Part 1

ROWE GROUP DESIGN

LOCAL STRUCTURE PLAN

PRECINCT 2A – PICTON INDUSTRIAL PARK SOUTHERN PRECINCT

OUR REF: 9013 17/01/2020

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RECORD OF ENDORSEMENT

This structure plan is prepared under the provisions of the Shire of Dardanup Local Planning Scheme No.3.

IT IS CERTIFIED THAT THIS STRUCTURE PLAN WAS APPROVED BY RESOLUTION OF THE WESTERN AUSTRALIAN PLANNING COMMISSION ON:

..... Date

Signed for and on behalf of the Western Australian Planning Commission:

.....

an officer of the Commission duly authorised by the Commission pursuant to section 16 of the Planning and Development Act 2005 for that purpose, in the presence of:

..... Witness

..... Date

..... Date of Expiry

TABLE OF AMENDMENTS

AMENDMENT NO.	SUMMARY OF THE AMENDMENT	AMENDMENT TYPE	DATE APPROVED BY WAPC

EXECUTIVE SUMMARY

Rowe Group act for the owners of Lots 103 and 110 Harris Road and Lot 603 Columbas Drive, Picton East and have been engaged to prepare a Local Structure Plan over the land.

The land is located south of South West Highway and southeast of the Picton Railway marshalling yards. It is within the planned expansion of the Picton Industrial Area, within the Shire of Dardanup.

The need for this Local Structure Plan (LSP) is outlined in the *Picton Industrial Park Southern Precinct District Structure Plan* (Western Australia Planning Commission (WAPC), 2017). The area is commonly referred to as the 'Picton South DSP' area. The Picton South DSP identifies four precincts within which local structure planning should be undertaken in order to guide future subdivision and development.

The land the subject of this local structure plan comprises the eastern part of the Picton South DSP Precinct 2. For clarity this LSP area is referred to as Precinct 2A. As the land is removed from the balance of the DSP Precinct 2 area by an existing rail loop alignment and adjoining DSP identified public open space, it is logical that the remainder of Precinct 2 be the subject of a separate 'Precinct 2B' LSP. Access, servicing and development timing for 2A and 2B will occur independent of each other while respecting the intentions of the overarching Picton South DSP.

The LSP area is zoned 'Industrial Deferred' in the Greater Bunbury Region Scheme (GBRS) and 'General Farming' in the Shire of Dardanup Town Planning Scheme No.3 (TPS3). A request for the 'Lifting of Industrial Deferred' under the GBRS to 'Industrial' zone, together with concurrent rezoning under TPS3 to 'Development' zone have been prepared and accompany this LSP as a separately prepared document.

Preparation of this LSP was delayed for some time by planning for the Bunbury Outer Ring Road (BORR). The LSP lies immediately west of Martin-Pelusey Road and the former BORR alignment. Given final resolution of the BORR route by Main Roads Western Australian (MRWA) and its reflection in documentation released by the WAPC, this LSP can now be progressed.

The key elements guiding formulation of the LSP are:

- Integrated land use and access;
- Connected road structure linking to the wider local road network and Bunbury Outer Ring Road (BORR) and Bunbury Port;
- Identified areas of vegetation recognised;
- Integrated design and delivery with a detailed Local Water Management Strategy (LWMS);
- Facilitation of industrial land use and development for a wide variety of general industrial land uses and supporting uses.

The Structure Plan is summarised in the following table:

STRUCTURE PLAN SUMMARY

ITEM	DATA	SECTION NUMBER REFERENCED IN PART 2 OF REPORT
Total area covered by the Structure Plan	73 hectares	2
Land Requirement (Martin Pelusey Road Widening) Primary Regional Road Reserve (Subject to Review)	2.1 hectares 2.44 hectares	3.1.1
Area of each land use proposed: Industrial Commercial	68.45 hectares 0 hectares	3.3.1
Total estimated lot yield	47 lots	3.3.1
Estimated area and percentage of public open space given over to: - Local parks	3.95 hectares, 5.41%	5.2

Note: All information and areas are approximate only and are subject to survey and detailed design.

Consistent with the Shire of Dardanup TPS3 this Local Structure Plan has been prepared for adoption by the Shire and endorsement by the Western Australian Planning Commission (WAPC).

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FIGURES

PLAN 1 – LOCAL STRUCTURE PLAN

TABLES

TECHNICAL APPENDICES

APPENDIX NUMBER	DOCUMENT TITLE	NATURE OF DOCUMENT	REFERRAL/APPROVAL AGENCY	APPROVAL STATUS AND MODIFICATIONS
1	Certificates of Title	Supporting	-	
2	Clause 53 Certificates	Supporting	-	
3	Environmental Assessment and Management Strategy	Supporting	Department of Biodiversity, Conservation and Attractions	
4	Bushfire Management Plan	Approval Required	Department of Fire and Emergency Services	
5	Local Water Management Strategy	Approval Required	Department of Water and Environmental Regulation	
6	Transport Impact Assessment	Supporting	Main Roads WA / Shire of Dardanup	
7	Engineering Servicing Report	Supporting	-	
8	Planning Framework – Schedule of Assessment in relation to the *Picton Industrial Park Southern Precinct DSP*	Supporting	-	

PART ONE

IMPLEMENTATION

ROWE GROUP DESIGN

1. STRUCTURE PLAN AREA

This Local Structure Plan (LSP) applies to Lots 603, 103 and 110 being the land generally bounded by Martin-Pelusey Road, Harris Road, Columbus Drive and the southwest railway line. The LSP area is contained within the inner edge of the line denoting the Structure Plan boundary on the Structure Plan map (Refer Plan 1 situated at the end of Part 1 of this Structure Plan report).

2. OPERATION

In accordance with Schedule 2, Part 4 of the Planning and Development (Local Planning Schemes) Regulations 2015, this Structure Plan shall come into operation when it is approved by the Western Australian Planning Commission (WAPC) pursuant to Schedule 2, Part 4, Clause 22 of the Regulations.

The Local Structure Plan is intended to guide subdivision, development and use of the land within the Structure Plan area.

3. STRUCTURE PLAN COMPONENTS

3.1 REPORT STRUCTURE

Part One of this document comprises the Local Structure Plan (LSP) map and guiding provisions.

Part Two provides appropriate background documentation that both demonstrates the appropriateness of the LSP content and also its design.

3.2 BACKGROUND TECHNICAL REPORTS

This LSP also incorporates related technical reports. These reports have directly informed the design and documentation of the LSP and include:

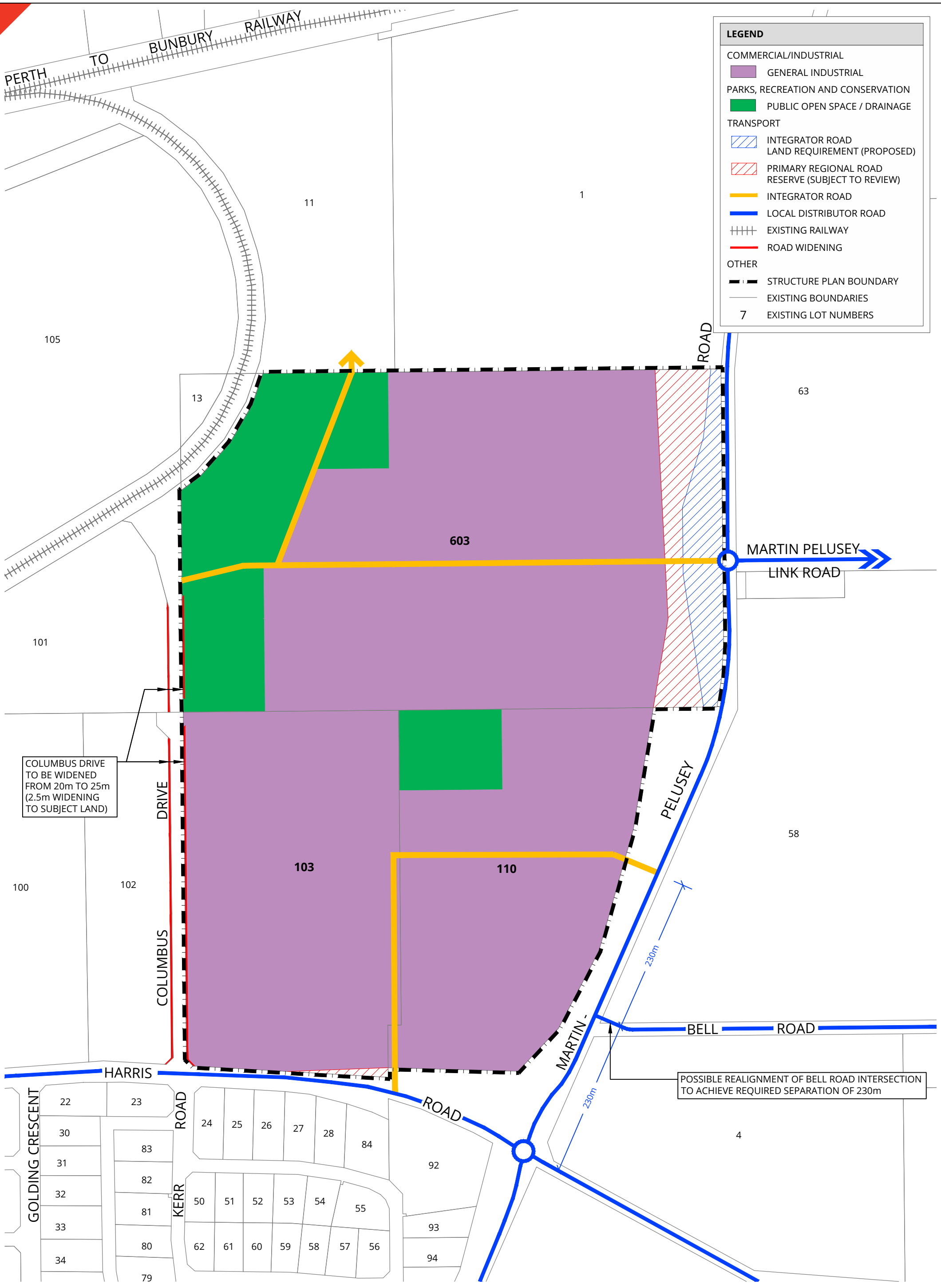
- Traffic Impact Assessment (Uloth, 2019)
- Local Water Management Strategy (Emerge, 2019)
- Infrastructure Servicing Review (Wood & Grieve, 2019)
- Environmental Assessment (Emerge, 2019)

4. RELATIONSHIP TO TOWN PLANNING SCHEME NO.3

The Precinct 2A Local Structure Plan has been prepared in accordance with Clause 3.1.5.7 of TPS3 and Part 4 of the Deemed Provisions which form Schedule A to TPS3.

