drain - major
- Earth Dam
- Swamp - perennial

Geomorphic Wetlands

- Conservation
- Resource Enhancement
- Multiple Use
- Not Assessed

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- DIWA SOURCED DOTE 2016
- SURFACE WATER FEATURES SOURCED DOW 2012
- GEOMORPHIC WETLANDS SOURCED DPAW JAN 2016
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE FEB 2016

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

0 200 400 600 800
Meters
1:20,000 @ A4

LOCALITY MAP

PROJECT ID	DATE
1405	17-May-16

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

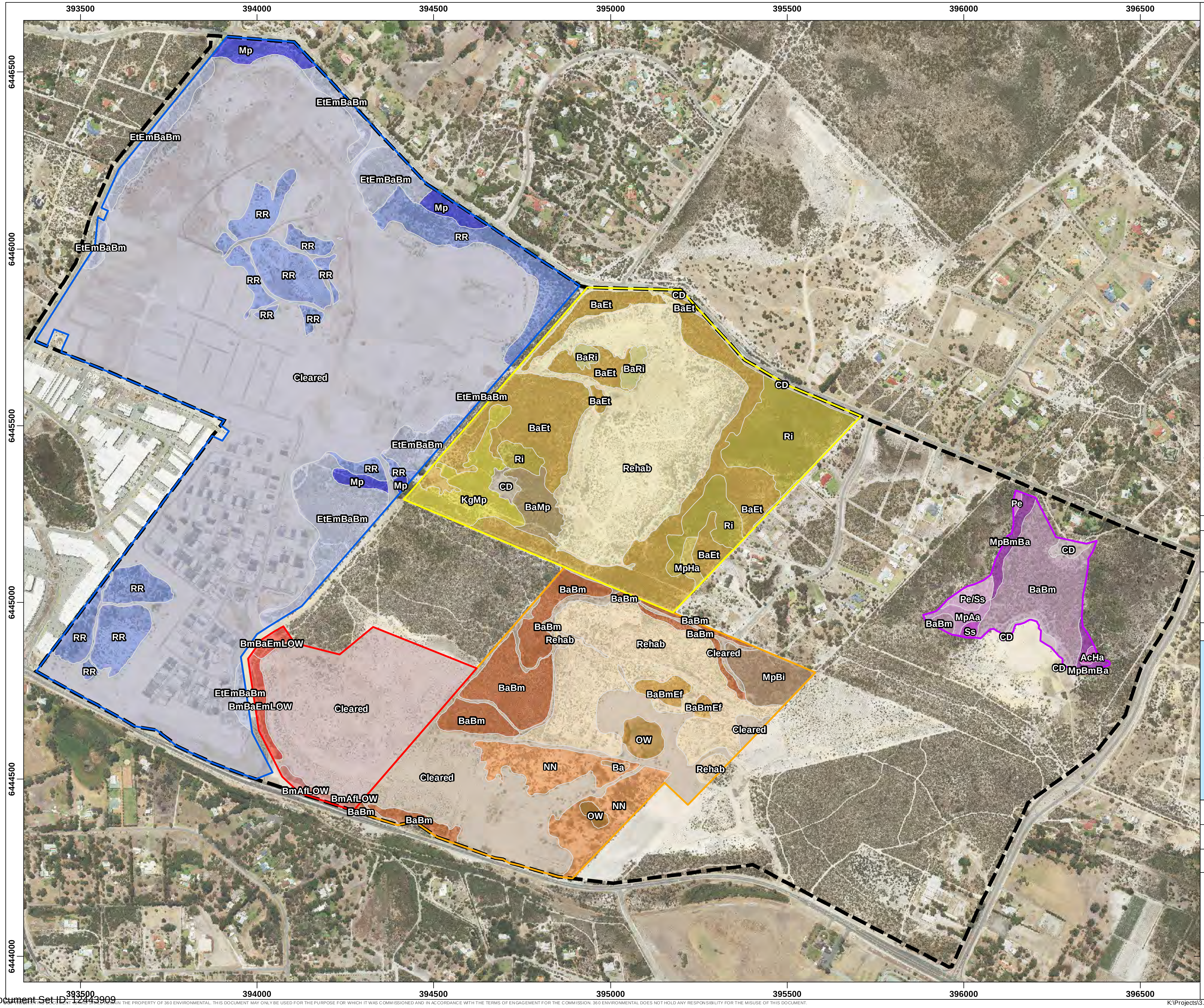
CREATED	CHECKED	APPROVED	REVISION
JJ	KC	SB	0

Perron Developments Pty Ltd
Banjup District Structure Plan

Environmental Assessment Report

Figure 7
Hydrology and Wetlands

K:\Projects\3.0 LD\1405 Banjup DSP EAR\Figures\1405 EAR Figure 6 - Hydrology and Wetlands.mxd



Legend

District Structure Plan Boundary

Survey Areas

- Lot 4 Armadale Road, Banjup
- Lot 467 Jandakot Road, Banjup
- Lot 1 (Previously Lot 821) Armadale Road, Banjup
- Lot 131 Jandakot Road, Banjup
- Calleya Estate LSP Area

Lot 4 Armadale Road

- Ba
- BaBm
- BaBmEf
- MpBi
- NN
- OW
- Rehab
- Cleared

Lot 467 Jandakot Road

- AcHa
- BaBm
- MpAa
- MpBmBa
- Pe
- Pe/Ss
- Ss
- CD

Lot 1 (Previously Lot 821) Armadale Road

- BmAfLOW
- BmBaEmLOW
- Cleared

Lot 131 Jandakot Road

- BaEt
- BaMp
- BaRi
- KgMp
- MpHa
- Ri
- Rehab
- CD

Calleya Estate LSP Area

- EtEmBaBm
- Mp
- RR
- Cleared

- VEGETATION ASSOCIATION SOURCED RPS 2011, RPS 2013, ENV 2013, PGV ENVIRONMENTAL 2013 AND 360 ENVIRONMENTAL 2015, SUPPLEMENTED WITH CURRENT CLEARED EXTENTS (AERIAL IMAGERY FEB 2016)
- LOCALITY MAP SOURCED FROM LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE FEB 2016 (© Western Australian Land Information Authority 2016)

Powered By SLIP ENABLER

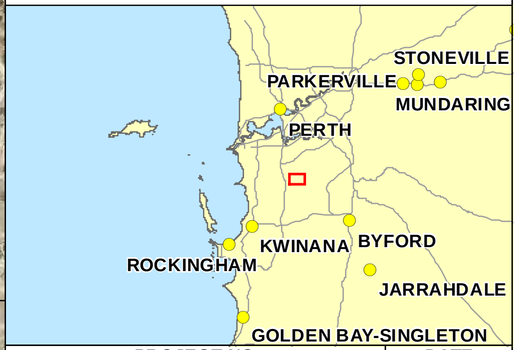
PERRON GROUP

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

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

0 100 200 300 400 500
Meters
1:10,000 @ A3

LOCALITY MAP



PROJECT NO	DATE
1405	24/05/2016

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
JJ	RH	SB	0

Perron Developments Pty Ltd
Banjup District Structure Plan

Environmental Assessment Report

Figure 8
Consolidated Vegetation Units

K:\Projects\3.0 LD\1405 Banjup DSP EAR\Figures\1405 EAR Figure 7 - Vegetation Units.mxd

393500 394000 394500 395000 395500 396000 396500

6446500 6446000 6445500 6445000 6444500 6444000

Legend

District Structure Plan Boundary

Survey Areas

- Lot 1 (Previously Lot 821) Armadale Road, Banjup
- Lot 131 Jandakot Road, Banjup
- Lot 4 (ENV 2013)
- Lot 467 Jandakot Road, Banjup
- Calleya Estate LSP Area

Consolidated Vegetation Condition

- E: Excellent
- VG-E: Very Good to Excellent
- VG: Very Good
- G-VG: Good to Very Good
- G: Good
- G-D: Good to Degraded
- D and D/R: Degraded and/or Degraded/Rehab
- CD-D: Completely Degraded to Degraded
- CD: Completely Degraded
- N/A: Open Water

- VEGETATION ASSOCIATION SOURCED RPS 2011, RPS 2013, ENV 2013, PGV ENVIRONMENTAL 2013 AND 360 ENVIRONMENTAL 2015, SUPPLEMENTED WITH CURRENT CLEARED EXTENTS (AERIAL IMAGERY FEB 2016)
- LOCALITY MAP SOURCED FROM LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE FEB 2016 (© Western Australian Land Information Authority 2016)

Powered by SLIP ENABLER

PERRON GROUP

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

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

0 100 200 300 400 500
Meters
1:10,000 @ A3

LOCALITY MAP

PROJECT NO	DATE
1405	24/05/2016

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

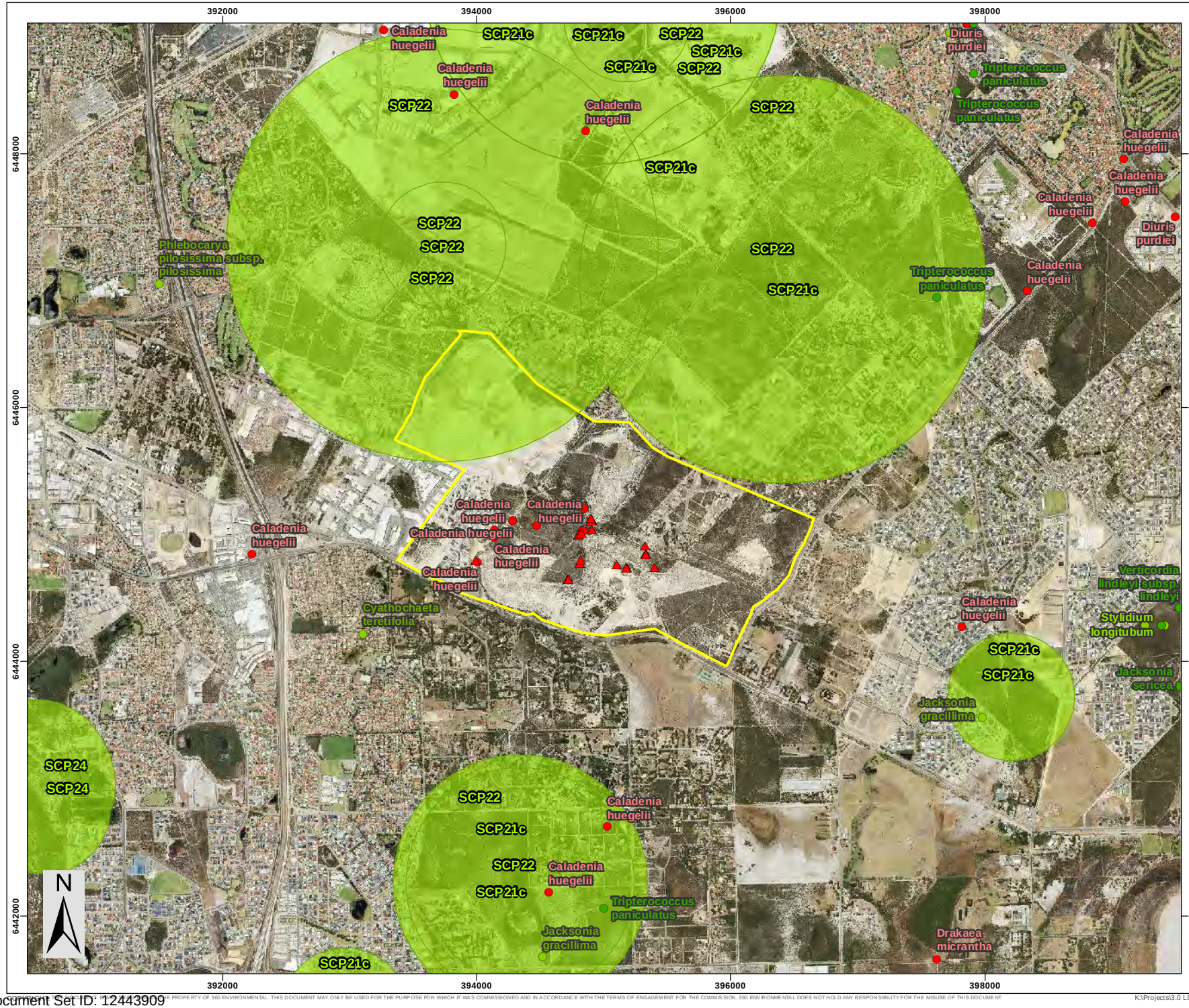
CREATED	CHECKED	APPROVED	REVISION
JJ	RH	SB	0

Perron Developments Pty Ltd
Banjup District Structure Plan

Environmental Assessment Report

Figure 9
Consolidated Vegetation Condition

K:\Projects\3.0 LD\1405 Banjup DSP EAR\Figures\1405 EAR Figure 8 - Vegetation Condition.mxd



Legend

District Structure Plan Boundary (461.54 ha)

Rare and Priority Flora

- Priority 4
- Priority 3
- Priority 2
- Priority 1
- Declared Rare
- *Caladenia huegelii* records (Surveyed)