5. SUBDIVISION & DEVELOPMENT REQUIREMENTS

Land use, subdivision, and development shall be generally in accordance with the Local Structure Plan.



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9013_LSP01G_20191112 Picton East (LSP) · DRAWN: A. GLASKIN · DATE CREATED: 2019.11.12 · PROJECTION: MGA50 GDA94 · CADASTE: LANDGATE

LOCAL STRUCTURE PLAN

LOTS 103, 110 AND 603

PICTON EAST

NORTH

0 125 m

SCALE @ A3: 1:5000

9013-LSP-01-G

ROWE GROUP

PART TWO

EXPLANATORY SECTION

ROWE GROUP DESIGN

1. PLANNING BACKGROUND

1.1 INTRODUCTION AND PURPOSE

Rowe Group act for the owners of Lots 103 and 110 Harris Road and Lot 603 Columbas Drive, Picton East ('the subject land') and have been engaged to prepare a Local Structure Plan over the land.

The need for this Local Structure Plan (LSP) is outlined in the *Picton Industrial Park Southern Precinct District Structure Plan* (WAPC, 2017). The area is commonly referred to as the 'Picton South DSP' area. The Picton South DSP identifies four precincts within which local structure planning should be undertaken in order to guide future subdivision and development:

- Precinct 1 comprises land north of the rail line, located between South Western Highway and the rail;
- Precinct 2 comprises land within the railway marshalling yards rail loop, together with land immediately west of the rail loop;
- Precinct 3 comprises land generally adjacent to the Ferguson River and south of Harris Road;
- Precinct 4 comprises land south of Harris Road centred around Golding Crescent and already subdivided into smaller allotments.

The land the subject of this local structure plan comprises the south eastern portion of the Picton South DSP Precinct 2. For clarity this proposed LSP area is referred to as Precinct 2A on the basis it comprises one of three such precincts:

- Precinct 2A comprises three adjoining landholdings with frontage to Colmbus Drive and Harris Road that will be developed independent of the remaining Precinct 2 area and are not impacted by South Western Highway, the Picton Marshalling Yards rail loop or other issues prevalent in the balance of Precinct 2;
- Precinct 2B comprises Lots 11 and 1 immediately north of 2A and, while adjoining, will be subject to separate access, servicing and development arrangements following final determination of Martin-Pelusey Road and South Western Highway access arrangements;
- Precinct 2C comprising the balance of the Precinct 2 area north of Harris Road and west of Columbus Drive.

The Precinct 2A approach ensures future planning of surrounding properties can be undertaken by landowners as and when required. This LSP has due regard to site and context surrounds while proposing formal adoption of this LSP over Precinct 2A only.

The LSP area is zoned 'Industrial Deferred' in the Greater Bunbury Region Scheme (GBRS). A request for the 'Lifting of Industrial Deferred' under the GBRS to 'Industrial' zone, together with a request for concurrent rezoning under the Shire of Dardanup TPS3 to 'Development' zone have been prepared and accompany this LSP proposal as a separate document.

The key elements guiding formulation of the LSP are:

- Integrated land use and access;
- Connected road structure linking to the wider local road network and Bunbury Outer Ring Road (BORR) and Bunbury Port;
- Identified areas of vegetation recognised;
- Integrated design and delivery with a detailed Local Water Management Strategy (LWMS);
- Facilitation of industrial land use and development for a wide variety of general industrial land uses and supporting uses.

1.2 PROJECT TEAM

The following multi-disciplinary project team has been engaged by the proponent to progress the preparation of the Structure Plan:

- Rowe Group – town planning and urban design
- Emerge – environment, bushfire planning and urban water management
- Wood & Grieve – engineering and servicing
- Uloth & Associates – traffic and transport analysis

2. DESCRIPTION OF SITE

2.1 LOCATION

The subject land is located to the east of Picton, an established industrial area to the east of the Greater Bunbury region. The land lies south of South West Highway and southeast of the Picton Railway marshalling yards. It is within the planned expansion of the Picton Industrial Area, within the Shire of Dardanup.

The land the subject of Local Structure Plan Precinct 2A is located within the Picton South area and comprises three (3) lots generally bounded by Martin-Pelusey Road to the east, Harris Road to the south, Columbas Drive to the west and abuts Lots 11 and 1 to the north.

The land is located within the Shire of Dardanup and lies approximately 12 km southeast of the Bunbury CBD.

Refer Figure 1 – Regional Location and Figure 2 – Local Location

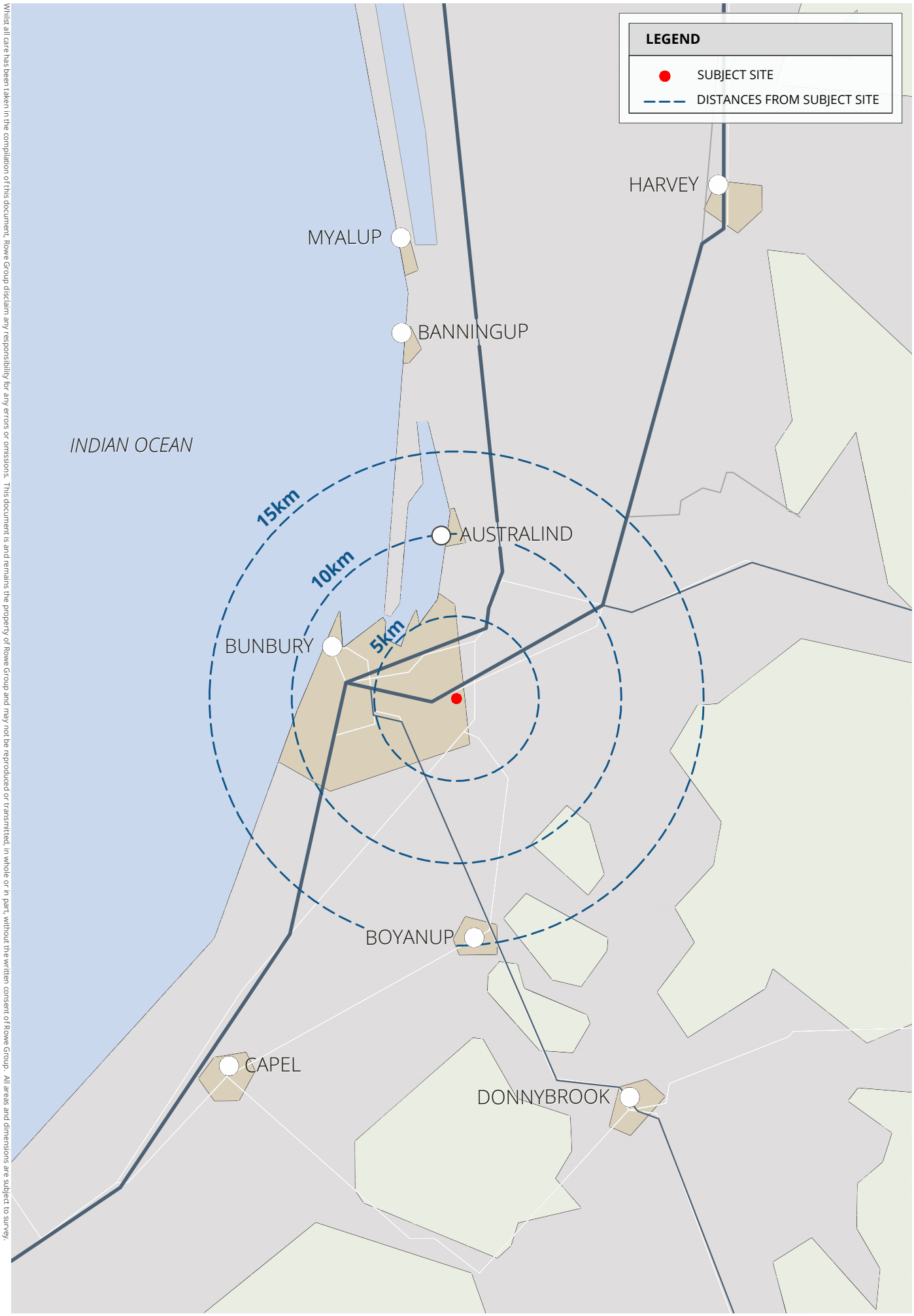
2.2 AREA AND LAND USE

The Precinct 2A LSP area comprises approximately 73.129 ha. The land is currently used for general farming and grazing purposes. Lot 110 also supports a timber sales operation on the southern portion of the lot.

A 132 kV power line traverses the LSP area from west to east crossing generally at the common boundary of Lot 603 and 103 and extending through Lot 110 before crossing Martin-Pelusey Road. A low voltage line extending from this southward crosses Lot 103. Easements associated with the lines are evident on Lots 603 and 103. No easements are evident on Lot 110.

Small farm drains and dams occur across the site ultimately linking to the East Picton Main Drain managed by the Water Corporation west of the site.

Refer Figure 3 – Site Plan



N:\TOWN PLANNING\9000-9999\9013\DRAFTING\A-CAD - ADAM GLASKIN - 2019.08.12

9058_FIG04A_20190812 Picton East (Regional Location) - DRAWN: **A. GLASKIN** - DATE CREATED: **2019.08.12** - PROJECTION: **MGA50** GDA94 -

0 5000 m

SCALE @ A4: 1:300,000

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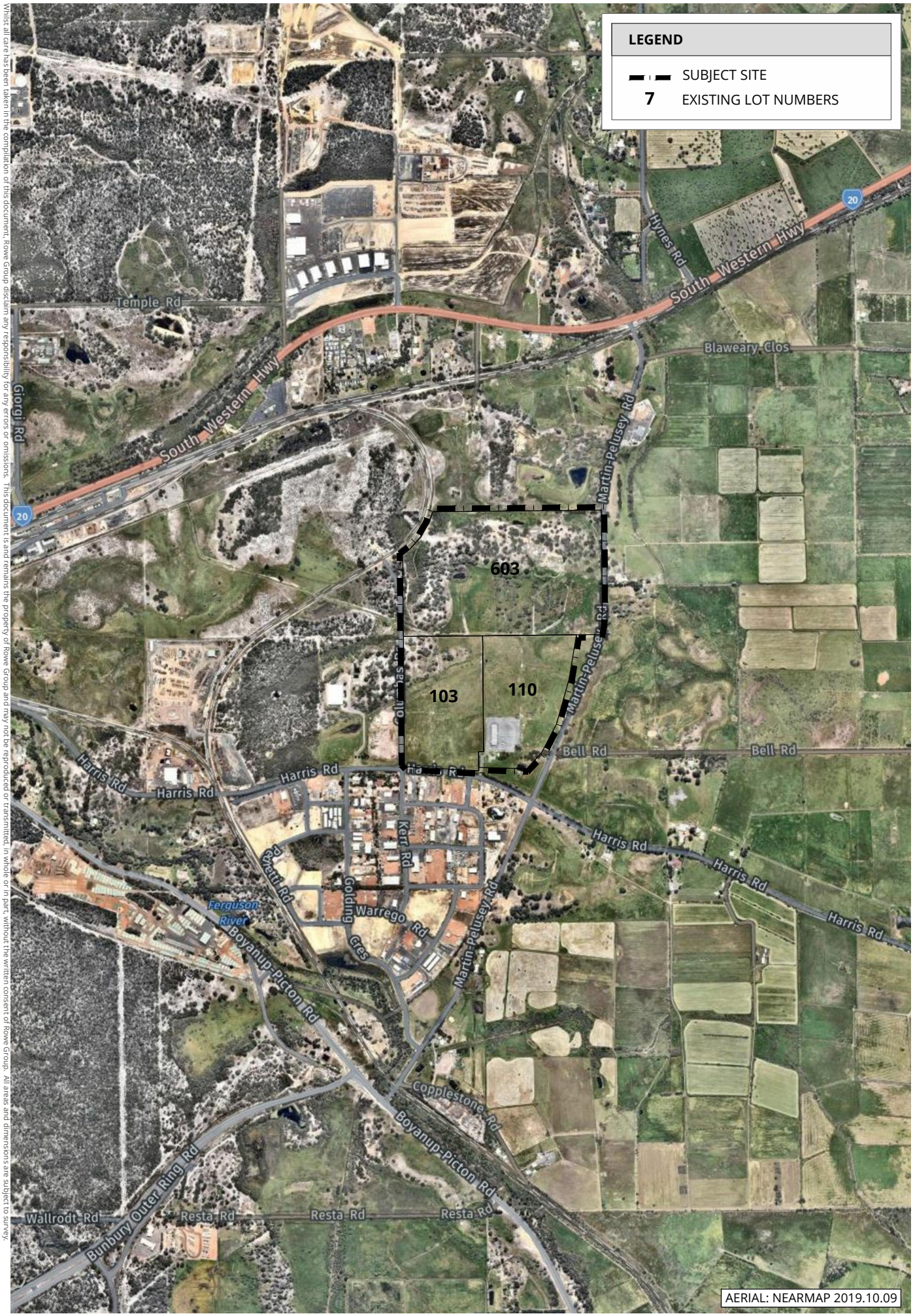
FIGURE 1

REGIONAL LOCATION



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9013_FIG05B_20191119 Picton East (Local Location) - DRAWN:WILLIAM CLEMENTS - DATE CREATED: 2019.11.19 - PROJECTION: MGA50 GDA94 - CADASTRE: LANDGATE - AERIAL: NEARMAP 20190530

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SCALE @ A4: 1:20,000

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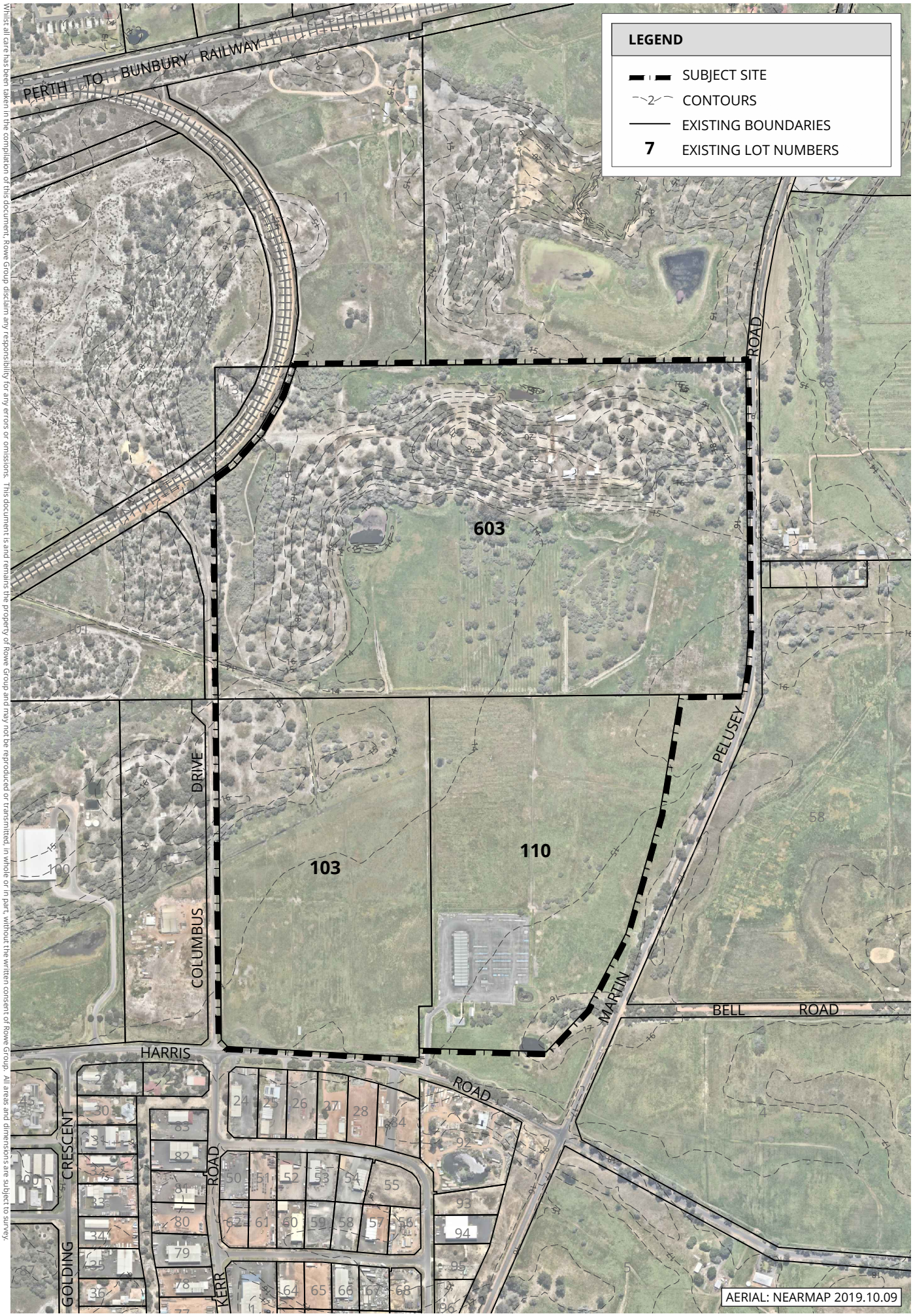
FIGURE 2

LOCAL LOCATION



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9013_FIG06B_20191119 Picton East (Site Plan) - DRAWN:WILLIAM CLEMENTS - DATE CREATED: 2019.11.19 - PROJECTION: MGA50 GDA94 - CADASTRE: LANDGATE - AERIAL: NEARMAP 20191009

0 187.5 m

SCALE @ A4: 1:7500

N

FIGURE 3

SITE PLAN

2.3 LEGAL DESCRIPTION AND OWNERSHIP

The details of each land parcel are included within the table below.

LOT	LANDOWNER	VOLUME / FOLIO	AREA (HA)
Lot 603 Columbus Dr	Harris Road Pty Ltd	2044 / 266	39.242
Lot 103 cnr Columbas Dr & Harris Rd	Harris Road Pty Ltd	2152 / 572	17.076
Lot 110 Harris Rd	Westim Pty Ltd	2741 / 234	16.811
		Total:	**73.129**

Table 1: Lot Details.

Copies of the Certificate of Title are included within Appendix 1 to this report.

3. PLANNING FRAMEWORK

3.1 ZONING AND RESERVATIONS

3.1.1 GREATER BUNBURY REGION SCHEME

The Greater Bunbury Region Scheme (GBRS) guides land use and provides the statutory framework for the zoning and reservation of land within the Greater Bunbury Region.

The subject land is predominantly zoned 'Industrial Deferred' under the GBRS with a portion of the eastern edge of Lot 603 reserved for Primary Regional Roads (PRR) where it fronts Martin-Pelusey Road. This eastern strip of reserve over Lot 603 varies between 82m and 98m in width and was reflected in the GBRS to accommodate the now superceded alignment for the Bunbury Outer Ring Road (BORR). This PRR as originally planned and reserved is no longer required. The required reservation of Martin-Pelusey Road in this location is addressed in this LSP and the Traffic Impact Assessment (TIA) appended.