TECs and PECs

- Priority 4
- Priority 3
- Priority 2
- Priority 1
- Vulnerable
- Endangered
- Critically Endangered

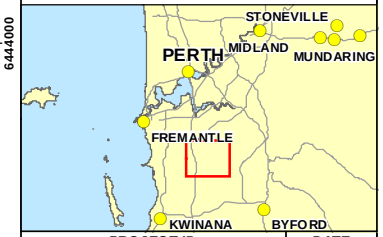
- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- SURVEYED FLORA LOCATIONS SOURCED ENV 2013, 360 ENVIRONMENTAL 2015 AND PGV ENVIRONMENTAL 2013
- FLORA RECORDS PURCHASED FROM DPAW 20 DEC 2013 (REF 36-1213FL)
- TEC AND PEC DATA PURCHASED FROM DPAW 23 DEC 2013
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE FEB 2016 (© Western Australian Land Information Authority 2016)

Powered by 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

0 250 500 750 1,000 1,250 1,500
Meters
1:40,000 @ A4

LOCALITY MAP



PROJECT ID	DATE
1405	24/05/2016

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
JJ	KC	SB	0

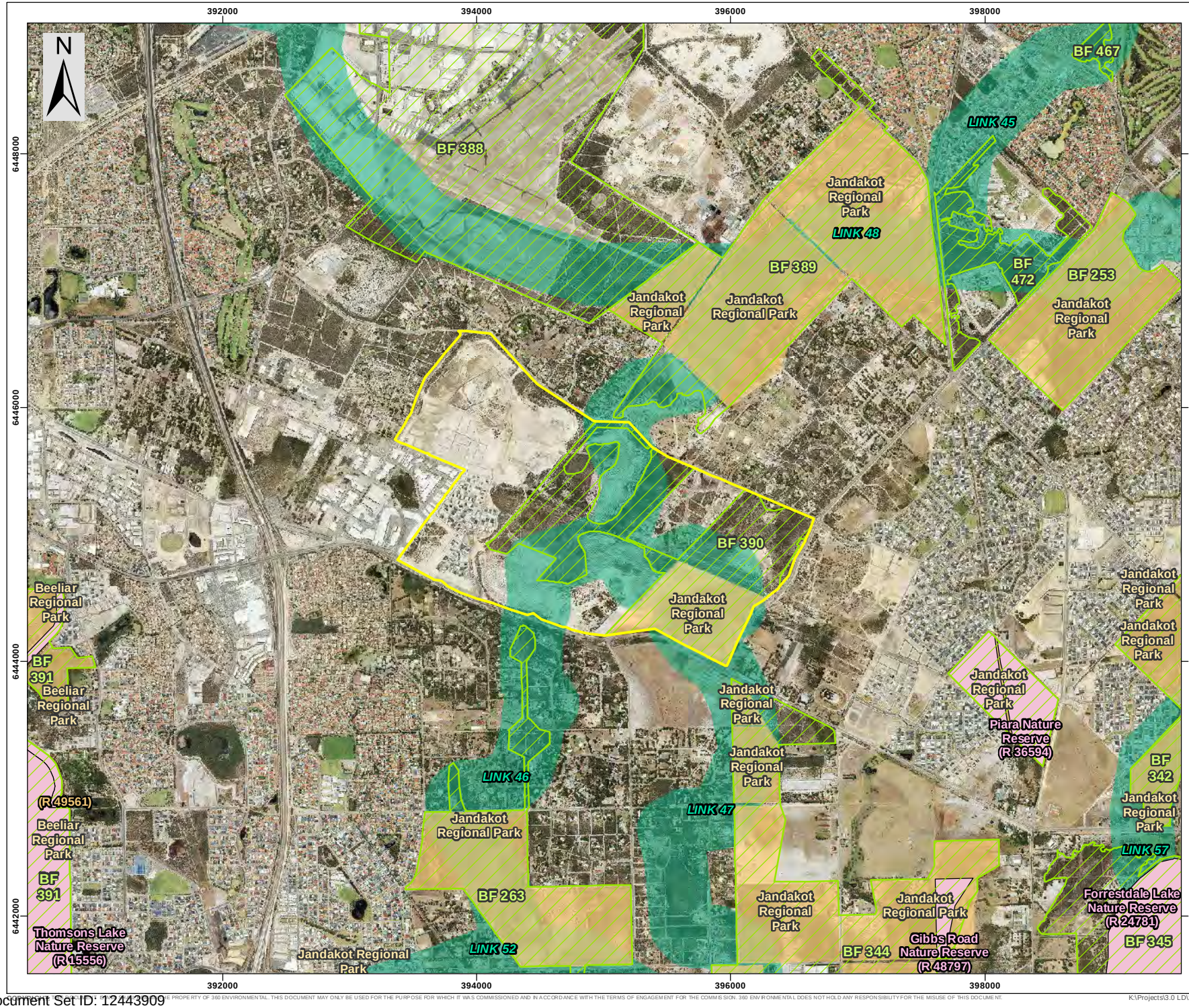
Perron Developments Pty Ltd
Banjup District Structure Plan

Environmental Assessment Report

Figure 10

Threatened and Priority Flora and Ecological Communities

K:\Projects\3.0 LD\1405 Banjup DSP EAR\Figures\1405 EAR Figure 9 - TECPEC and Flora.mxd



Legend

- District Structure Plan Boundary (461.54 ha)
- Bush Forever Sites
- Regional Parks
- Perth Regional Ecological Linkages

DPaW Managed Lands

- Conservation Park
- Nature Reserve

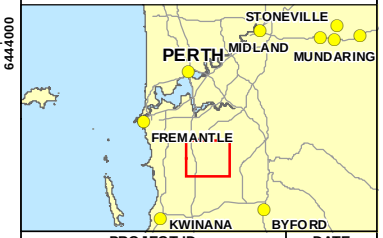
- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- BUSH FOREVER SOURCED DOP 2014
- REGIONAL PARKS SOURCED LANDGATE 2015
- ECOLOGICAL LINKAGES SOURCED PBP 2008 (WALGA)
- DPAW LANDS SOURCED DPAW 2016
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE FEB 2016

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

0 250 500 750 1,000 1,250 1,500
Meters
1:40,000 @ A4

LOCALITY MAP



PROJECT ID	DATE
1405	18-May-16

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
JJ	KC	SB	0

Perron Developments Pty Ltd
Banjup District Structure Plan

Environmental Assessment Report

Figure 11
Conservation Areas

K:\Projects\3.0 LD\1405 Banjup DSP EAR\Figures\1405 EAR Figure 10 - Conservation Areas.mxd

Legend

- District Structure Plan Boundary (461.54 ha)
- Municipal Heritage List

Aboriginal Heritage Sites

- Registered Site
- Lodged Site
- Stored Data / Not a Site

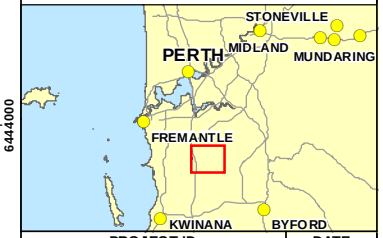
- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- ABORIGINAL HERITAGE SITES SOURCED DAA 2016
- MUNICIPAL LISTING SOURCED INHERIT (SHO) 2016
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE FEB 2016

Powered by 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

0 200 400 600 800 1,000 1,200
Meters
1:30,000 @ A4

LOCALITY MAP



PROJECT ID	DATE
1405	24/05/2016

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

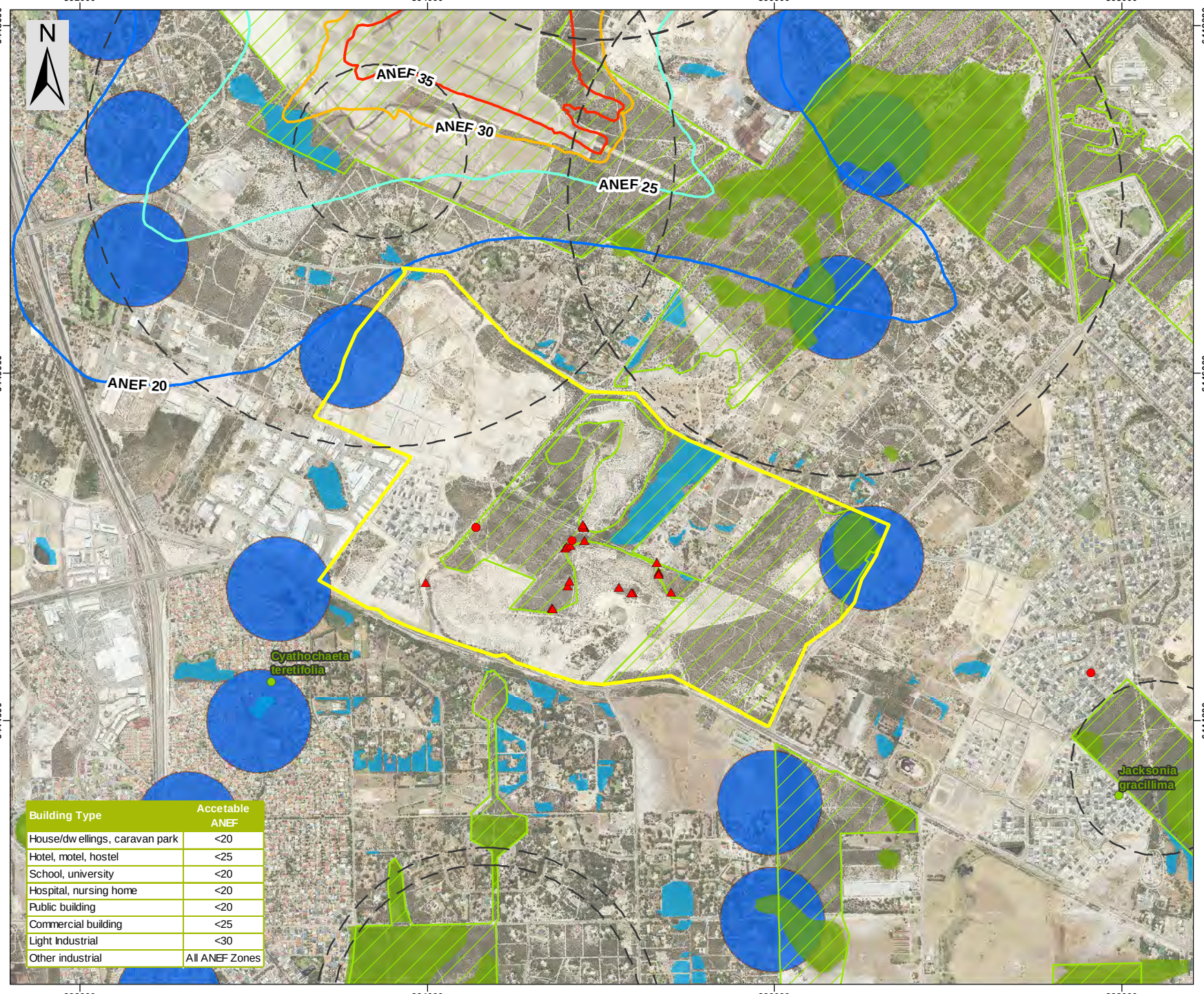
CREATED	CHECKED	APPROVED	REVISION
JJ	KC	SB	0

Perron Developments Pty Ltd
Banjup District Structure Plan

Environmental Assessment Report

Figure 12
Heritage

K:\Projects\3.0 LD\1405 Banjup DSP EAR\Figures\1405 EAR Figure 11 - Heritage.mxd



Building Type	Accetable ANEF
House/dwellings, caravan park	<20
Hotel, motel, hostel	<25
School, university	<20
Hospital, nursing home	<20
Public building	<20
Commercial building	<25
Light Industrial	<30
Other industrial	All ANEF Zones

Legend

- DSP Boundary (461.54 ha)
- CCW
- REW (With Remant Vegetation)
- PEC Buffers
- Bush Forever Sites
- Wellhead Protection Buffer

Jandakot Airport Ultimate Capacity ANEF [1]

- 20 ANEF
- 25 ANEF
- 30 ANEF
- 35 ANEF

Rare and Priority Flora

- Priority 4
- Priority 3
- Priority 2
- Priority 1
- Declared Rare (*C. huegelii*)
- Known *Caladenia huegelii* records (Surveyed)

NOTE:

1. ANEF: Australian Noise Exposure Forecast

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- JANDAKOT ANEF SOURCED FROM JANDAKOT AIRPORT (AIR SERVICES 2014)
- WETLANDS SOURCED DPAW 2016
- PEC BUFFERS AND FLORA SOURCED DPAW 2013 & SURVEYS (SEE FIGURE 7/8)
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE FEB 2016 (© Western Australian Land Information Authority 2016)

Prepared by SLIP ENABLER

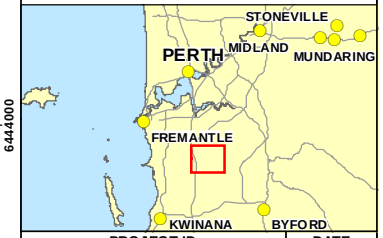
360 environmental
a 10 Bermondsey St, West Leederville, 6007 WA
t (08) 9388 8360
f (08) 9381 2360
w www.360environmental.com.au

0 200 400 600 800 1,000 1,200

Meters

1:30,000 @ A4

LOCALITY MAP



PROJECT ID	DATE
1405	24/05/2016

HORIZONTAL DATUM AND PROJECTION
GDA 1994 MGA Zone 50

CREATED	CHECKED	APPROVED	REVISION
JJ	KC	SB	0

Perron Developments Pty Ltd
Banjup District Structure Plan

Environmental Assessment Report

Figure 13

Environmental Opportunities and Constraints

K:\Projects\3.0 LD\1405 Banjup DSP EAR\Figures\1405 EAR Figure 12 - Opportunities and Constraints.mxd

APPENDIX A

Draft Treeby (Banjup) District Structure 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.