Copies of the Clause 53 Certificates for the subject land are included within Appendix 2 to this report.

A separate report has been prepared to accompany this LSP which outlines the zoning of the land under the GBRS and formally requests both lifting of industrial deferred and concurrent rezoning under the Shire of Dardanup Town Planning Scheme No.3 (TPS3).

The progression of this LSP, incorporating land use, traffic, servicing, water, environment and bushfire considerations and demonstrates the appropriateness of the lifting of 'Industrial Deferred'.

Refer Figure 4 GBRS Zoning Plan.

3.1.2 SHIRE OF DARDANUP TPS3

The subject land is zoned 'General Farming' under TPS3, along with the above-mentioned portion of land reserved for PRR associated with the former BORR alignment.

As noted above, this LSP is accompanied by an associated report requesting the 'Lifting of Industrial Deferred' over the land, together with concurrent rezoning of the land from 'General Farming' to 'Development' Zone.

The aim of the 'Development' Zone is to facilitate the planning of land through a comprehensive Structure Plan in accordance with Clause 3.15.7 of TPS3 and the Deemed Provisions.

Refer Figure 5 TPS 3 Zoning Plan.

3.2 REGIONAL PLANS AND STRATEGIES

3.2.1 INDUSTRY 2030

The *Industry 2030: Greater Bunbury Industrial Land and Port Access Planning Final Report* (WAPC, 2000) documented the outcome of community consultation and related technical studies. These studies included the *Preston Industrial Park Land Use and Port Access Study*. The report included an

'Interim Strategy Plan' which identified the subject land as 'Secondary General Industry Precinct' and 'Transitional Industry Precinct'. The plan was, as its title indicates, intended as an interim guide pending more detailed technical investigations regarding traffic, environmental and water management considerations. Notwithstanding, the Industry 2030 report highlights the subject land's identification for general industrial.

3.2.2 GREATER BUNBURY STRATEGY

The *Greater Bunbury Strategy Final Report* (WAPC, 2013) was prepared to guide urban, industrial and regional land use planning; and associated infrastructure delivery in the Greater Bunbury sub-region in the short, medium and long terms. The Strategy provides for land use requirements to accommodate growth of the region's population from 84,000 to over 150,000.

The Strategy includes a 'Sub-regional Structure Plan 2013'. The land the subject of this LSP is identified as 'Industrial Expansion' in the Structure Plan.

3.2.3 SOUTH WEST REGIONAL PLANNING & INFRASTRUCTURE FRAMEWORK

The *South West Regional Planning and Infrastructure Framework - Parts A and B* (WAPC, 2015) provide the overall strategic context for land use planning in the South West Region of Western Australia.

In relation to Strategic Industrial Areas, section 6.8.3 of Part A recognises that, through the *Greater Bunbury Strategy*, the WAPC has planned additional industrial areas to accommodate general industry in the Greater Bunbury Area including the Preston Industrial Park. The subject land is within this area.

3.3 DISTRICT PLANS

3.3.1 PICTON INDUSTRIAL PARK SOUTHERN PRECINCT DISTRICT STRUCTURE PLAN

The Picton Industrial Park Southern Precinct is located to the east of Picton, the existing industrial area within the eastern part of Greater Bunbury. The *Picton Industrial Park Southern Precinct District Structure Plan* (WAPC, 2018) ('the Picton South DSP') outlines the key planning considerations for development of the area. As outlined above, the Picton South DSP represents the latest DSP for the wider Preston Industrial Park covering approximately 2950 hectares originally identified in the *Industry 2030* report.

The Picton South DSP provides a high-level guide to the planning requirements for the area, for industrial use, together with associated infrastructure and designations for regional open space and other reserves. It is relevant to note that the DSP indicates *"The former Office of the Environmental Protection Authority (OEPA), now part of the Department of Water and Environmental Regulation, previously provided advice and guidance on the environmental issues associated with remnant vegetation within the Preston Industrial Park (EPA, 2008) and identified key areas for retention. These are reflected in the DSP." (piii).*

The land the subject of this DSP lies within the Picton South DSP and a number of elements within the DSP are worth noting:

- the subject land is identified as 'General Industry';

- the DSP recognises the final BORR alignment has moved southeast of Martin-Pelusey Road and Martin-Pelusey Road is shown as an 'Integrator Road';
- Harris Road is shown as a 'Local Distributor Road';
- Columbus Road is shown as a 'Local Distributor Road' and shown as indicatively extending west across the existing railway marshalling yards rail loop before turning south to again cross the rail loop and intersect Harris Road;
- Public Open Space areas to the west of Columbas Road are also identified.

The Picton South DSP identified four precincts within which more detailed structure planning should occur. These range in size from Precinct 1 (29 hectares) to Precinct 2 (347 hectares). Subdivision and development requirements are outlined within the DSP for each precinct.

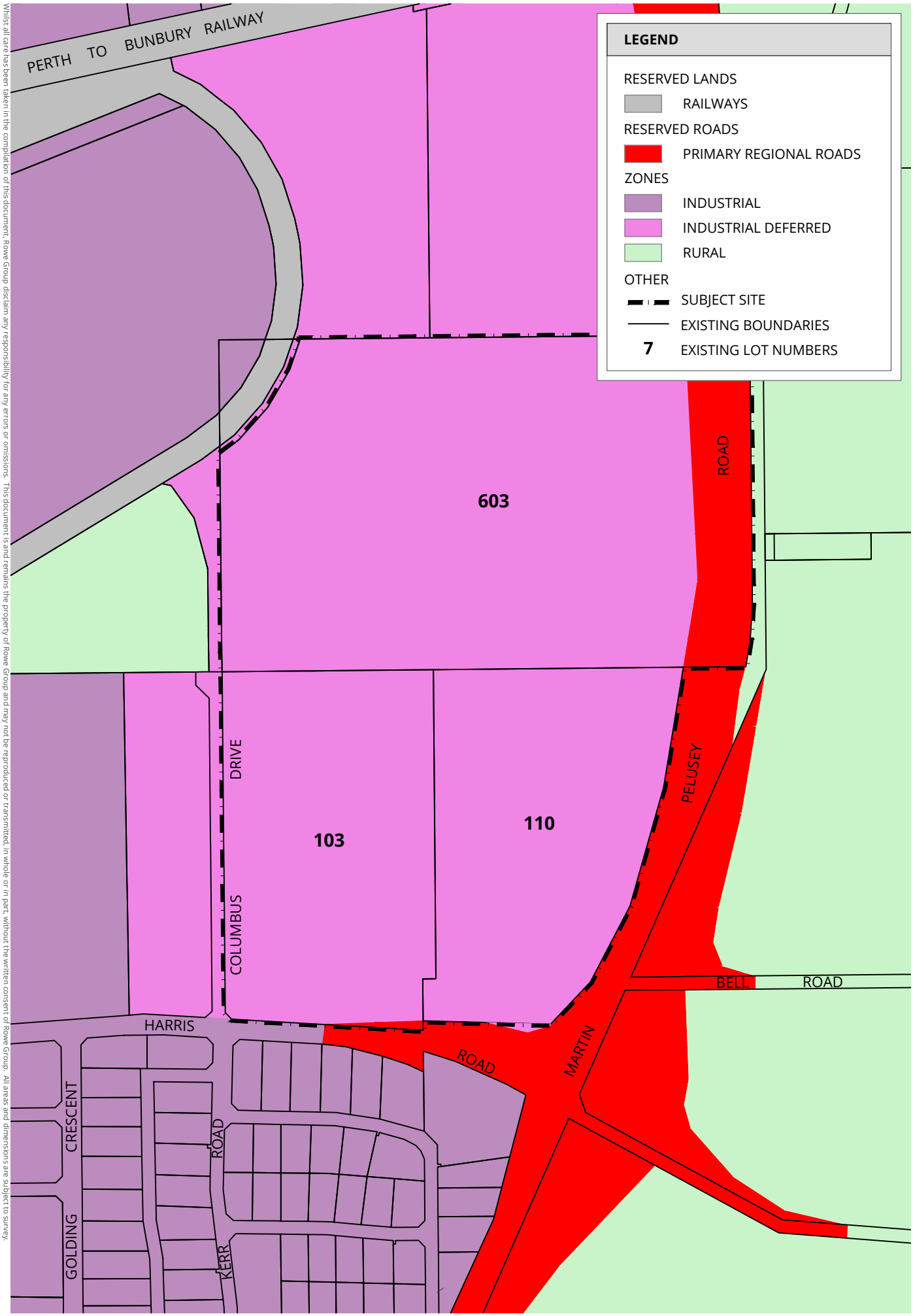
The land the subject of this Local Structure Plan is located within Precinct 2 of the DSP. Given the significant size of the precinct, this Local Structure Plan further divides Precinct 2 into more manageable local planning precincts, while responding to the elements outlined in the Picton South DSP. A detailed assessment of this LSP against DSP elements comprises Appendix 8.

3.4 WATERLOO INDUSTRIAL PARK DISTRICT STRUCTURE PLAN (DRAFT)

The *Draft Waterloo Industrial Park District Structure Plan* (WAPC, 2019) was released by the WAPC in draft for public comment and is, at the time of writing, subject to finalisation. The DSP includes a 'Regional Context of Waterloo Industrial Park' Plan, identifying the Preston Industrial Park Southern Precinct (the Picton South DSP area including the subject land), the Waterloo Industrial Park DSP area east of the subject land, and the Wanju urban residential DSP area to the north east of the subject land.

The Waterloo Industrial DSP is directly relevant to the subject land and this LSP as it facilitates the delivery of an integrated local road network following DSP endorsed by the WAPC. The local road network will provide much-needed connectivity to the newly endorsed BORR alignment east of the Waterloo DSP boundary.

Refer Figure 6 – Location Context for Picton Industrial Park Southern Precinct.



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9013_FIG07A_20190812 Picton East (GBRS ZONING) · DRAWN:ADAM GLASKIN · DATE CREATED: 2019.08.12 · PROJECTION: MGA50 GDA94 · CADASTRE: LANDGATE · MAP DATA: DPLH

0 187.5 m

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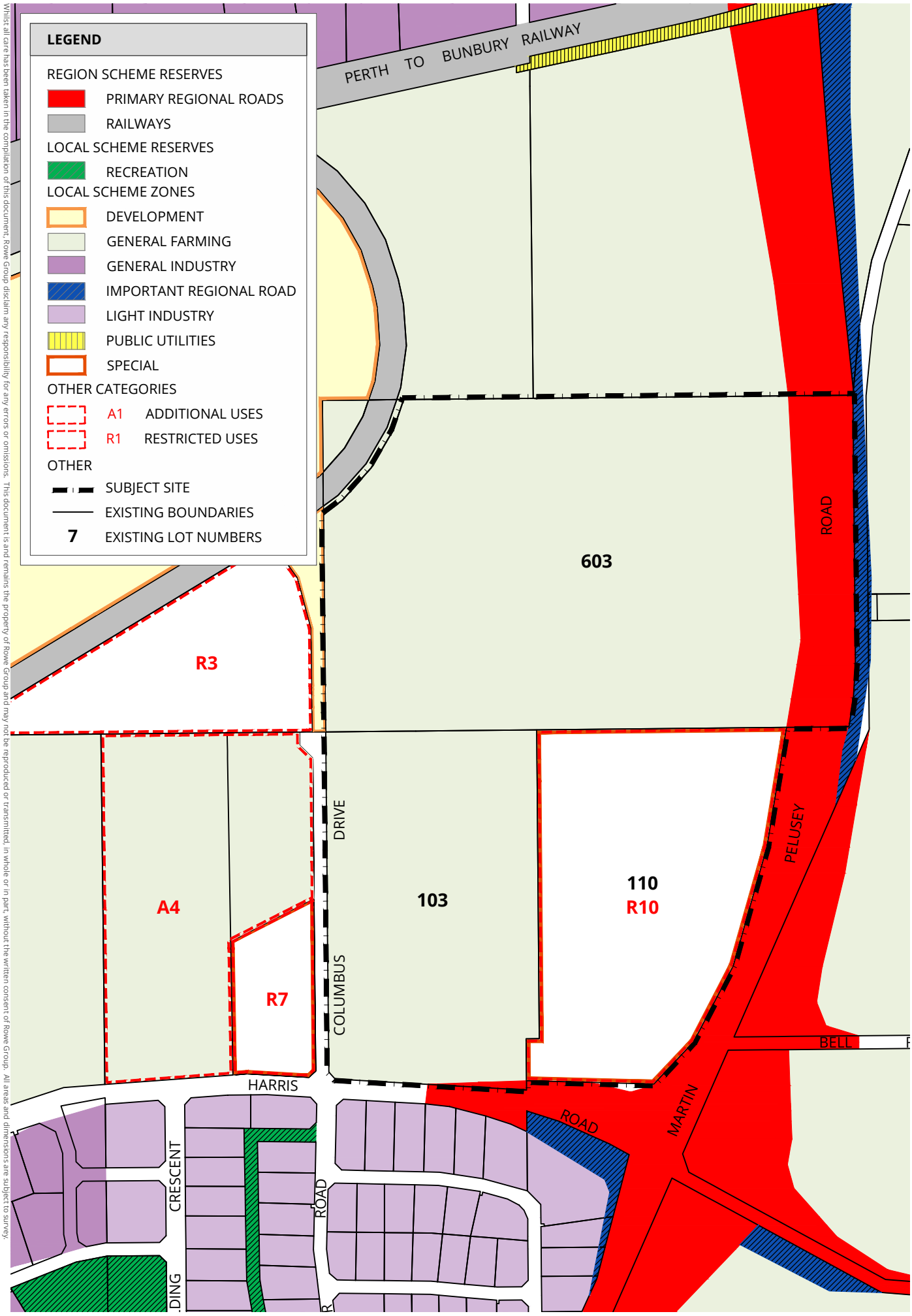
FIGURE 4

GREATER BUNBURY REGION SCHEME ZONING



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9013_FIG11A_20191112 Picton East (TPS) - DRAWN:ADAM GLASKIN - DATE CREATED: 2019.11.12 - PROJECTION: MGA50 GDA94 - CADASTRE: LANDGATE - MAP DATA: DPLH

0 187.5 m

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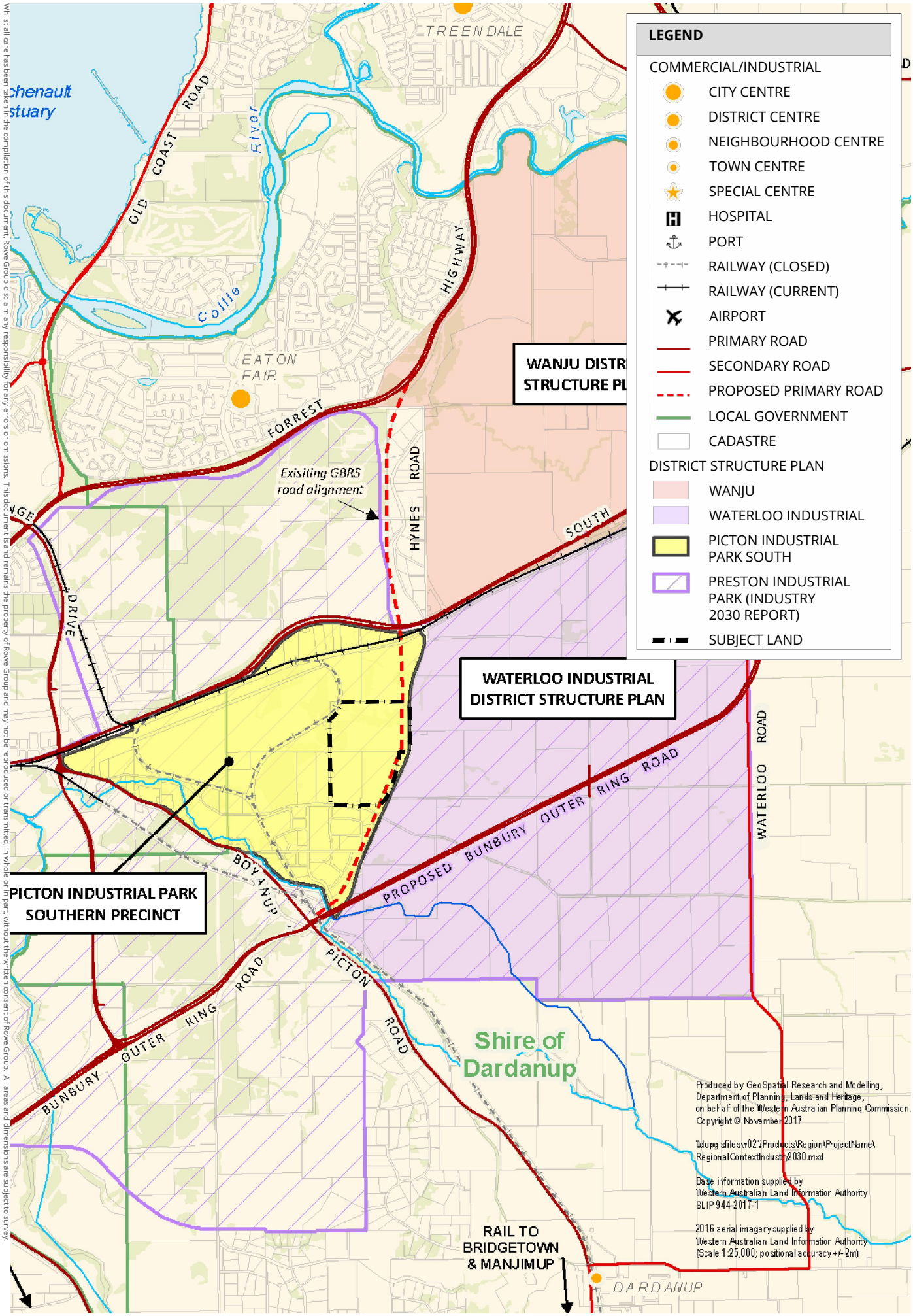
FIGURE 5

SHIRE OF DARDANUP TOWN PLANNING SCHEME No. 3 ZONING



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9013_FIG09A_20190814 Picton East (Picton Industrial Context) - DRAWN:ADAM GLASKIN - DATE CREATED: 2019.08.14 - PROJECTION: MGA50 GDA94 - MAP DATA: DPLH

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SCALE @ A4: 1:50,000

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FIGURE 6

LOCATION CONTEXT FOR PICTON INDUSTRIAL PARK SOUTHERN PRECINCT

3.5 OTHER DISTRICT STRUCTURE PLANS

Other District Structure Plans of relevance to this LSP are:

- *Preston Industrial Park (Northern Precinct) Structure Plan* (WAPC, 2009): Also known as the Picton North District Structure Plan, this DSP recognises the anticipated southern expansion of the Preston Industrial Park into what encompasses the Picton South DSP area and including the subject land;
- *Draft Waterloo Industrial Park District Structure Plan* (WAPC, 2019): released for public comment following resolution of the new BORR alignment, the DSP supercedes the early May 2017 draft DSP. The Waterloo DSP area lies immediately east of the subject land and will ultimately facilitate access from the BORR to Martin-Pelusey Road and the subject land. This proposed LSP recognises and respects the road network contemplated under the 2019 draft Waterloo DSP;
- *Draft Wanju District Structure Plan* (WAPC, 2019): released in draft for public comment as an update to the former 2016 draft Wanju District Structure Plan, this document sets out the key planning parameters for new urban development northeast of the land the subject of this structure plan. As one of three newly developing areas (the subject land and surrounds as Picton South, the Waterloo Industrial DSP and Wanju) it is directly connected through the regional and district road networks now established and will provide long term housing choice to workers within the industrial areas. The area is connected to and accesses the subject land via Martin-Pelusey Road;

3.6 STATE PLANNING POLICIES

3.6.1 STATE PLANNING POLICY 3.7 - PLANNING IN BUSHFIRE PRONE AREAS

SPP3.7 and the WAPC's associated Guidelines provide guidance on the management of bushfire risk within bushfire prone areas throughout Western Australia. The policy is relevant to this LSP given a portion of the LSP area, and land adjoining, are identified as bushfire prone.