Jandakot Airport & Business Park

BOUNDARIES SUBJECT TO FORMAL ASSESSMENT AND APPROVAL.

POSSIBLE REALIGNMENT OF JANDAKOT ROAD

POSSIBLE INTERSECTION (SUBJECT TO LEVELS & DESIGN REVIEW)

EXISTING RESOURCE ZONED LOTS

COCKBURN CENTRAL TRAIN STATION

PLANNING CONTROL AREA (REALIGNED NORTH LAKE ROAD CONNECTION)

COCKBURN CENTRAL ACTIVITY CENTRE

EXISTING SIGNALISED INTERSECTION

PROPOSED LEFT IN/OUT INTERSECTION

EXISTING SIGNALISED INTERSECTION. SUBJECT TO REVIEW BY MAIN ROADS WA.

POSSIBLE ADDITIONAL LEFT IN / LEFT OUT INTERSECTION SUBJECT TO FURTHER CONSIDERATION AND APPROVAL AS PART OF LSP PROCESS.

PROPOSED SIGNALISED INTERSECTION OR ROUNDABOUT

EXISTING SIGNALISED INTERSECTION

Approved Banjup Quarry Cell 4 Final Structure Plan

LEGEND

- Treeby (Banjup) DSP
- Residential
- Public Open Space (District level)
- POS (including areas with Regional Conservation Values)
- Public Purposes - School / Civic
- Neighbourhood / Local Centre
- Mixed Business and/or Residential
- Resource
- Powerline Easement
- Green Linkage
- Primary Regional Road
- District Distributor Road
- Connector Road
- Major Dual Use Path / Cycle path
- distance to Train Station
- distance to Amenities
- X Signalised intersection
- Left IN / OUT Only
- Roundabout with access at grade. Subject to current design review by MRWA.

DRAFT

TREEBY (BANJUP) DISTRICT STRUCTURE PLAN

Banjup
City of Cockburn

0 100 200 300 400 500 750m 1km

nearmap 12.07.2015

plan no: 2310-122D-01
scale: 1:12,500@A3, 1:6,250@A1
date: 23.08.2016

CLE TOWN PLANNING + DESIGN

APPENDIX B

EPBC Referral Decision for Lot 4 Armadale Road, Banjup

Australian Government
Department of the Environment

Notification of

REFERRAL DECISION – not controlled action
Urban development and associated infrastructure, Lot 4 Armadale Road, Banjup, WA

This decision is made under Section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Proposed action

person named in the referral	Perron Developments Pty Ltd ACN: 000230446
proposed action	To undertake an urban development and associated infrastructure, Lot 4, Armadale Road, Banjup, Western Australia; as described in the referral received by the department on 7 November 2013 and additional information received on the 6 December 2013 (See EPBC Act referral 2013/7049).

Referral decision: not a controlled action

status of proposed action	The proposed action is not a controlled action.

Person authorised to make decision

name and position	Victoria Press A/g Assistant Secretary North, West and Offshore Assessment Branch

signature

date of decision 16 December 2013

APPENDIX C

NatureMap and EPBC Protected Matters Search Results

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 28/04/2016

Kingdom Plantae
Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 115° 53' 09" E,32° 07' 31" S
Buffer 5km
Group By Conservation Status

Conservation Status	Species	Records
Non-conservation taxon	403	809
Priority 2	1	1
Priority 3	6	13
Priority 4	4	14
Rare or likely to become extinct	4	45
TOTAL	**418**	**882**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Rare or likely to become extinct					
1.	1596	*Caladenia huegelii (Grand Spider Orchid)*		T	
2.	1637	*Diuris purdiei (Purdie's Donkey Orchid)*		T	
3.	1639	*Drakaea elastica (Glossy-leaved Hammer Orchid)*		T	
4.	13635	*Drakaea micrantha*		T	
Priority 2					
5.	18564	*Stylidium aceratum*		P2	
Priority 3					
6.	3178	*Byblis gigantea (Rainbow Plant)*		P3	
7.	16245	*Cyathochaeta teretifolia*		P3	
8.	20462	*Jacksonia gracillima*		P3	
9.	11557	*Phlebocarya pilosissima subsp. pilosissima*		P3	
10.	1008	*Schoenus pennisetis*		P3	
11.	25800	*Stylidium paludicola*		P3	
Priority 4					
12.	4027	*Jacksonia sericea (Waldjumi)*		P4	
13.	7756	*Stylidium longitubum (Jumping Jacks)*		P4	
14.	44444	*Tripterococcus sp. Brachylobus (A.S. George 14234)*		P4	
15.	14714	*Verticordia lindleyi subsp. lindleyi*		P4	
Non-conservation taxon					
16.	3374	*Acacia huegelii*			
17.	3502	*Acacia pulchella (Prickly Moses)*			
18.	30032	*Acacia saligna subsp. saligna*			
19.	1775	*Adenanthos cygnorum (Common Woollybush)*			
20.	1791	*Adenanthos obovatus (Basket Flower)*			
21.	184	*Aira caryophyllea (Silvery Hairgrass)*	Y		
22.	1728	*Allocasuarina fraseriana (Sheoak, Kondil)*			
23.	1732	*Allocasuarina humilis (Dwarf Sheoak)*			
24.	20184	*Amphipogon laguroides subsp. laguroides*			
25.	199	*Amphipogon strictus (Greybeard Grass)*			
26.	200	*Amphipogon turbinatus*			
27.	7833	*Angianthus preissianus*			
28.	1409	*Anigozanthos humilis (Catspaw)*			
29.	1411	*Anigozanthos manglesii (Mangles Kangaroo Paw, Kurulbrang)*			
30.	11566	*Anigozanthos viridis subsp. viridis*			
31.	3686	*Aotus cordifolia*			
32.	3692	*Aotus procumbens*			
33.	207	*Aristida contorta (Bunched Kerosene Grass)*			
34.	1264	*Arnocrinum preissii*			
35.	8779	*Asparagus asparagoides (Bridal Creeper)*	Y		