In response to the policy obligations of SPP3.7 a Bushfire Management Plan (BMP) has been prepared which considers the site context surrounding, the current, and the post-development circumstances for bushfire risk. This is discussed further in the report and the BMP is appended.

3.6.2 DRAFT STATE PLANNING POLICY 4.1- INDUSTRIAL INTERFACE

The draft SPP 4.1 Industrial Interface Policy was released by the WAPC in November 2017 and remains in draft following completion of advertising in February 2018. It is intended to replace earlier versions of the policy released in 2009 and 2007.

The Local Structure Plan accords with SPP4.1 by:

- recognising regional and district level planning endorsed in the Picton South DSP;
- proposing an appropriate mix of industrial development that does not include heavy or noxious industry; and
- adequately providing for the access and servicing of subdivision and development.

In the context that the subject land, the broader Picton South DSP area, and the adjoining Waterloo Industrial Park DSP area are identified for General Industry, there are no interface implications to be considered in the context of SPP4.1.

3.6.3 STATE PLANNING POLICY 5.4 – ROAD AND RAIL NOISE

This policy became operational in September 2019 and replaces the earlier SPP 5.4 released in 2009. The policy seeks to minimise the adverse impact of road and rail noise on noise-sensitive land use and / or development within specified distances.

The policy references noise sensitive land uses as being determined by a local planning scheme or structure plan that is occupied or designed for occupation or use for residential purposes, caravan park, camping ground, education, childcare, hospital, or place of worship.

While the proposed LSP and the surrounding Picton South DSP area lie in proximity to both regional road and rail infrastructure, no sensitive land uses are proposed within this LSP. In addition, the subject land does not lie within the prescribed distances to such infrastructure.

The Local Structure Plan accords with SPP4.1 by:

- recognising regional and district level planning endorsed in the Picton South DSP;
- proposing an appropriate mix of industrial development that does not include heavy or noxious industry; and
- adequately providing for the access and servicing of subdivision and development.

3.7 OTHER GOVERNMENT POLICIES, APPROVALS AND DECISIONS

- *Government Sewerage Policy (2019)*: this policy sets the State Government's position on how sewerage services are to be provided in W.A. through the planning and development of land.

  The Policy defines sewage sensitive areas as, inter alia, estuary catchments on the Swan and Scott Coastal Plains. The DPLH online policy mapping shows the land the subject of this LSP as lying within estuary catchment. Notwithstanding this, both the Picton South DSP, and Waterloo Industrial Park DSP acknowledge that reticulated sewer is not currently available to the locality.

  Industrial development within the proposed LSP will be serviced by appropriately sited on-site wastewater treatment systems. The type, size, siting and use of aerobic treatment units will be determined at the time of individual development.

- *Development Control Policy 4.1 – Industrial Subdivision (DC4.1)* is an operational policy of the WAPC and provides guidance on matters considered by the WAPC when determining applications of industrial subdivision. The design of the LSP has taken into account future requirements under DC4.1.

3.8 PRE-LODGEMENT CONSULTATION

As part of the preparation of this LSP, consultation was undertaken with representatives of:

- Department of Planning, Lands & Heritage (DPLH)
- Shire of Dardanup
- Main Roads Western Australia

The document has been finalised having regard to matters identified during those meetings and subsequent discussions.

4. SITE ATTRIBUTES

The following provides a summary of site conditions and constraints. The structure plan is accompanied by more detailed technical reports referenced in each section of Part 4.

An Environmental Assessment and Management Strategy (EAMS), a Local Water Management Strategy (LWMS) and a Bushfire Management Plan (BMP) have been completed by Emerge and are included as Appendices. Similarly, a Transport Assessment Report by Uloth & Associates and a Engineering Servicing Report by Wood & Grieve are also appended to this LSP.

4.1 TOPOGRAHPY & SOILS

4.1.1 TOPOGRAPHY

The majority of the southern portion of the subject site is relatively flat at approximately RL13m AHD to RL14m AHD. An elevated area exists in the northern area of the subject site (extending parallel to the northern and western boundaries and lies at RL16m AHD to RL22m AHD). The flatter areas of the site are generally clear of vegetation, with the elevated area supporting greater vegetation. The site is underlain by fine to medium grained sands with clayey sands of the Guildford Formation at depth. Yellow Bassendean sands are located in the areas of higher elevation.

4.1.2 SOILS

Regional mapping and previous soil investigation undertaken on site in 2010 (reviewed in the EAMS appended to this report) confirm the site comprises of Guildford formation alluvial sandy clay, Bassendean sand and thin Bassendean sand over Guidford formation.

4.1.3 ACID SULFATE SOILS

The Department of Water and Environmental Regulation Acid Sulphate Soil Risk Mapping identifies the subject site as having a “moderate to low” Acid Sulphate Soils (ASS) risk. This is consistent with the broader surrounding area which is similarly moderate to low. Review of the risk of ASS would be undertaken at detailed subdivision design and development to review the need for any further investigation.

4.1.4 POTENTIAL CONTAMINATION

The DWER Contaminated Sites Database does not list the subject site as being a known or suspected contaminated site. The EAMS notes that there are also no locally listed sites that would impact this LSP. Historic agricultural use of the land us considered unlikely to raise significant risk of contamination.

4.2 VEGETATION, FLORA & FAUNA

The EAMS completed by Emerge to inform this LSP concludes that there are no significant environmental constraints to industrial development of the subject site.

The EAMS is included as Appendix 3.

4.2.1 VEGETATION & FLORA

Given historic clearing and associated agricultural land uses, vegetation and flora within the site has been significantly modified, with all areas of remnant native vegetation on the subject site categorised as 'completed degraded'.

No threatened ecological communities (TECs) were identified within the site, nor are any likely to occur given the degraded nature of vegetation within the LSP area. The EAMS also notes that no threatened or priority flora species have been identified within the site, nor are any likely to occur for the same reasons.

Notwithstanding the above, the EAMS does encourage the consideration of tree retention opportunities (in addition to areas of public open space) as part of future detailed design and development. Where finished earthworks levels permit this should be considered.

4.2.2 FAUNA

The EAMS prepared to accompany this LSP notes that a number of conservation significant fauna species were identified as utilising vegetation within the site, including the western ringtail possum and the three black cockatoo species (Carnaby's, Baudin's and the forest red-tailed cockatoo). In addition to the retention of vegetation as proposed within open space, other retention opportunities should therefore be considered at detailed design stage.

4.2.3 ECOLOGICAL LINKAGES AND ENVIRONMENTALLY SENSITIVE AREAS

The EAMS notes that no mapped ecological linkages, identified through the South West Biodiversity Project, occur within the subject site. The nearest is located approximately 870m west of the subject site and will not be affected by this LSP.

Environmentally sensitive areas (ESAs) as prescribed under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* are identified to protect native vegetation values around significant threatened or scheduled flora, vegetation communities or ecosystems. No ESAs occur within or are in proximity to the subject site.

4.3 HERITAGE

4.3.1 INDIGENOUS HERITAGE

A search of the subject site using the Department of Aboriginal Affairs ('DAA') Aboriginal Heritage Inquiry System identified there are no Registered Aboriginal Heritage Sites within the subject site. An 'Other Heritage Plan' is identified approximately 20m to the south of the subject site, being Site ID 18886 Bunbury Bypass Archaeological Site 3.

Importantly, the subject land lies within an area where heritage surveys have been completed and, given the extent of previous surveys the EAMS notes that it is unlikely any Aboriginal heritage sites exist within the site.

4.3.2 EUROPEAN HERITAGE

The EAMS completed searches of the Australian Heritage Database, the State Heritage Office database and the Shire of Dardannup Local Government Inventory and notes that there are no registered heritage sites within the LSP area.

4.4 WATER MANAGEMENT

A Local Water Management Strategy (LWMS) has been prepared by Emerge to accompany the structure plan. A summary of existing conditions is provided below.

4.4.1 GROUNDWATER

The EAMS notes that groundwater monitoring undertaken shows a depth to maximum groundwater level ranged from 0.05 m to 3.4m below natural surface. Seasonal fluctuations indicate a variance from 0.25m to 2.7m. Monitoring indicates groundwater flows are generally from the southeast to the northwest corner of the subject site.

4.4.2 SURFACE WATER

Small farm drains and dams occur across the site and ultimately contribute to a major drain that is currently managed by the Water Corporation. These drains ultimately discharge into the Ferguson River before entering the Preston River. Pre-development surface runoff modelling determined that the majority of the site is located within a catchment that discharges beneath the railway loop to the west of the site at a rate of 0.96 m^3/s in the 1% average exceedance probability (AEP) rainfall event. A small portion of the site discharges north into a trapped low point.

4.4.3 WETLANDS

Wetlands are areas which are permanently, seasonally or intermittently waterlogged or inundated with water. Naturally occurring wetland features are common across the Swan Coastal Plain and can contain fresh or salty water, which may be flowing or still. The EAMS review of geomorphic wetlands within the LSP area indicates that there are several multiple use wetlands. Multiple Use Wetlands (MUWs) contain few wetland attributes but still provide hydrological functions. Use, development and management can be reviewed through this LSP process and has been considered in the hydrological review undertaken as part of the Local Water Management Strategy (LWMS) appended.

4.4.4 PUBLIC DRINKING WATER SOURCE AREAS

The site is not located within a PDSWA and there are no wellhead protection zones where public drinking water is extracted either within or in proximity to the subject site.

4.5 BUSHFIRE MANAGEMENT

The LSP area is located within a Department of Fire and Emergency Services (DFES) Bushfire Prone Area (2018). A Bushfire Management Plan (BMP) has been prepared in accordance with the *Guidelines for Planning in Bushfire Prone Areas* (WAPC 2018) (the 'Guidelines').

The BMP is included as Appendix 4.

The BMP considers the bushfire hazards surrounding the subject site and the associated bushfire risk is readily manageable through standard management responses. On implementation of the proposed management measures, the subject site will be able to be developed with a manageable level of bushfire risk while maintaining full compliance with the relevant controls.

From a bushfire hazard management perspective, the key issues and the responses identified in the BMP that are likely to require management include:

- **Location:** all proposed buildings can be located in an area subject to a low or moderate bushfire hazard, given buildings will be located within areas identified as low threat in accordance with Clause 2.2.3.2(e) of AS 3959.
- **Siting and Design:** all future built form can be sited within the proposed development so that BAL-29 or less can be achieved based on the proposed local structure plan and separation to nearby hazards through the location of public roads and/or through the use of in-lot setbacks. The development areas adjoining the northern, western and southern boundaries of the site are likely to include areas subject to a BAL rating of BAL-FZ, however the future lots can be suitably sized to accommodate built form that will not be exposed to a BAL rating exceeding BAL-29. The proposed public open space in the north-western corner of the site is intended to be revegetated and will therefore be considered a bushfire hazard. However suitable separation from this area can be provided based on the proposed road layout and use of in-lot setbacks.
- **Vehicular Access:** appropriate vehicle access can be provided, with the proposed development connecting to the existing public road network including Martin-Pelusey Road immediately east of the site, Harris Road immediately south of the site, Columbas Drive to the west of the site, and future industrial development to the north of the site. The site will have two connections to Martin-Pelusey Road which is a major regional connector road and provides egress opportunities to the north and south, including to South Western Highway and Boyanup-Picton Road.
- **Water:** the development will be provided with a permanent and reticulated water supply to support onsite firefighting requirements.

5. LAND USE AND SUBDIVISION REQUIREMENTS

5.1 LAND USE

This Precinct 2A – LSP sets out land use, open space, environmental, servicing, bushfire and movement considerations. The LSP provides for General Industrial use over the full extent of the LSP area and is to be serviced by road connections linking Martin-Pelusey Road to Columbas Drive and to Harris Road.

Please refer to Plan 1 – Local Structure Plan map and the Structure Plan Summary table.

5.2 PUBLIC OPEN SPACE

The proposed LSP identifies four (4) areas of public open space and drainage in response to identified environmental attributes and the Local Water Management Strategy (LWMS). These are additional to the Picton South DSP and reflect the EAMS and LWMS prepared for this LSP.

The LSP incorporates the following features:

- Public Open Space – the northwest corner of Lot 603 is identified for a public open space area comprising 3.95ha. The designation of POS in this location provides for the retention of vegetation, while acting as an extension of already identified open space land to the immediate southwest outside this LSP area.
- POS / Drainage – 9426m2 – the northwest corner of Lot 603 is identified for POS/Drainage in accordance with LWMS modelling (LWMS Detention Area 1).
- POS / Drainage (2.23ha) – the western end of Lot 603 is identified for POS/Drainage in accordance with LWMS modelling (LWMS Detention Area 2).
- POS / Drainage – 1.48ha – the northwest corner of Lot 110 is identified for POS/Drainage in accordance with LWMS modelling for Lot 110 (LWMS Detention Area 3).

The location and size of drainage locations have been sited in response to the LWMS modelling contained in the appendix 5 to this report. The POS/Drainage site sizing and shape allows for appropriate basin size accommodation and landscaping treatments to occur.

5.3 GENERAL INDUSTRIAL

The Structure Plan provides for development of the land for General Industrial use, consistent with the Picton South DSP. The full range of uses permissible under the Shire of Dardanup TPS 3 General Industry zone are to be accommodated.

Development requirements within the Local Structure Plan area will be in accordance with the normal guidance provisions of TPS3 and approval requirements imposed by the Shire at the time.

Refer to Figure 7 - Concept Plan

For the purposes of lot yield estimating, the Concept Plan shows a range of potential industrial lots across Lots 603, 103 and 110. The proposed layout is served by a logical, robust local road network design to accommodate industrial development. The Concept Plan is shown for explanatory purposes only and is subject to further review and detailed design at subdivision stage.

5.4 MOVEMENT NETWORKS

Uloth & Associates have completed a comprehensive review of the road network, access and transport considerations for the subject site. The review has considered the proposed LSP as well as the Concept Plan for the subject site.

Refer to Appendix 6 – Transport Impact Assessment.

5.4.1 RAIL NETWORK

The Wood & Grieve Engineering Servicing report appended to this LSP notes that Arc Infrastructure operate the rail line that runs to the northwest of the subject site. The rail line forms part of the Boyanup Loop near Picton Junction and services the South West Region. There are no plans to widen the rail requirements in this locality. The rail line currently operates 24 / 7. The planned general industrial development of the subject site under this LSP is entirely compatible with the rail line operation as no sensitive land uses (residential etc) are contemplated.

Future road planning for land inside the rail loop, west of the subject site, will need to consider the extension of Columbus Drive across the rail loop and any of Arc Infrastructure's requirements at that time. This LSP does not include the future rail crossing location. The design of Columbas Drive immediately adjoining the LSP is discussed as part of the proposed road network discussion below.

5.4.2 EXISTING ROAD NETWORK

The Uloth review notes that the Main Roads WA (MRWA) functional road hierarchy shows the wider existing road network comprises of Forrest Highway, South Western Highway, Boyanup-Picton Road, Willinge Drive and Bunbury Outer Ring Road as Primary Distributor Roads in the vicinity of the proposed LSP. Martin-Pelusey Road and Hynes Road are Regional Distributor Roads. Harris Road is classified as a Local Distributor Road, with other neighbouring roads (including Columbas Drive, Kerr Road and Golding Crescent) classified as Access Roads.

5.4.3 REGIONAL ROAD NETWORK PLANNING

The Uloth review examines the existing regional road network, and the subsequent review occurring as a result of the final Bunbury Outer Ring Road (BORR) alignment. The review notes that there is no planned connection to the BORR at Martin-Pelusey Road or Boyanup Picton Road. There will be a connection from Martin-Pelusey Road to Boyanup-Picton Road. A new east-west link road is also proposed from Martin-Pelusey Road to Wireless Road in order to provide local access to and from the BORR.

The Uloth review considers this and the related district road network planning within the BORR as part of its movement analysis of this LSP.

5.4.4 PROPOSED ROAD NETWORK

The Uloth review determines that the LSP area could generate a total of 7,800 vehicle trips per day on an average weekday, based on the indicative Concept Plan lot yield. The review considers that 55% of traffic flows will be to/from the west via Harris Road, with 25% to/from the north via Martin-Pelusey Road. A further 15% will be to/from the east via the new east-west link to Wireless Road and 5% from the south.

The review by Uloth finds that Harris Road be classified as a 'District Distributor B' road (or Integrator B using the Liveable Neighbourhoods terminology), as should Golding Crescent and its extension to the south-east side of the BORR (in the long term). Columbas Drive and other 'internal distributor' roads within the Picton Industrial Park Southern Precinct will only need to be 'Local Distributor' roads (with maximum volumes of approximately 7,000 vehicles per day).

Key design considerations from the Uloth review accommodated within the LSP are:

- The appropriate sizing of all subdivision roads to 'Local Distributor' (25m road reserve) and local internal roads (20m road reserve);
- Widening of Columbas Drive to 25m road reserve through a 2.5m road widening on either wide;
- Appropriate spacing of intersections along Martin-Pelusey Road and Harris Road for proposed access roads. This includes 230m spacing separation of intersections along Martin-Pelusey Road, and retention of Golding Crescent as full movement with Kerr Road restricted to left-in/left-out access onto Harris Road allowing for Columbas Drive access.

5.5 WATER MANAGEMENT

A Local Water Management Strategy ('LWMS') has been prepared by Emerge in support of this LSP and is provided as Appendix 5.

The LWMS consider the matters of relevant to the subject site as identified in the District Water Management Strategy (DWMS) prepared by Calibre (2017) including:

- Drainage management (on lot and off lot detention, treatment and flows)
- Groundwater (inflows, treatment, water quality, subsoil drainage and discharge)
- Sustainable water servicing (rainwater storage and use, potable water, sewer or ATU usage, waterwise landscaping)
- Water dependent ecosystem management (bioretention and detention systems to provide wetland habitat, water quality improvement)
- Fill Management (use of subsoil drainage, swales to minimise groundwater impact and manage fill requirements).

5.5.1 LOCAL WATER MANAGEMENT STRATEGY

The LWMS design objectives seek to deliver best practice outcomes using a water sensitive urban design approach, including detailed management approaches for:

- Water and wastewater servicing
- Water conservation
- Stormwater quantity and quality management
- Groundwater level and quality management.

The overall approach to water supply is a reticulated network for potable uses with groundwater available for non-potable uses within the lots. No ongoing water use is proposed for the estate itself and water efficiency measures (e.g. waterwise gardening (WWG)) will be promoted to lot owners to reduce water requirements. All lots will install a secondary treatment system (i.e. an aerobic treatment unit (ATU)) for the management of waste from buildings/site offices and any wastewater produced from industrial processes will be required to be treated appropriately on lot.

Stormwater management focuses on treating runoff from the small rainfall event as close to source as possible within lots and road reserves to mimic the existing hydrological regime. Detention structures are also required to maintain pre-development peak flow rates for minor and major events. Detention locations are identified within the LWMS and are reflected in the LSP. The use of roadside swales to capture and treat runoff from road reserves is also recognised in the LWMS. These would ultimately be designed at the detailed subdivision stage.