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
36.	20350	*Astartea affinis*			
37.	20283	*Astartea scoparia*			
38.	7851	*Asteridea pulverulenta (Common Bristle Daisy)*			
39.	6334	*Astroloma pallidum (Kick Bush)*			
40.	6339	*Astroloma xerophyllum*			
41.	2471	*Atriplex prostrata (Hastate Orache)*	Y		
42.	17234	*Austrostipa compressa*			
43.	17245	*Austrostipa mollis*			
44.	233	*Avena barbata (Bearded Oat)*	Y		
45.	17737	*Azolla pinnata*			
46.	42902	*Azolla rubra*			
47.	1800	*Banksia attenuata (Slender Banksia, Piara)*			
48.	32580	*Banksia dallanneyi var. dallanneyi*			
49.	1822	*Banksia ilicifolia (Holly-leaved Banksia)*			
50.	1834	*Banksia menziesii (Firewood Banksia)*			
51.	1852	*Banksia telmatiaea (Swamp Fox Banksia)*			
52.	741	*Baumea articulata (Jointed Rush)*			
53.	744	*Baumea laxa*			
54.	5393	*Beaufortia squarrosa (Sand Bottlebrush, Puno)*			
55.	1417	*Blancoa canescens (Winter Bell)*			
56.	749	*Bolboschoenus caldwellii (Marsh Club-rush)*			
57.	4413	*Boronia crenulata (Aniseed Boronia)*			
58.	16636	*Boronia crenulata subsp. viminea*			
59.	4417	*Boronia dichotoma*			
60.	11381	*Boronia ramosa subsp. anethifolia*			
61.	3710	*Bossiaea eriocarpa (Common Brown Pea)*			
62.	30142	*Brachyloma preissii subsp. obtusifolium*			
63.	30136	*Brachyloma preissii subsp. preissii*			
64.	7867	*Brachyscome bellidioides*			
65.	7878	*Brachyscome iberidifolia*			
66.	244	*Briza maxima (Blowfly Grass)*	Y		
67.	245	*Briza minor (Shivery Grass)*	Y		
68.	249	*Bromus diandrus (Great Brome)*	Y		
69.	12770	*Burchardia congesta*			
70.	1277	*Caesia occidentalis*			
71.	1592	*Caladenia flava (Cowslip Orchid)*			
72.	15348	*Caladenia flava subsp. flava*			
73.	1599	*Caladenia latifolia (Pink Fairy Orchid)*			
74.	15361	*Caladenia longicauda subsp. calcigena*			
75.	1605	*Caladenia marginata (White Fairy Orchid)*			
76.	15503	*Caladenia paludosa*			
77.	15398	*Caladenia xantha*			
78.	16365	*Calandrinia sp. Kenwick (G.J. Keighery 10905)*			
79.	19309	*Calectasia narragara*			
80.	36600	*Callitris pyramidalis (Swamp Cypress)*			
81.	5411	*Calothamnus hirsutus*			
82.	5415	*Calothamnus lateralis*			
83.	5439	*Calytrix angulata (Yellow Starflower)*			
84.	5458	*Calytrix flavescens (Summer Starflower)*			
85.	5460	*Calytrix fraseri (Pink Summer Calytrix)*			
86.		*Calytrix sp.*			
87.	32338	*Campylopus introflexus*	Y		
88.	2794	*Carpobrotus aequilaterus (Angular Pigface)*	Y		
89.	2795	*Carpobrotus edulis (Hottentot Fig)*	Y		
90.	1162	*Cartonema philydroides*			
91.	2957	*Cassytha racemosa (Dodder Laurel)*			
92.	6542	*Centaurium tenuiflorum*	Y		
93.	6214	*Centella asiatica*			
94.	1125	*Centrolepis drummondiana*			
95.	1134	*Centrolepis polygyna (Wiry Centrolepis)*			
96.	2889	*Cerastium glomeratum (Mouse Ear Chickweed)*	Y		
97.	17685	*Chaetanthus aristatus*			
98.	17687	*Chaetanthus tenellus*			
99.	18156	*Chamaecytisus palmensis (Tagasaste)*	Y		
100.	1280	*Chamaescilla corymbosa (Blue Squill)*			
101.	2483	*Chenopodium album (Fat Hen)*	Y		
102.	2490	*Chenopodium glaucum (Glaucous Goosefoot)*	Y		
103.		*Chiloscyphus semiteres var. semiteres*			
104.	7937	*Cirsium vulgare (Spear Thistle, Scotch Thistle)*	Y		
105.	4550	*Comesperma calymega (Blue-spike Milkwort)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
106.	4554	*Comesperma flavum*			
107.	1858	*Conospermum amoenum (Blue Smokebush)*			
108.	6348	*Conostephium pendulum (Pearl Flower)*			
109.	6349	*Conostephium preissii*			
110.	1418	*Conostylis aculeata (Prickly Conostylis)*			
111.	11826	*Conostylis aculeata subsp. aculeata*			
112.	11695	*Conostylis festucacea subsp. festucacea*			
113.	1436	*Conostylis juncea*			
114.	7939	*Conyza bonariensis (Flaxleaf Fleabane)*	Y		
115.	20074	*Conyza sumatrensis*	Y		
116.	1285	*Corynotheca micrantha (Sand Lily)*			
117.	7945	*Cotula coronopifolia (Waterbuttons)*	Y		
118.	3137	*Crassula colorata (Dense Stonecrop)*			
119.	3139	*Crassula exserta*			
120.	13527	*Croninia kingiana*			
121.	6663	*Cuscuta epithymum (Lesser Dodder, Greater Dodder)*	Y		
122.	40660	*Cycnogeton huegelii*			
123.	783	*Cyperus congestus (Dense Flat-sedge)*	Y		
124.	10916	*Cyrtostylis huegelii*			
125.	10942	*Cyrtostylis tenuissima*			
126.	17692	*Cytogonidium leptocarpoides*			
127.	7451	*Dampiera lavandulacea*			
128.	7454	*Dampiera linearis (Common Dampiera)*			
129.	5508	*Darwinia citriodora (Lemon-scented Darwinia)*			
130.	1218	*Dasypogon bromeliifolius (Pineapple Bush)*			
131.	3832	*Daviesia physodes*			
132.	3845	*Daviesia triflora*			
133.	16595	*Desmocladus flexuosus*			
134.	1259	*Dianella revoluta (Blueberry Lily)*			
135.	1287	*Dichopogon capillipes*			
136.	32344	*Dicranoloma diaphanoneuron*			
137.	32345	*Didymodon australasiae*			
138.	17838	*Dielsia stenostachya*			
139.	11049	*Diuris corymbosa*			
140.	1634	*Diuris laxiflora (Bee Orchid)*			
141.	1635	*Diuris longifolia (Common Donkey Orchid)*			
142.	1636	*Diuris pauciflora*			
143.	1640	*Drakaea glyptodon (King-in-his-carriage)*			
144.	13217	*Drosera erythrorhiza subsp. erythrorhiza*			
145.	3106	*Drosera macrantha (Bridal Rainbow)*			
146.	14298	*Drosera macrantha subsp. macrantha*			
147.	3109	*Drosera menziesii (Pink Rainbow)*			
148.	13216	*Drosera menziesii subsp. penicillaris*			
149.	11768	*Drosera neesii subsp. neesii*			
150.	8911	*Drosera rosulata*			
151.	3131	*Drosera stolonifera (Leafy Sundew)*			
152.	33500	*Dysphania ambrosioides (Mexican Tea)*	Y		
153.	2501	*Dysphania glomulifera*			
154.	11368	*Dysphania glomulifera subsp. glomulifera*			
155.	11105	*Echinochloa crus-galli*	Y		
156.	347	*Ehrharta calycina (Perennial Veldt Grass)*	Y		
157.	349	*Ehrharta longiflora (Annual Veldt Grass)*	Y		
158.	5187	*Elatine gratioloides (Waterwort)*			
159.	822	*Eleocharis acuta (Common Spikerush)*			
160.	1644	*Elythranthera emarginata (Pink Enamel Orchid)*			
161.	1645	*Epiblema grandiflorum (Babe-in-a-cradle)*			
162.	6133	*Epilobium hirtigerum (Hairy Willow Herb)*			
163.		*Eragrostis sp.*			
164.	13950	*Eremaea asterocarpa subsp. asterocarpa*			
165.	13962	*Eremaea atala*			
166.	13951	*Eremaea hadra*			
167.	5543	*Eremaea violacea (Violet Eremaea)*			
168.	15412	*Eriochilus dilatatus subsp. multiflorus*			
169.	15414	*Eriochilus helonomos*			
170.	1647	*Eriochilus scaber (Pink Bunny Orchid)*			
171.	15415	*Eriochilus scaber subsp. scaber*			
172.	5659	*Eucalyptus gomphocephala (Tuart, Duart)*			
173.	5763	*Eucalyptus rudis (Flooded Gum, Kulurda)*			
174.	13511	*Eucalyptus rudis subsp. rudis*			
175.	5790	*Eucalyptus todtiana (Coastal Blackbutt)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
176.	3872	*Euchilopsis linearis (Swamp Pea)*			
177.	4648	*Euphorbia terracina (Geraldton Carnation Weed)*	Y		
178.	3880	*Eutaxia virgata*			
179.	835	*Evandra pauciflora*			
180.	1747	*Ficus carica (Common Fig)*	Y		
181.	11571	*Galenia pubescens var. pubescens*	Y		
182.	20475	*Gastrolobium capitatum*			
183.	20483	*Gastrolobium linearifolium*			
184.	20482	*Gastrolobium nervosum*			
185.	3921	*Gastrolobium reticulatum*			
186.	3924	*Gastrolobium spinosum (Prickly Poison)*			
187.	1520	*Gladiolus caryophyllaceus (Wild Gladiolus)*	Y		
188.	17043	*Glyceria declinata*	Y		
189.	12624	*Gnephosis angianthoides*			
190.	6587	*Gomphocarpus fruticosus (Narrowleaf Cottonbush)*	Y		
191.	10909	*Gompholobium confertum*			
192.	3957	*Gompholobium tomentosum (Hairy Yellow Pea)*			
193.	6160	*Gonocarpus paniculatus*			
194.	6161	*Gonocarpus pithyoides*			
195.	19628	*Grevillea bipinnatifida subsp. bipinnatifida*			
196.	2032	*Grevillea leucopteris (White Plume Grevillea)*			
197.	1475	*Haemodorum spicatum (Mardja)*			
198.	2197	*Hakea prostrata (Harsh Hakea)*			
199.	2216	*Hakea varia (Variable-leaved Hakea)*			
200.	3961	*Hardenbergia comptoniana (Native Wisteria)*			
201.	29594	*Helichrysum luteoalbum (Jersey Cudweed)*			
202.	6710	*Heliotropium europaeum (Common Heliotrope)*	Y		
203.	6839	*Hemiandra pungens (Snakebush)*			
204.	1293	*Hensmania turbinata*			
205.	5134	*Hibbertia huegelii*			
206.	5135	*Hibbertia hypericoides (Yellow Buttercups)*			
207.	5162	*Hibbertia racemosa (Stalked Guinea Flower)*			
208.	43280	*Hibbertia sericosepala*			
209.		*Hibbertia sp. Bankstown (R.T.Miller & C.P.Gibson s.n. 18/10/06)*			
210.	5173	*Hibbertia subvaginata*			
211.	5176	*Hibbertia vaginata*			
212.	444	*Holcus lanatus (Yorkshire Fog)*	Y		
213.	6222	*Homalosciadium homalocarpum*			
214.	3968	*Hovea trisperma (Common Hovea)*			
215.	5817	*Hypocalymma angustifolium (White Myrtle, Kudjid)*			
216.	5825	*Hypocalymma robustum (Swan River Myrtle)*			
217.	8086	*Hypochaeris glabra (Smooth Catsear)*	Y		
218.	9352	*Hypochaeris radicata (Flat Weed)*	Y		
219.	17841	*Hypolaena pubescens*			
220.	20200	*Isolepis cernua var. setiformis*			
221.	917	*Isolepis marginata (Coarse Club-rush)*			
222.	921	*Isolepis producta*			
223.	4012	*Jacksonia furcellata (Grey Stinkwood)*			
224.	4029	*Jacksonia sternbergiana (Stinkwood, Kapur)*			
225.	1178	*Juncus bufonius (Toad Rush)*	Y		
226.	1186	*Juncus microcephalus*	Y		
227.	1188	*Juncus pallidus (Pale Rush)*			
228.	1190	*Juncus planifolius (Broadleaf Rush)*			
229.	4044	*Kennedia prostrata (Scarlet Runner)*			
230.	17506	*Kunzea ericifolia subsp. ericifolia*			
231.	15498	*Kunzea glabrescens (Spearwood)*			
232.	13562	*Lachenalia aloides*	Y		
233.	20019	*Lachnagrostis filiformis*			
234.	19955	*Lachnagrostis plebeia*			
235.	6777	*Lachnostachys albicans*			
236.	8095	*Lactuca saligna (Wild Lettuce)*	Y		
237.	18585	*Lagenophora huegelii*			
238.	4052	*Latrobea tenella*			
239.	1307	*Laxmannia ramosa (Branching Lily)*			
240.	11911	*Laxmannia ramosa subsp. ramosa*			
241.	11464	*Laxmannia sessiliflora subsp. australis*			
242.	1309	*Laxmannia squarrosa*			
243.	7572	*Lechenaultia expansa*			
244.	7574	*Lechenaultia floribunda (Free-flowering Leschenaultia)*			
245.	44490	*Leontodon rhagadioloides*	Y		

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
246.	8099	*Leontodon saxatilis (Hairy Hawkbit)*	Y		
247.	925	*Lepidosperma angustatum*			
248.	937	*Lepidosperma longitudinale (Pithy Sword-sedge)*			
249.	41649	*Lepidosperma rigidulum*			
250.		*Lepidosperma sp.*			
251.	19833	*Leptocarpus laxus*			
252.	2344	*Leptomeria empetriformis*			
253.	2350	*Leptomeria pauciflora (Sparse-flowered Currant Bush)*			
254.	6374	*Leucopogon conostephioides*			
255.	6425	*Leucopogon oxycedrus*			
256.	6434	*Leucopogon polymorphus*			
257.	6439	*Leucopogon pulchellus (Beard-heath)*			
258.	19579	*Leucopogon sp. Murdoch (M. Hislop 1037)*			
259.	6445	*Leucopogon squarrosus*			
260.	40803	*Leucopogon squarrosus subsp. squarrosus*			
261.	6451	*Leucopogon tenuis*			
262.	9289	*Lobelia anceps (Angled Lobelia)*			
263.	7408	*Lobelia tenuior (Slender Lobelia)*			
264.	10957	*Lolium perenne x rigidum*	Y		
265.	478	*Lolium rigidum (Wimmera Ryegrass)*	Y		
266.	1223	*Lomandra caespitosa (Tufted Mat Rush)*			
267.	1228	*Lomandra hermaphrodita*			
268.	1236	*Lomandra odora (Tiered Matrush)*			
269.	1239	*Lomandra preissii*			
270.	1243	*Lomandra sericea (Silky Mat Rush)*			
271.		*Lomandra sp.*			
272.	4059	*Lotus angustissimus (Narrowleaf Trefoil)*	Y		
273.	8564	*Lotus subbiflorus*	Y		
274.	4065	*Lupinus angustifolius (Narrowleaf Lupin)*	Y		
275.	1097	*Lyginia barbata*			
276.	18049	*Lyginia imberbis*			
277.	6456	*Lysinema ciliatum (Curry Flower)*			
278.	6458	*Lysinema elegans*			
279.	34736	*Lysinema pentapetalum*			
280.	5281	*Lythrum hyssopifolia (Lesser Loosestrife)*	Y		
281.	2838	*Macarthuria apetala*			
282.	2839	*Macarthuria australis*			
283.	85	*Macrozamia riedlei (Zamia, Djiridji)*			
284.		*Marchantia berteroana*			
285.	4079	*Medicago polymorpha (Burr Medic)*	Y		
286.	17683	*Meeboldina cana*			
287.		*Meeboldina roycei MS*			
288.	34676	*Meionectes brownii (Swamp Raspwort)*			
289.	37580	*Melaleuca acutifolia*			
290.	5900	*Melaleuca cuticularis (Saltwater Paperbark)*			
291.	5917	*Melaleuca hamulosa*			
292.	13273	*Melaleuca incana subsp. incana*			
293.	5926	*Melaleuca lateritia (Robin Redbreast Bush)*			
294.	18394	*Melaleuca parviceps*			
295.	5959	*Melaleuca rhaphiophylla (Swamp Paperbark)*			
296.	5964	*Melaleuca seriata*			
297.	5978	*Melaleuca teretifolia (Banbar)*			
298.	5980	*Melaleuca thymoides*			
299.	5987	*Melaleuca viminea (Mohan)*			
300.	4085	*Melilotus indicus*	Y		
301.	953	*Mesomelaena graciliceps*			
302.	15419	*Microtis media subsp. media*			
303.		*Microtis sp.*			
304.	8106	*Millotia tenuifolia (Soft Millotia)*			
305.	16693	*Minuartia mediterranea*	Y		
306.	4666	*Monotaxis occidentalis*			
307.	2401	*Nuytsia floribunda (Christmas Tree, Mudja)*			
308.	14293	*Oenothera indecora subsp. bonariensis*	Y		
309.	16347	*Oenothera laciniata*	Y		
310.	6140	*Oenothera mollissima*	Y		
311.	7090	*Parentucellia viscosa (Sticky Bartsia)*	Y		
312.	527	*Paspalum dilatatum*	Y		
313.	1550	*Patersonia occidentalis (Purple Flag, Koma)*			
314.	4343	*Pelargonium capitatum (Rose Pelargonium)*	Y		
315.	6006	*Pericalymma ellipticum (Swamp Teatree)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
316.	16477	*Pericalymma ellipticum var. ellipticum*			
317.	16478	*Pericalymma ellipticum var. floridum*			
318.	11052	*Persicaria prostrata*			
319.	2273	*Persoonia saccata (Snottygobble)*			
320.	2299	*Petrophile linearis (Pixie Mops)*			
321.	20460	*Pheladenia deformis*			
322.	18529	*Philotheca spicata (Pepper and Salt)*			
323.	1478	*Phlebocarya ciliata*			
324.	1479	*Phlebocarya filifolia*			
325.	4	*Phylloglossum drummondii (Pigmy Clubmoss)*			
326.	4141	*Phyllota gracilis*			
327.	2793	*Phytolacca octandra (Red Ink Plant)*	Y		
328.	5252	*Pimelea lanata*			
329.	18353	*Pithocarpa pulchella var. pulchella*			
330.	6249	*Platysace compressa (Tapeworm Plant)*			
331.	4524	*Platytheca galioides*			
332.	578	*Poa porphyroclados*			
333.	8184	*Podotheca gnaphalioides (Golden Long-heads)*			
334.	582	*Polypogon monspeliensis (Annual Beardgrass)*	Y		
335.	1670	*Prasophyllum drummondii (Swamp Leek Orchid)*			
336.	1672	*Prasophyllum fimbria (Fringed Leek Orchid)*			
337.	1673	*Prasophyllum gibbosum (Humped Leek Orchid)*			
338.	1674	*Prasophyllum giganteum (Bronze Leek Orchid)*			
339.	1676	*Prasophyllum hians (Yawning Leek Orchid)*			
340.	1680	*Prasophyllum parvifolium (Autumn Leek Orchid)*			
341.	1681	*Prasophyllum regium (King Leek Orchid)*			
342.	17267	*Pterostylis brevisepala*			
343.	44723	*Pterostylis glebosa*			
344.	1693	*Pterostylis recurva (Jug Orchid)*			
345.	12217	*Pterostylis sanguinea*			
346.		*Pterostylis sp.*			
347.	18648	*Pterostylis sp. cauline leaves (N. Gibson & M.N. Lyons 1490)*			
348.	18655	*Pterostylis sp. crinkled leaf (G.J. Keighery 13426)*			
349.	1698	*Pterostylis vittata (Banded Greenhood)*			
350.	2718	*Ptilotus drummondii (Narrowleaf Mulla Mulla)*			
351.	4177	*Pultenaea ochreata*			
352.	4181	*Pultenaea reticulata*			
353.	6012	*Regelia ciliata*			
354.	4822	*Rhamnus alaternus (Buckthorn)*	Y		
355.	14485	*Romulea flava var. minor*	Y		
356.	14924	*Romulea rosea var. communis*	Y		
357.	44608	*Rosulabryum billarderii*			
358.	6263	*Schoenolaena juncea*			
359.	973	*Schoenus asperocarpus (Poison Sedge)*			
360.	978	*Schoenus brevisetis*			
361.	979	*Schoenus caespititius*			
362.	984	*Schoenus curvifolius*			
363.	986	*Schoenus efoliatus*			
364.	992	*Schoenus grandiflorus (Large Flowered Bogrush)*			
365.	1011	*Schoenus rigens*			
366.	1017	*Schoenus subbulbosus*			
367.	1018	*Schoenus subfascicularis*			
368.	6033	*Scholtzia involucrata (Spiked Scholtzia)*			
369.	8203	*Senecio diaschides*			
370.	8225	*Siloxerus humifusus (Procumbent Siloxerus)*			
371.	7020	*Solanum linnaeanum (Apple of Sodom)*	Y		
372.	7022	*Solanum nigrum (Black Berry Nightshade)*	Y		
373.	45036	*Solidago chilensis*	Y		
374.	8231	*Sonchus oleraceus (Common Sowthistle)*	Y		
375.	4211	*Sphaerolobium vimineum (Leafless Globe Pea)*			
376.	2316	*Stirlingia latifolia (Blueboy)*			
377.	25831	*Stylidium araeophyllum (Stilt Walker)*			
378.	7693	*Stylidium brunonianum (Pink Fountain Triggerplant)*			
379.	7696	*Stylidium calcaratum (Book Triggerplant)*			
380.	7717	*Stylidium divaricatum (Daddy-long-legs)*			
381.	7734	*Stylidium guttatum (Dotted Triggerplant)*			
382.	25829	*Stylidium neurophyllum (Coastal Plain Triggerplant)*			
383.	7774	*Stylidium piliferum (Common Butterfly Triggerplant)*			
384.	7777	*Stylidium preissii (Lizard Triggerplant)*			
385.	7785	*Stylidium repens (Matted Triggerplant)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
386.	25806	*Stylidium scariosum*			
387.	7798	*Stylidium schoenoides (Cow Kicks)*			
388.	7806	*Stylidium utricularioides (Pink Fan Triggerplant)*			
389.	1260	*Stypandra glauca (Blind Grass)*			
390.	1716	*Thelymitra tigrina (Tiger Orchid)*			
391.	1318	*Thysanotus arbuscula*			
392.	1338	*Thysanotus manglesianus (Fringed Lily)*			
393.	1339	*Thysanotus multiflorus (Many-flowered Fringe Lily)*			
394.	1343	*Thysanotus patersonii*			
395.	1358	*Thysanotus triandrus*			
396.	6280	*Trachymene pilosa (Native Parsnip)*			
397.	4383	*Tribulus terrestris (Caltrop)*	Y		
398.	1363	*Tricoryne tenella*			
399.	1038	*Tricostularia neesii*			
400.	4289	*Trifolium angustifolium (Narrowleaf Clover)*	Y		
401.	17145	*Trifolium angustifolium var. angustifolium*	Y		
402.	14738	*Trifolium resupinatum var. resupinatum*	Y		
403.	4309	*Trifolium scabrum (Rough Clover)*	Y		
404.	150	*Triglochin stowardii*			
405.	4360	*Tropaeolum majus (Garden Nasturtium)*	Y		
406.	98	*Typha domingensis (Bulrush, Djandjid)*			
407.	8255	*Ursinia anthemoides (Ursinia)*	Y		
408.	38388	*Ursinia anthemoides subsp. anthemoides*	Y		
409.	15432	*Verticordia densiflora var. densiflora*			
410.	6077	*Verticordia drummondii (Drummond's Featherflower)*			
411.	11474	*Vicia sativa subsp. nigra*	Y		
412.	4325	*Viminaria juncea (Swishbush, Koweda)*			
413.	724	*Vulpia myuros (Rat's Tail Fescue)*	Y		
414.	7384	*Wahlenbergia capensis (Cape Bluebell)*	Y		
415.	7389	*Wahlenbergia preissii*			
416.	8282	*Waitzia suaveolens (Fragrant Waitzia)*			
417.	1256	*Xanthorrhoea preissii (Grass tree, Palga)*			
418.	6289	*Xanthosia huegelii*			

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

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

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 28/04/2016

Kingdom Animalia
Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 115° 53' 09" E,32° 07' 31" S
Buffer 5km
Group By Conservation Status

Conservation Status	Species	Records
Non-conservation taxon	235	4626
Other specially protected fauna	1	2
Priority 1	1	4
Priority 3	1	11
Priority 4	3	54
Priority 5	2	212
Protected under international agreement	13	82
Rare or likely to become extinct	4	352
TOTAL	**260**	**5343**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Rare or likely to become extinct					
1.	24784	*Calidris ferruginea (Curlew Sandpiper)*		T	
2.	24731	*Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black-Cockatoo)*		T	
3.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo (short-billed black-cockatoo), Carnaby's Cockatoo)*		T	
4.	24146	*Myrmecobius fasciatus (Numbat, Walpurti)*		T	
Protected under international agreement					
5.	41323	*Actitis hypoleucos (Common Sandpiper)*		IA	
6.	41324	*Ardea modesta (Eastern Great Egret)*		IA	
7.	24779	*Calidris acuminata (Sharp-tailed Sandpiper)*		IA	
8.	24786	*Calidris melanotos (Pectoral Sandpiper)*		IA	
9.	24788	*Calidris ruficollis (Red-necked Stint)*		IA	
10.	24789	*Calidris subminuta (Long-toed Stint)*		IA	
11.	25574	*Charadrius dubius (Little Ringed Plover)*		IA	
12.	24293	*Haliaeetus leucogaster (White-bellied Sea-Eagle)*		IA	
13.	25741	*Limosa limosa (Black-tailed Godwit)*		IA	
14.	24598	*Merops ornatus (Rainbow Bee-eater)*		IA	
15.	24843	*Plegadis falcinellus (Glossy Ibis)*		IA	
16.	24806	*Tringa glareola (Wood Sandpiper)*		IA	
17.	24808	*Tringa nebularia (Common Greenshank)*		IA	
Other specially protected fauna					
18.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
Priority 1					
19.	33994	*Throscodectes xiphos (cricket)*		P1	Y
Priority 3					
20.	25147	*Lerista lineata (Perth Slider, Lined Skink)*		P3	
Priority 4					
21.	24133	*Macropus irma (Western Brush Wallaby)*		P4	
22.	24328	*Oxyura australis (Blue-billed Duck)*		P4	
23.	33992	*Synemon gratiosa (Graceful Sunmoth)*		P4	
Priority 5					
24.	25478	*Isoodon obesulus (Southern Brown Bandicoot)*		P5	
25.	24153	*Isoodon obesulus subsp. fusciventer (Quenda, Southern Brown Bandicoot)*		P5	
Non-conservation taxon					
26.	24260	*Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)*			
27.	24261	*Acanthiza chrysorrhoa (Yellow-rumped Thornbill)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
28.	24262	*Acanthiza inornata (Western Thornbill)*			
29.		*Acantholophus hypoleucus*			
30.	24560	*Acanthorhynchus superciliosus (Western Spinebill)*			
31.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			
32.	25536	*Accipiter fasciatus (Brown Goshawk)*			
33.	24282	*Accipiter fasciatus subsp. fasciatus (Brown Goshawk)*			
34.	42368	*Acritoscincus trilineatus (Western Three-lined Skink)*			
35.	25755	*Acrocephalus australis (Australian Reed Warbler)*			
36.		*Aname mainae*			
37.		*Aname tepperi*			
38.	24312	*Anas gracilis (Grey Teal)*			
39.	24315	*Anas rhynchotis (Australasian Shoveler)*			
40.	24316	*Anas superciliosa (Pacific Black Duck)*			
41.	25553	*Anhinga melanogaster (Darter)*			
42.		*Anhinga novaehollandiae*			
43.	44629	*Anilios australis*			
44.		*Anser anser*			
45.		*Anser sp.*			
46.	24561	*Anthochaera carunculata (Red Wattlebird)*			
47.	24562	*Anthochaera lunulata (Western Little Wattlebird)*			
48.	24991	*Aprasia repens (Sand-plain Worm-lizard)*			
49.	24285	*Aquila audax (Wedge-tailed Eagle)*			
50.		*Archiargiolestes parvulus*			
51.		*Archiargiolestes pusillus*			
52.	24340	*Ardea novaehollandiae (White-faced Heron)*			
53.	24341	*Ardea pacifica (White-necked Heron)*			
54.		*Arenopsaltria fullo*			
55.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
56.	24353	*Artamus cyanopterus (Dusky Woodswallow)*			
57.		*Artoria flavimana*			
58.		*Artoria linnaei*			
59.		*Artoria taeniifera*			
60.	24318	*Aythya australis (Hardhead)*			
61.		*Ballarra longipalpus*			
62.		*Barnardius zonarius*			
63.	24319	*Biziura lobata (Musk Duck)*			
64.	42381	*Brachyurophis semifasciatus (Southern Shovel-nosed Snake)*			
65.	25714	*Cacatua pastinator (Western Long-billed Corella)*			
66.	25716	*Cacatua sanguinea (Little Corella)*			
67.		*Cacatua sp.*			
68.	25598	*Cacomantis flabelliformis (Fan-tailed Cuckoo)*			
69.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
70.		*Cairina moschata*			
71.	25717	*Calyptorhynchus banksii (Red-tailed Black-Cockatoo)*			
72.		*Calyptorhynchus sp.*			
73.		*Castiarina crenata*			
74.		*Castiarina rufipennis*			
75.	24373	*Charadrius melanops (Black-fronted Dotterel)*			
76.	24377	*Charadrius ruficapillus (Red-capped Plover)*			
77.	43380	*Chelodina colliei (Oblong Turtle)*			
78.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
79.	24980	*Christinus marmoratus (Marbled Gecko)*			
80.		*Chroicocephalus novaehollandiae*			
81.	24834	*Cincloramphus mathewsi (Rufous Songlark)*			
82.	24288	*Circus approximans (Swamp Harrier)*			
83.	24774	*Cladorhynchus leucocephalus (Banded Stilt)*			
84.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
85.	24399	*Columba livia (Domestic Pigeon)*	Y		
86.		*Coptotermes michaelseni*			
87.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
88.	24363	*Coracina novaehollandiae subsp. subpallida (Black-faced Cuckoo-shrike)*			
89.		*Cormocephalus aurantiipes*			
90.		*Cormocephalus rubriceps*			
91.	25592	*Corvus coronoides (Australian Raven)*			
92.	24417	*Corvus coronoides subsp. perplexus (Australian Raven)*			
93.	25595	*Cracticus tibicen (Australian Magpie)*			
94.	24422	*Cracticus tibicen subsp. dorsalis (White-backed Magpie)*			
95.	25596	*Cracticus torquatus (Grey Butcherbird)*			
96.	25399	*Crinia glauerti (Clicking Frog)*			
97.	25400	*Crinia insignifera (Squelching Froglet)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
98.	30893	*Cryptoblepharus buchananii*			
99.		*Cryptoerithus quobba*			
100.	30899	*Ctenophorus adelaidensis (Southern Heath Dragon, Western Heath Dragon)*			
101.	25027	*Ctenotus australis*			
102.	25040	*Ctenotus gemmula (Jewelled South-west Ctenotus (Swan Coastal Plain pop P3), skink)*			
103.	25047	*Ctenotus impar*			
104.		*Cubicorhynchus crenicollis*			
105.	24322	*Cygnus atratus (Black Swan)*			
106.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*	Y		
107.	25673	*Daphoenositta chrysoptera (Varied Sittella)*			
108.	25766	*Delma fraseri (Fraser's Legless Lizard)*			
109.	24999	*Delma grayii*			
110.	25296	*Demansia psammophis subsp. reticulata (Yellow-faced Whipsnake)*			
111.	25607	*Dicaeum hirundinaceum (Mistletoebird)*			
112.		*Dingosa serrata*			
113.		*Dysmicoccus macrozamiae*			
114.	25100	*Egernia napoleonis*			
115.		*Egretta garzetta*			
116.		*Egretta novaehollandiae*			
117.		*Elanus axillaris*			
118.	25250	*Elapognathus coronatus (Crowned Snake)*			
119.		*Elseyornis melanops*			
120.		*Eodelena convexa*			
121.		*Eolophus roseicapillus*			
122.	24567	*Epthianura albifrons (White-fronted Chat)*			
123.		*Erythracarus decoris*			
124.	24379	*Erythrogonys cinctus (Red-kneed Dotterel)*			
125.	25621	*Falco berigora (Brown Falcon)*			
126.	25622	*Falco cenchroides (Australian Kestrel)*			
127.	25623	*Falco longipennis (Australian Hobby)*			
128.	25727	*Fulica atra (Eurasian Coot)*			
129.	24761	*Fulica atra subsp. australis (Eurasian Coot)*			
130.	25729	*Gallinula tenebrosa (Dusky Moorhen)*			
131.	24763	*Gallinula tenebrosa subsp. tenebrosa (Dusky Moorhen)*			
132.	24764	*Gallinula ventralis (Black-tailed Native-hen)*			
133.	25730	*Gallirallus philippensis (Buff-banded Rail)*			
134.	24959	*Gehyra variegata*			
135.		*Geitoneura minyas*			
136.	25530	*Gerygone fusca (Western Gerygone)*			
137.	24271	*Gerygone fusca subsp. fusca (Western Gerygone)*			
138.	24443	*Grallina cyanoleuca (Magpie-lark)*			
139.	24295	*Haliastur sphenurus (Whistling Kite)*			
140.	25410	*Heleioporus eyrei (Moaning Frog)*			
141.		*Helicoverpa punctigera*			
142.	25119	*Hemiergis quadrilineata*			
143.		*Heteronympha merope subsp. duboulayi*			
144.	25734	*Himantopus himantopus (Black-winged Stilt)*			
145.	24491	*Hirundo neoxena (Welcome Swallow)*			
146.		*Isopeda leishmanni*			
147.		*Lampona cylindrata*			
148.		*Latrobiella guttatus*			
149.		*Latrodectus hasseltii*			
150.	25131	*Lerista distinguenda*			
151.	25133	*Lerista elegans*			
152.	25005	*Lialis burtonis*			
153.	25661	*Lichmera indistincta (Brown Honeyeater)*			
154.	24582	*Lichmera indistincta subsp. indistincta (Brown Honeyeater)*			
155.	25415	*Limnodynastes dorsalis (Western Banjo Frog)*			
156.	25378	*Litoria adelaidensis (Slender Tree Frog)*			
157.	25388	*Litoria moorei (Motorbike Frog)*			
158.		*Longepi woodman*			
159.		*Lophoictinia isura*			
160.		*Lycosa gilberta*			
161.	24132	*Macropus fuliginosus (Western Grey Kangaroo)*			
162.	24326	*Malacorhynchus membranaceus (Pink-eared Duck)*			
163.	25654	*Malurus splendens (Splendid Fairy-wren)*			
164.	24583	*Manorina flavigula (Yellow-throated Miner)*			
165.		*Maratus pavonis*			
166.	25758	*Megalurus gramineus (Little Grassbird)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
167.	25663	*Melithreptus brevirostris (Brown-headed Honeyeater)*			
168.	24587	*Melithreptus chloropsis (Western White-naped Honeyeater)*			
169.	25184	*Menetia greyii*			
170.		*Metaballus litus*			
171.		*Microcarbo melanoleucos*			
172.		*Missulena granulosa*			
173.		*Mituliodon tarantulinus*			
174.		*Mitzoruga insularis*			
175.	25192	*Morethia obscura*			
176.	24223	*Mus musculus (House Mouse)*	Y		
177.	25420	*Myobatrachus gouldii (Turtle Frog)*			
178.		*Myrmecia chasei*			
179.		*Myrmecia infima*			
180.	24738	*Neophema elegans (Elegant Parrot)*			
181.	25748	*Ninox novaeseelandiae (Boobook Owl)*			
182.	25252	*Notechis scutatus (Tiger Snake)*			
183.	25564	*Nycticorax caledonicus (Rufous Night Heron)*			
184.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
185.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
186.	24624	*Pachycephala rufiventris subsp. rufiventris (Rufous Whistler)*			
187.		*Paramphisopus sp.*			
188.	25253	*Parasuta gouldii*			
189.	25681	*Pardalotus punctatus (Spotted Pardalote)*			
190.	25682	*Pardalotus striatus (Striated Pardalote)*			
191.	24628	*Pardalotus striatus subsp. murchisoni (Striated Pardalote)*			
192.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
193.		*Peripsocus maoricus*			
194.	24659	*Petroica goodenovii (Red-capped Robin)*			
195.	25697	*Phalacrocorax carbo (Great Cormorant)*			
196.	25698	*Phalacrocorax melanoleucos (Little Pied Cormorant)*			
197.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
198.	24409	*Phaps chalcoptera (Common Bronzewing)*			
199.		*Phenasteron longiconductor*			
200.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			
201.		*Pinkfloydia harveii*			
202.	24841	*Platalea flavipes (Yellow-billed Spoonbill)*			
203.	25720	*Platycercus icterotis (Western Rosella)*			
204.	25007	*Pletholax gracilis subsp. gracilis (Keeled Legless Lizard)*			
205.	25704	*Podiceps cristatus (Great Crested Grebe)*			
206.	25510	*Pogona minor (Dwarf Bearded Dragon)*			
207.	24907	*Pogona minor subsp. minor (Dwarf Bearded Dragon)*			
208.		*Pogona sp.*			
209.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
210.	25722	*Polytelis anthopeplus (Regent Parrot)*			
211.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
212.	24767	*Porphyrio porphyrio subsp. bellus (Purple Swamphen)*			
213.	24769	*Porzana fluminea (Australian Spotted Crake)*			
214.	25732	*Porzana pusilla (Baillon's Crake)*			
215.	24771	*Porzana tabuensis (Spotless Crake)*			
216.		*Prionosternum scutatum*			
217.	25511	*Pseudonaja affinis (Dugite)*			
218.	25259	*Pseudonaja affinis subsp. affinis (Dugite)*			
219.	25433	*Pseudophryne guentheri (Crawling Toadlet)*			
220.		*Ptycta cornigera*			Y
221.		*Ptycta emarginata*			Y
222.		*Pulvinaria sp.*			
223.		*Purpureicephalus spurius*			
224.	25008	*Pygopus lepidopodus (Common Scaly Foot)*			
225.	24245	*Rattus rattus (Black Rat)*	Y		
226.		*Raveniella cirrata*			
227.		*Raveniella peckorum*			
228.	24776	*Recurvirostra novaehollandiae (Red-necked Avocet)*			
229.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
230.	24454	*Rhipidura leucophrys subsp. leucophrys (Willie Wagtail)*			
231.		*Sclerorrhinella crawshawi*			
232.	25534	*Sericornis frontalis (White-browed Scrubwren)*			
233.	30948	*Smicrornis brevirostris (Weebill)*			
234.	24329	*Stictonetta naevosa (Freckled Duck)*			
235.	25597	*Strepera versicolor (Grey Currawong)*			
236.	24426	*Strepera versicolor subsp. plumbea (Grey Currawong)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
237.	25589	*Streptopelia chinensis (Spotted Turtle-Dove)*	Y		
238.	25590	*Streptopelia senegalensis (Laughing Turtle-Dove)*	Y		
239.		*Supunna funerea*			
240.		*Supunna picta*			
241.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
242.	24682	*Tachybaptus novaehollandiae subsp. novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
243.	24331	*Tadorna tadornoides (Australian Shelduck, Mountain Duck)*			
244.		*Talaurinus carbonarius*			
245.		*Talaurinus sp.*			
246.	24167	*Tarsipes rostratus (Honey Possum, Noolbenger)*			
247.	24844	*Threskiornis molucca (Australian White Ibis)*			
248.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
249.	25203	*Tiliqua occipitalis (Western Bluetongue)*			
250.	25519	*Tiliqua rugosa*			
251.	25204	*Tiliqua rugosa subsp. aspera*			
252.	25207	*Tiliqua rugosa subsp. rugosa*			
253.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
254.	25723	*Trichoglossus haematodus (Rainbow Lorikeet)*			
255.		*Urodacus novaehollandiae*			
256.	24386	*Vanellus tricolor (Banded Lapwing)*			
257.	25218	*Varanus gouldii (Bungarra or Sand Monitor)*			
258.		*Venator immansueta*			
259.	24040	*Vulpes vulpes (Red Fox)*	Y		
260.	25765	*Zosterops lateralis (Grey-breasted White-eye, Silvereye)*			

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

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

Australian Government

Department of the Environment

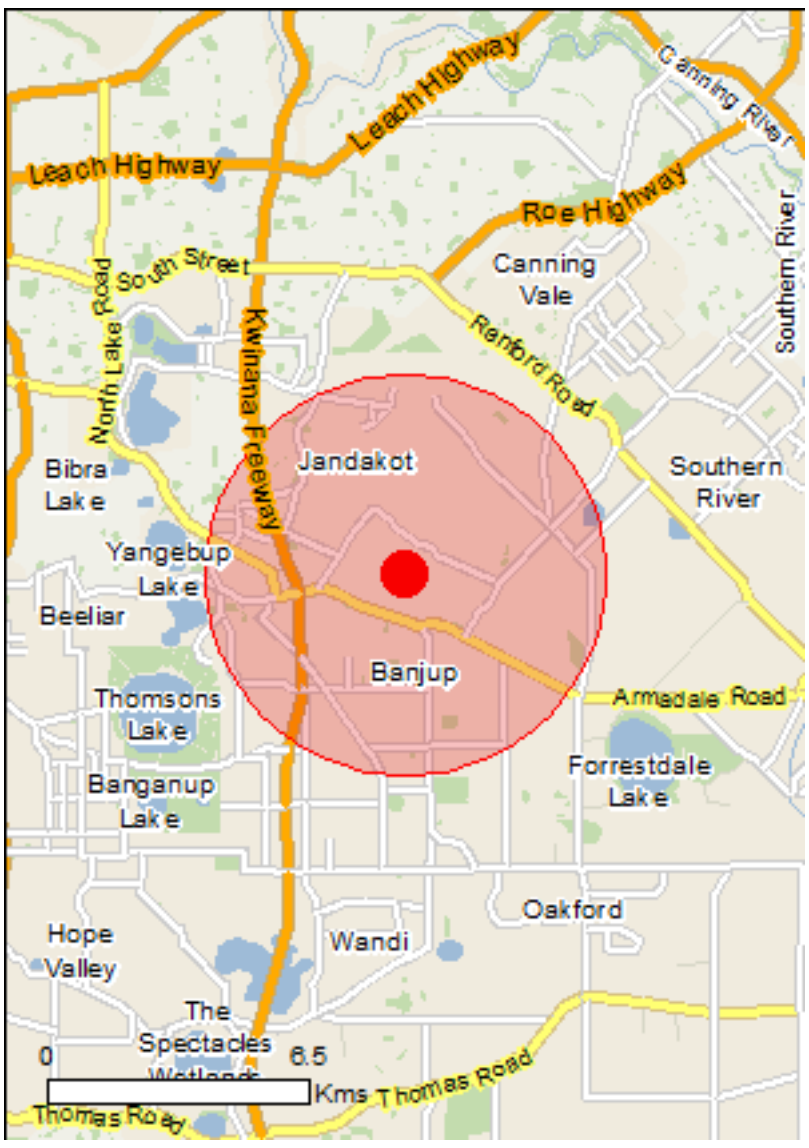
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

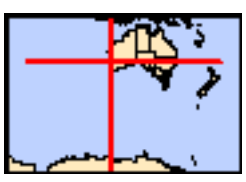
Report created: 28/04/16 14:57:51



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates

Buffer: 5.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	19
Listed Migratory Species:	18

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	24
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	3
Regional Forest Agreements:	None
Invasive Species:	43
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)	[Resource Information]
Name	Proximity
Forrestdale and thomsons lakes	Within 10km of Ramsar

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Botaurus poiciloptilus		
Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calyptorhynchus banksii naso		
Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat may occur within area
Calyptorhynchus baudinii		
Baudin's Black-Cockatoo, Long-billed Black-Cockatoo [769]	Vulnerable	Roosting known to occur within area
Calyptorhynchus latirostris		
Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat likely to occur within area
Leipoa ocellata		
Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Insects		
Neopasiphae simplicior		
A native bee [66821]	Critically Endangered	Species or species habitat may occur within area
Mammals		
Dasyurus geoffroii		
Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Pseudocheirus occidentalis		
Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Vulnerable	Species or species habitat may occur within area
Plants		
Andersonia gracilis		
Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat known to occur within area
Darwinia foetida Muchea Bell [83190]	Critically Endangered	Species or species habitat likely to occur within area
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat known to occur within area
Diuris purdiei Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat known to occur within area
Drakaea elastica Glossy-leafed Hammer-orchid, Praying Virgin [16753]	Endangered	Species or species habitat known to occur within area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat known to occur within area
Lepidosperma rostratum Beaked Lepidosperma [14152]	Endangered	Species or species habitat likely to occur within area
Thelymitra dedmaniarum Cinnamon Sun Orchid [65105]	Endangered	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
[Calidris ruficollis](#) Red-necked Stint [860]		Species or species habitat known to occur within area
[Calidris subminuta](#) Long-toed Stint [861]		Species or species habitat known to occur within area
[Charadrius dubius](#) Little Ringed Plover [896]		Species or species habitat known to occur within area
[Limosa limosa](#) Black-tailed Godwit [845]		Species or species habitat known to occur within area
[Pandion haliaetus](#) Osprey [952]		Species or species habitat known to occur within area
[Philomachus pugnax](#) Ruff (Reeve) [850]		Species or species habitat known to occur within area
[Tringa glareola](#) Wood Sandpiper [829]		Species or species habitat known to occur within area
[Tringa nebularia](#) Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
[Tringa stagnatilis](#) Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
[Apus pacificus](#) Fork-tailed Swift [678]		Species or species habitat likely to occur within area
[Ardea alba](#) Great Egret, White Egret [59541]		Breeding known to occur within area
[Ardea ibis](#) Cattle Egret [59542]		Species or species habitat may occur within area
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Calidris canutus Red Knot, Knot [855]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area
Charadrius dubius Little Ringed Plover [896]		Species or species habitat known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Himantopus himantopus Black-winged Stilt [870]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Species or species habitat known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat may occur within area
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis		
Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Gibbs Road	WA
Piara	WA
Thomsons Lake	WA

Invasive Species	[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis		
Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos		
Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis		
European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia		
Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus		
House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus		
Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis		
Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis		
Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris		
Common Starling [389]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Protasparagus densiflorus Asparagus Fern, Plume Asparagus [5015]		Species or species habitat likely to occur within area
Protasparagus plumosus Climbing Asparagus-fern, Ferny Asparagus [11747]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

Nationally Important Wetlands	[Resource Information]
Name	State
Gibbs Road Swamp System	WA

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-32.12428 115.88346

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Parks and Wildlife Commission NT, Northern Territory Government
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

Department of the Environment
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111

APPENDIX D

Conservation Significant Flora Likelihood Assessment

Conservation significant flora species likelihood assessment

The Likelihood of each species is based on the following criteria: Recorded: Recorded during the field survey or site reconnaissance;

- Likely: Suitable habitat present and records less than 5 km from the Study area
- Possible = Suitable habitat present and records between 5 km and 20 km from the Study area
- Unlikely = No suitable habitat present and/or records greater than 20 km from the Study area.

SPECIES	SPECIES DESCRIPTION	CONSERVATION STATUS	LIKELIHOOD	LIKELIHOOD JUSTIFICATION
Andersonia gracilis (Slender Andersonia)	*Andersonia gracilis is found in w*hite/grey sand, sandy clay, gravelly loam. Winter-wet areas, near swamps.	DRF(T)/EN	Unlikely	Due to the lack of suitable habitat, *Andersonia gracilis* is considered as Unlikely to occur in the Study area.
Caladenia huegelii King Spider-(orchid)	*Caladenia huegelii* occurs in areas of mixed woodland of Jarrah (*Eucalyptus marginata*), Candlestick Banksia (*Banksia attenuata*), Holly Banksia (*B. ilicifolia*) and Firewood Banksia (*B. menziesii*) with scattered Sheoak (*Allocasuarina fraseriana*) and Marri (*Corymbia calophylla*) over dense shrubs of Blueboy (*Stirlingia latifolia*), Swan River Myrtle (*Hypocalymma robustum*), Yellow Buttercups (*Hibbertia hypericoides*), Buttercups (H. *subvaginata*), Balga (Xanthorrhoea preissii), Coastal Jugflower (*Adenanthos cuneatus*) and Conostylis species, from just north of Perth to the Busselton area, usually within 20 km of the coast. Throughout its range the species tends to favour areas of dense undergrowth. Soil is usually deep grey-white sand usually associated with the Bassendean sand-dune system.	DRF(T)/EN	Found on site	*Caladenia huegelii* was found on Site during numerous flora and vegetation surveys on-site (RPS 2010; PGV Environmental 2012; ENV Australia 2013; 360 Environmental 2015).

Species	Species Description	Conservation Status	Likelihood	Likelihood Justification
	However, rare plants have been known to extend into the Spearwood system (in which calcareous yellow sands dominate) in some areas (DEC 2009).			
Darwinia foetida (Muchea Bell)	*Darwinia foetida* occurs in grey-white sand on swampy, seasonally wet sites. Plants are found alongside sump land, that is, land acting as a pit or well where water collects (CALM 2006).	DRF(T)/CE	Unlikely	The nearest specimen of *Darwinia foetida* from the site is approximately 54 km and the extent of the population is approximately 1.2 $km^{2.}$ As such *Darwinia foetida* is considered Unlikely to occur in the Study area.
Diuris micrantha (Dwarf Bee-orchid)	The species grows in seasonally wet flats amongst sedges and scattered shrubs (Brown et al. 2013), on brown loamy clay.	DRF(T)/V	Unlikely	The habitat preference of the species being the borders of swamps and shallow water makes the species unlikely to occur
Diuris purdiei (Purdie's Donkey-orchid)	*Diuris purdiei* grows under dense shrubs in seasonally-wet swamps and drainage lines (Brown et al. 2013), in grey-black sand, moist, winter-wet swamps.	DRF(T)/EN	Unlikely	The habitat preference of the species being the borders of swamps makes the species unlikely to occur
Drakaea elastic (Glossy-leafed Hammer-orchid)	The species grows in deep sandy soil in Banksia woodland, in low lying areas alongside winter-wet swamps. (Brown et al., 1998).	DRF(T)/EN	Unlikely	The habitat preference of the species being the borders of swamps makes the species unlikely to occur

Species	Species Description	Conservation Status	Likelihood	Likelihood Justification
Drakaea micrantha (Dwarf Hammer-orchid)	*Drakaea micrantha* inhabits infertile white-grey sands in common sheoak (*Allocasuarina fraseriana*) and jarrah (*Eucalyptus marginata*) woodland or forest. It usually grows on fire breaks and in disturbed sites where competition from other plants has been removed (Brown et al., 1998).	DRF(T)/V	Likely	The nearest specimen of *Drakaea micrantha* is 4.1 km from the site and occurs sporadically over a wide range between Perth and Albany. The Study area has suitable habitat and as such is considered Likely to occur.
*Lepidosperma rostratum (*Beaked Lepidosperma)	Rhizomatous, tufted perennial, grass-like or herb) sedge. Prefers peaty sand and clay.	DRF(T)/EN	Possible	The nearest specimen being approximately 9 km from the site and the presence of its preferred habitat.
*Thelymitra dedmaniarum (*Cinnamon Sun Orchid)	A rare sienna sun orchid 200 to 400 mm high with a broad, pale green or yellowish-green leaf 100-200 mm long by 20 to 40 mm wide and up to 15 rich brown and yellow, cinnamon-scented flowers 40 to50 mm across with broad petals and sepals and a broad column with fimbriate outer lateral lobes and a bulbous apex	DRF(T)/EN	Unlikely	The nearest specimen is approximately 37.5 km from the site and is found in a small area near Gidgegannup in the Darling range, growing on granite slopes and in open wandoo woodland (Brown *et al.* 2013)
Stylidium aceratum	Fibrous rooted annual herb. Prefers sandy soils, swamp healthland.	P2	Possible	The nearest specimen being approximately 7 km from the site and the presence of its preferred habitat.

Species	Species Description	Conservation Status	Likelihood	Likelihood Justification
Byblis gigantea (Rainbow Plant)	*Byblis gigantea* inhabits sandy-peat swamps and seasonally wet areas.	P3	Unlikely	The absence of suitable habitat means that *Byblis gigantea is* considered unlikely to occur.
Cyathochaeta teretifolia	*Cyathochaeta teretifolia* inhabits grey sand, sandy clay. Swamps and creek edges.	P3	Likely	The nearest specimen is located 2.9 km from the Study area and suitable habitat is present. As such the species is considered as likely to occur in the Study area.
Jacksonia gracillima	Unknown	P3	Unknown	The nearest specimen is located 4.3 km from the Study area, however, it is unknown whether suitable habitat is present. As such the species is considered as unknown to occur in the Study area.
Phlebocarya pilosissima subsp. pilosissmia	Shortly rhizomatous, compactly tufted perennial grass-like or her, 0.15-.04 m high. Occurs in white or grey sand, lateritic gravel.	P3	Likely	The nearest specimen being less than 4 km from the site and the presence of its preferred habitat.
Schoenus pennisetis	Tufted annual, grass-like or herb (sedge), 0.05-0.15m high. Occurs in grey or peaty sand, sandy clay, swamps and winter wet depressions.	P3	Possible	The nearest specimen being approximately 6 km from the site and the presence of its preferred habitat.

Species	Species Description	Conservation Status	Likelihood	Likelihood Justification
Stylidium paludicola	Reed-like perennial, herb between .35 – 1m high. Inhabits peaty sand over clay, winter wet habitats. Marri and melaleuca woodland and melaleuca shrubland.	P3	Likely	The nearest specimen being less than 2 km from the site and the presence of its preferred habitat.
Jacksonia sericea (Waldjumi)	*Jacksonia sericea inhabits* calcareous and sandy soils.	P4	Likely	The nearest specimen is located 4.6 km from the Study area and suitable habitat is present. Therefore the species is considered likely to occur in the Study area.
Stylidium longitubum (Jumping Jacks)	*Stylidium longitubum inhibits* sandy clay, clay and seasonal wetlands.	P4	Unlikely	The nearest specimen is located 4.1 km from the Study area and no suitable habitat is present. Therefore *Stylidium longitubum* is considered unlikely to occur in the Study area.
Tripterococcus sp. brachylobus	No data available	P4	Unknown	Unknown
Verticordia lindleyi subsp. lindleyi	*Verticordia lindleyi subsp. lindleyi* inhabits sand, sandy clay.	P4	Likely	The nearest specimen is located 4.2 km from the Study area and suitable habitat is present. Therefore the species is considered likely to occur in the Study area

EN = Listed as Endangered under the EBPC Act

V = Listed as Vulnerable under the EBPC

CE= Critically Endangered under the EBPC Act

P = Listed as Priority by the DPaW

DRF (T) = Declared Rare Flora (Threatened) as listed by the State.

References

360 Environmental 2015, *Level 2 Flora and Vegetation Survey of Lot 131 Jandakot Road, Banjup.* Prepared for Perron Developments Pty Ltd.

Brown, A., Kingsley, D, French, C, & Brockman, G, 2013. Field Guide to the Orchids of Western Australia.

Department of Environment and Conservation (2009). *Grand Spider Orchid (Caladenia huegelii) Recovery Plan*. Commonwealth Department of the Environment, Water, Heritage and the Arts, Canberra.

ENV Australia 2013. *Level 2 Flora and Vegetation Survey of Lot 4 Armadale Road, Banjup*. Prepared for Perron Developments Pty Ltd.

PGV Environmental 2012. *Environmental Assessment Report for Lot 821 Armadale Road, Banjup*. Prepared for Department of Housing.

RPS 2011. *Environmental Assessment Report for Lots 1, 868, 9002 and 9004 Armadale Road, Banjup*. Prepared for Stockland.

Western Australia Department of Conservation and Land Management (WA CALM) (2006). *Records held in CALM's Declared Flora Database and rare flora files*. Perth, Western Australia: WA CALM.

APPENDIX E

Conservation Significant Fauna Likelihood Assessment

Conservation significant fauna species likelihood assessment

The Likelihood of each species is based on the following criteria:

- Recorded: Recorded during the field survey or site reconnaissance;
- Likely: Suitable habitat is present in the Study area and the Study area is in the species' known distribution;
- Possible: Limited or no suitable habitat is present in Study Area, but is nearby. The species has good dispersal abilities and is known from the general area; and
- Unlikely: No suitable habitat is present in Study area but is nearby, the species has poor dispersal abilities, but is known from the general area; or suitable habitat is present, however the Study area is outside of the species' known distribution.

SPECIES	SPECIES DESCRIPTION	CONSERVATION STATUS	LIKELIHOOD*	LIKELIHOOD JUSTIFICATION
Lerista lineata (Perth Slider)	The Perth Slider is listed as P3 under the DPaW priority list. The Perth Slider is a burrowing species found in coastal heaths and low shrubland, where it feeds at night on ants, termites and other small insects (Cogger 2014). This species is mainly found in coastal heath and shrubland on the lower west coast between Perth and Mandurah (Wilson & Swan 2013).	P3	Likely	The Study Area has sandy soils considered suitable for the Perth Slider and as such is considered Likely to occur in the Survey Area.
Leipoa ocellata (Malleefowl)	The Malleefowl is listed as Vulnerable under the EBPC Act and Schedule 3 under the WC Act. In the past century the range of the Malleefowl has contracted, particularly in arid areas and at the periphery of its former range. In Australia, clearing for Agriculture has eliminated and fragmented much of the Malleefowl habitat, resulting in localised extinctions and	V S1	Unlikely	The Study Area is not within the known distribution of the species (Barrett *et al*. 2003). Consequently, the Malleefowl is considered unlikely to occur.

Species	Species Description	Conservation Status	Likelihood*	Likelihood Justification
	fragmented populations (Garnett *et al*. 2011). In WA since 1981, the Malleefowls range has been estimated to have contracted by between 28 and 30% (Parsons *et al*. 2008). Historically, the species was originally common and widespread in semiarid zones, mainly in scrubs of mallee and other low Eucalypts on sandy and lateritic soils; also Acacia scrubs on heavy red soils, especially north and east of the mulga-eucalypt line. The Malleefowl is now generally rare to uncommon and patchily distributed due to habitat loss.			
Falco peregrinus (Peregrine Falcon)	The Peregrine Falcon is listed as Schedule 7 under the WC Act. It is an uncommon but wide-ranging across Australia. It occurs mainly along rivers and ranges as well as wooded watercourses and lakes and nests primarily on cliffs, granite outcrops and quarries. They feed mostly on birds (Johnstone & Storr 1998).	S 4	Unlikely	A lack of suitable habitat result in this species being considered unlikely to occur in the Study Area.
Calyptorhynchus banksii subsp. *naso* (Forest Red-tailed Black Cockatoo)	The Forest Red-tailed Black Cockatoo (FRTBC) is listed as Vulnerable under the EPBC Act and Schedule 3 under the WC Act. The FRTBC is distributed through the humid and subhumid south-west of Western Australia from Gingin through the Darling Ranges to the south-west from Bunbury to Albany. The FRTBC feeds primarily on Marri and Jarrah fruit (Johnstone & Kirkby 1999) and to a lesser extent on Blackbutt (*Eucalyptus patens*), Albany Blackbutt (*Eucalyptus staeri*), Karri (*Eucalyptus diversicolor*), Sheoak (*Allocasuarina*	V S1	Likely	The project area is located in the known distribution of this species and there are small areas of vegetation containing various *Eucalyptus* and *Banksia* species that the FRTBC is known to include in its diet.

Species	Species Description	Conservation Status	Likelihood*	Likelihood Justification
	fraseriana) and Snottygobble (Persoonia longifolia). Forest Red-tailed Black Cockatoo can obtain energy faster when feeding on Marri and Jarrah than other food sources (Cooper *et al*. 2002) and these two plant species make up 90% of the diet of the FRBC.			
Calyptorhynchus baudinii (Baudin's Black-Cockatoo)	Baudin's Cockatoo is listed as Vulnerable under the EPBC Act and Schedule 2 under the WC Act. The species is distributed through the south-western humid and subhumid zones, from the northern Darling Range and adjacent far east of the Swan Coastal Plain (south of the Swan River), south to Bunbury and across to Albany. Baudin's Cockatoo rarely occurs near the coast north of Mandurah, and rarely occurs north of the Swan River (Johnstone & Kirkby 2008, Johnstone & Storr 1998). Baudin's Cockatoo usually occur in small flocks of up to 30, or occasionally up to 50 and rarely in aggregations of up to 1200 (Johnstone & Kirkby 2008). Baudin's Cockatoo is distinguished from the other white-tailed black cockatoo (Carnaby's Cockatoo) by its longer bill and slightly different call. This species forages primarily in eucalypt forest, where it feeds on Marri seeds, flowers, nectar and buds. They also feed on a wide range of seeds of Eucalyptus, Banksia, Hakea and Pines (*Pinus* sp.) as well as fruiting apples and pears and beetle larvae from under the bark of trees (Johnstone & Kirkby 2008, Johnstone & Storr 1998).	V S1	Likely	The project area is located in the known distribution of this species and there are small areas of vegetation containing various *Eucalyptus* and *Banksia* species which provide suitable foraging habitat.

Species	Species Description	Conservation Status	Likelihood*	Likelihood Justification
Calyptorhynchus latirostris (Carnaby's Cockatoo)	Carnaby's Cockatoo is listed as Endangered under the EPBC Act and Schedule 2 under the WC Act. Carnaby's Cockatoo is endemic to south-west Western Australia, and is distributed from the Murchison River to Esperance and inland to Coorow, Kellerberrin and Lake Cronin (Cale 2003). The species was once common, but the population has declined significantly in the last half century, and is now locally extinct in some areas (Johnstone & Storr 1998, Shah 2006). In the last 45 years the species has suffered a 50% reduction in its abundance (Cale 2003). This reduction is due to the clearing of core breeding habitat in the wheatbelt, the deterioration of nesting hollows, and clearing of food resources on the Swan Coastal Plain (Cale 2003). The total population of Carnaby's Cockatoo is currently estimated at 40,000. Carnaby's Cockatoos feed on seeds, nuts and flowers of a variety of native and exotic plants. Food plants include Banksia (including those previously included in the genus Dryandra), Pine trees (*Pinus* sp.), Marri, Jarrah, Grevillea, Allocasuarina, and Hakea species (Shah 2006). Marri nuts that are damaged extensively, especially on the main body of the nut, are likely to have been chewed by Carnaby's Cockatoo or FRTBC.	EN S1	Likely	The project area is located in the known distribution of this species and there are small areas of vegetation containing various *Eucalyptus* and *Banksia* species which provide suitable foraging habitat.
Merops ornatus (Rainbow Bee-	The Rainbow Bee-eater is listed as Migratory under the EPBC Act and Schedule 5 under the WC Act. It occurs in lightly wooded, often sandy country, preferring areas near water. It	MiMa	Likely	The Rainbow Bee-eater was returned from both the NatureMap and EPBC PMST. This species is one of the

Species	Species Description	Conservation Status	Likelihood*	Likelihood Justification
eater)	feeds on airborne insects, and nests throughout its range in WA in burrows excavated in sandy ground or banks, often at the margins of roads and tracks. In WA this species can occur as a 'resident, breeding visitor, postnuptial nomad, passage migrant and winter visitor' (Johnstone & Storr 1998). The Study areacontains potential foraging habitat for this species.			most common and widespread birds in Australia with a distribution that covers the majority of Australia (Barrett et al. 2003), as such it is considered as Likely to occur in the Survey Area.
Dasyurus geoffroii (Western Quoll)	The Western Quoll is listed as Vulnerable under the EPBC Act and Schedule 3 under the WC Act. Knowledge of the ecology of the Western Quoll is largely restricted to its distribution in mesic jarrah forests. Here, population densities are three times greater than in semi-arid zones where rainfall and consequently productivity are lower than mesic forests and home ranges are larger (Rayner et al. 2012). The Western Quolls diet includes mammals, birds, reptiles, invertebrates, plants and rubbish, which is consistent with it being a generalist predator. The Western Quoll was formerly distributed over nearly 70% of the continent, occurring in every Mainland State and Territory (Woinarski et al. 2014). Since European settlement, its range has contracted dramatically. Historically it was found in the vicinity of the Survey Area, but it is now restricted to the south-west of WA where it has a fragmented distribution.	V S1	Unlikely	This species is now only found in sclerophyll forest, woodland and mallee shrubland (Van Dyck & Strahan 2008). It is highly mobile, and appears able to utilise bush remnants and corridors. However, due to its now limited distribution and the fragmented nature of the Survey Area, the Western Quoll is considered unlikely to occur.
Isoodon obesulus	Southern Brown Bandicoot once occurred throughout the	P 5	Likely	The Southern Brown Bandicoot is

Species	Species Description	Conservation Status	Likelihood*	Likelihood justification
(Southern Brown Bandicoot)	south west of WA. It now occurs from Guilderton southwards on the SCP, including the Perth metropolitan area, in the Jarrah and Karri forests and adjacent coastal vegetation complexes, east along the south coast to Cape Arid National Park. Southern Brown Bandicoots prefer dense vegetation, including wetland fringes and heathland. It is patchily distributed in suitable habitat and can still be found in forest, woodland, shrub and heath communities (Woinarski et al. 2012).			patchily distributed in suitable habitat, being often found near road verges and in fragmented and degraded areas. Suitable scrubby habitat with sandy soils is present in the Study area and as such the species is considered likely to occur.
Macropus irma *(Western Brush Wallaby)*	The Western Brush Wallaby is listed as Priority 4 under the DPaW priority list. This species occurs in open forest or woodland, particularly where grassy understory and scrubby thickets are present. It is found only in south-western WA, where it is in decline, probably as a result of an increase in the numbers of foxes. Due to limited studies on this species, very little is known of its food preferences, but it seems to manage without free water (Van Dyck & Strahan 2008).	P4	Unlikely	The Study Area does not have a grassy understory which results in a lack of suitable habitat and as such it can be considered Unlikely to occur in the Survey Area.

EN= Listed as Endangered under the EBPC Act

V= Listed as Vulnerable under the EBPC Act

Mi= Listed as Migratory under the EBPC Act

Ma= Listed as Marine under the EBPC Act

S= Scheduled under the WC Act (Threatened)

P= Listed as Priority by DPaW

The below wetland and marine species were returned from the 5km EPBC PMST and NatureMap database searches.

- *Actitis hypoleucos* (Common Sandpiper) IA
- *Ardea ibis* (Cattle Egret) IA
- *Ardea modesta* (Eastern Great Egret) IA
- *Botaurus poiciloptilus* (Australasian Bittern) Endangered
- *Calidris acuminata* (Sharp-tailed Sandpiper) IA
- *Calidris ferruginea (*Curlew Sandpiper*)*
- *Calidris melanotos* (Pectoral Sandpiper) IA
- *Calidris ruficollis* (Red-necked Stint) IA
- *Calidris subminuta* (Long-toed Stint) IA
- *Charadrius dubius* (Little Ringed Plover) IA
- *Apus pacificus (Fork-tailed Swift)*
- *Haliaeetus leucogaster* (White-bellied Sea-Eagle) IA
- *Limosa limosa* (Black-tailed Godwit) IA
- *Oxyura australis* (Blue-billed Duck) P4
- *Pandion cristatus* (Osprey) IA
- *Plegadis falcinellus* (Glossy Ibis) IA
- *Rostratula australis* (Australian Painted Snipe) Endangered
- *Thinornis rubricollis (*Hooded Plover*) IA*
- *Tringa glareola* (Wood Sandpiper) IA

- *Tringa nebularia* (Common Greenshank) IA

Database Errors and Locally Extinct Species

A number of species returned were also known to be historical records of species now extinct in the local area and more broadly in the region, or database errors:

- *Motacilla cinerea* (Grey Wagtail)
- *Myrmecobius fasciatus* (Numbat)
- *Pseudocheirus occidentalis* (Western Ringtail Possum)

These species have been omitted from any further discussion.

References:

Barrett, G., Silcocks, A., Barry, S., Cunningham, R., & Poulter, R. (2003). The New Atlas of Australian Birds. Hawthorn East, Victoria: Royal Australasian Ornithologists Union.

Cale, B. (2003). *Carnaby's Black-Cockatoo (Calyptorhynchus latirostris) Recovery Plan*. Perth: Department of Conservation and Land Management.

Cogger, H. (2013). Reptiles and Amphibians of Australia. CSIRO Publishing

Cooper, C. E., Withers, P. C., Mawson, P. R., Bradshaw, S. D., Prince, J., & Robertson, H. (2002). *Metabolic ecology of cockatoos in the south-west of Western Australia*. *Australian Journal of Zoology* **50**, 67–76.

Garnett, S.T., Szabo, J.K., & Dutson, G. (2011). The action plan for Australian birds 2010. CSIRO. Publishing.

Johnstone, R. E., & Kirkby, T. (1999). Food of the forest red-tailed black cockatoo Calyptorhynchus banksii naso in south-west Western Australia. *Western Australian Naturalist* **22**, 167–177.

Johnstone, R. E. & Storr, G. M. (1998). *Handbook of Western Australian Birds*. Volume 1 - Non-Passerines (Emu to Dollarbird). Oxford University Press.

Johnstone, R. E. & Storr, G. M. (1998b). *Handbook of Western Australian Birds*. Volume 2 - Passerines (Blue-winged Pitta to Goldfinch). Oxford University Press.

Parsons B.C., Short, J.C., & Roberts, J.D. (2008). Contraction in the range of Malleefowl (Leipoa ocellata) in WA: a comparative assessment using presence-only and presence–absence datasets. *Emu* **108**, 221–231.

Rayner, K., Chambers, B., Johnson, B., Morris, K.D., & Mills, H.R. (2012). Spatial and dietary requirements of the Chuditch (*Dasyurus geoffroii*) in a semiarid climatic zone. *Australian Mammalogy* **34**, 59–67.

Shah, B. (2006). Conservation of Carnaby's Black Cockatoo on the Swan Coastal Plain, WA. Perth: Birds Australia.

Van Dyck, S., & Strahan, R. (2008). The Mammals of Australia. New South Wales: New Holland Publishers.

Wilson, S. & Swan, G. (2008). *A Complete Guide to Reptiles of Australia*. *Second Edition*. New Holland: Sydney, NSW.

Woinarski, J.C.Z., Burbidge, A.A., & Harrison, P.L. (2014). The action plan for Australian mammals 2012. CSIRO Publishing.

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

people • planet • professional