Groundwater management focuses on creating controlled groundwater levels (CGL) through a combination of maintaining existing inverts, creating roadside swales and subsoil drains. The inverts of these will maintain CGLs across the site, which will be set in accordance with *Water resource considerations when controlling groundwater levels in urban development* (DoW 2013). Required clearances to the CGL will be achieved by utilising imported fill. Non-structural measures (e.g. education) have been proposed to ensure both stormwater and groundwater quality outcomes are met.

This LWMS demonstrates that the site is capable of being developed by following the recommendations detailed in the report.

In accordance with the processes defined under *Better Urban Water Management (WAPC)* an Urban Water Management Plan (UWMP) will also be required to be prepared and implemented at the time of subdivision. The UWMP will refine and implement the proposed drainage network/system, as identified under the LWMS.

5.6 INFRASTRUCTURE COORDINATION, SERVICING AND STAGING

The following provides a summary of the infrastructure and servicing for the Structure Plan area. Further information is contained within the Engineering Services Report prepared by Wood & Grieve at Appendix 7.

5.6.1 WATER

The proposed subdivision falls into an area currently licensed and operated by Aqwest. Provision of reticulated water as will be a condition of subdivision and / or development approval.

Aqwest have advised that an existing DN300 water main within the Harris Road reserve has capacity to service the subject site without need for any network upgrades.

5.6.2 WASTEWATER RETICULATION

No sewerage infrastructure exists within proximity to the subject site, with the nearest gravity sewer being over 3km to the northwest. Water Corporation long term sewer planning indicates the site grades into two future wastewater pump station (WWPS) catchment areas with the southern boundary of Lot 603 generally forming the catchment area boundary. The two proposed WWPSs are not currently planned to be constructed in the next 5 years.

Notwithstanding the horizon for sewer planning, the rezoning and structure planning of the land can still progress and will ultimately provide impetus for that sewer planning to occur. In the interim, development on site will be subject to detailed site assessment at subdivision and development stage to demonstrate suitability for alternate treatment units (ATUs). This is already the case for the nearby industrial land, south of Harris Road at Golding Crescent. Connection to reticulated sewer would then be necessary as it becomes available. The EAMS prepared to accompany this LSP considers the matter further and a summary is provided below in regard to wastewater management.

5.6.3 WASTEWATER MANAGEMENT

Acknowledging the site is planned, but is not currently, serviced by reticulated sewer the consideration of both domestic (office use) and industrial wastewater has been considered in the EAMS accompanying this LSP.

- On-site effluent disposal: As a minimum alternate treatment units (ATUs) will be required to manage domestic wastewater requirements (including general office needs such as toilets, sinks, showers). The ATU, its siting, and sizing will be required to meet Department of Health requirements and a site's ability to accommodate. This is discussed further in the EAMS; and
- Industrial wastewater management: Wastewater resulting from industrial processes occurring as part of any future development will need to be treated appropriately on-site, captured and removed to a licenced treatment facility. These obligations are discussed further in the EAMS and are typical obligations for industrial development throughout WA. It is expected that normal conditions of development will apply at the time any specific and use and development is proposed.

5.6.4 POWER

Western power requires that commercial/industrial lots are provided with 200kVa/ha power supplies. There is sufficient capacity in the Picton zone substation to accommodate the likely demand from the LSP area.

No high voltage (HV) take-off points are currently provided in the surrounding area, likely meaning that lines will need to be constructed to the point of subdivision. This would be determined at the detailed design and development stage and is not an impediment to the LSP's progression.

A 132 kV power line traverses the LSP area from west to east crossing generally at the common boundary of Lot 603 and 103 and extending through Lot 110 before crossing Martin-Pelusey Road. A low voltage line extending from this southward crosses Lot 103. Easements associated with the lines are evident on Lots 603 and 103. No easements are evident on Lot 110. While the existing power lines corridors do not align with the future road reserves identified in the Concept Plan, and may need to be relocated, the need for this can be considered at the detailed design stage when final local road and lot layouts are determined.

5.6.5 GAS

ATCO Gas operates a reticulated gas network adjacent the subject site. The DN110 pressure main with Harris Road has the capacity to service the proposed development.

Department of Mines, Industry Regulation and Safety (MIRS) confirm that the LSP area overlaps an investigation corridor for the proposed extension of the Dampier to Bunbury Natural Gas Pipeline (DBNGP). It is noted that the corridor has been aligned with the former Bunbury Outer Ring Road (BORR) reservation alignment. The intention to relocate the DBNGP investigation corridor to align with the new BORR route is currently unknown.

While acknowledging the existence of the corridor as an investigation area, the timing of any investigation in this location or elsewhere is currently unclear. Further the timing of any subsequent works and future planning is unknown. This proposed LSP acknowledges the extent of the former BORR reservation, within which the gas investigation corridor lies and, in that context,, it is not an impediment to the immediate progression of this LSP. It is anticipated that further dialogue with DMIRS will occur as this LSP is progressed.

5.6.6 TELECOMMUNICATIONS

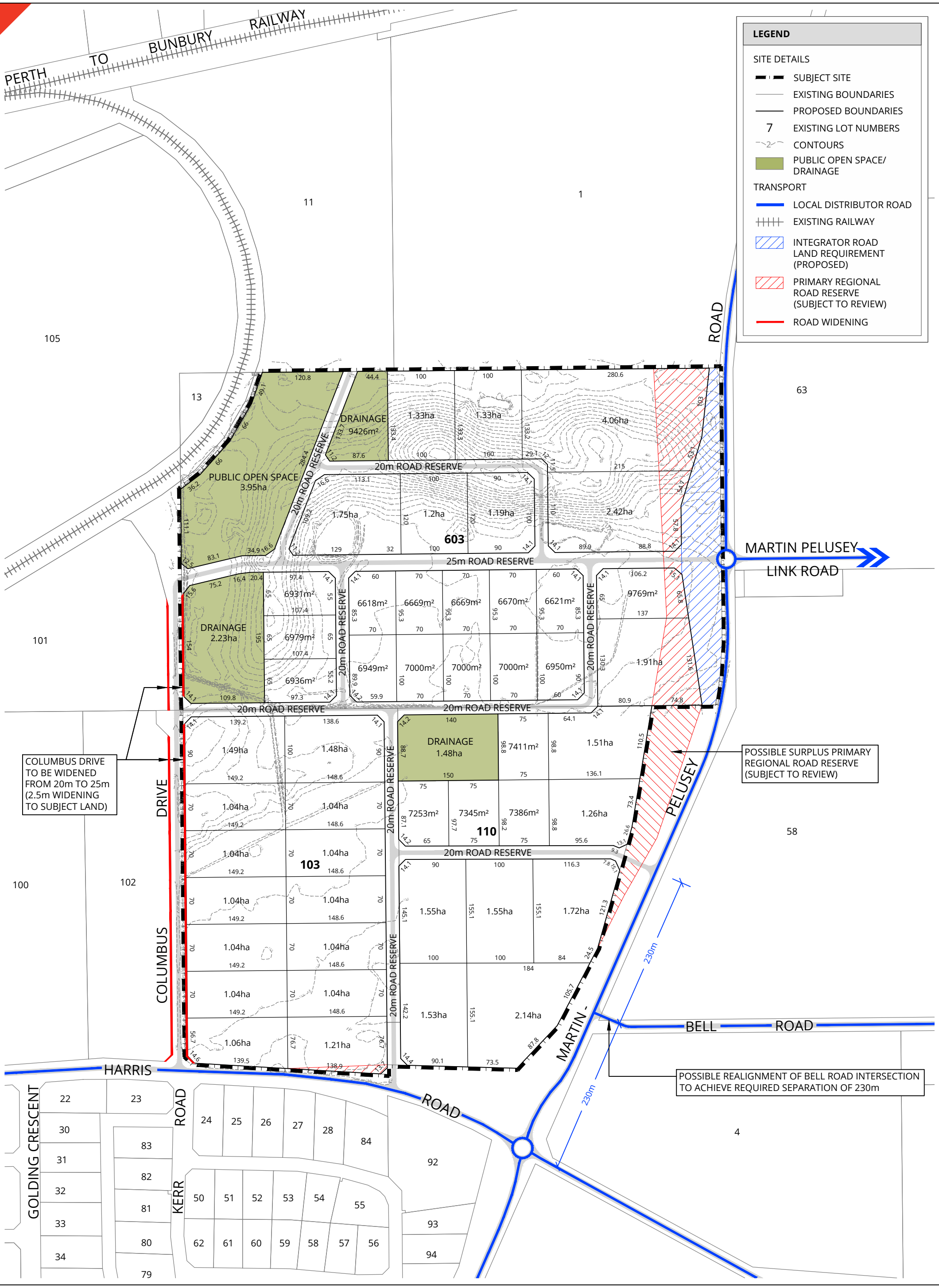
Telecommunications are expected to be provided by NBN Co, Telstra or similar broadband provider. Broadband services are available in Harris and Martin-Pelusey Roads and are able to be extended to service the future subdivision and development.

5.6.7 EARTHWORKS & STAGING

Detailed design and development of the subject site will ultimately be influenced by landowner expectations and market demand. Detailed design of finished road and lot levels will be undertaken following this LSP to inform any application for subdivision. Staging of development is expected to generally occur from Martin-Pelusey Road west.

5.7 SUMMARY OF ASESSMENT IN RELATION TO DSP

To assist in the review of this LSP a *Schedule of LSP Assessment in relation to the Picton Industrial Park Southern Precinct DSP* comprises Appendix 8. The appendix summarises the above report content in a form referencing various DSP matters identified.



CONCEPT PLAN

LOTS 103, 110 AND 603
PICTON EAST

NORTH

0 125 m
SCALE @ A3: 1:5000

9013-CON-01-E

ROWE GROUP

N:\TOWN PLANNING\9000-9999\9013\DRAFTING\A-CAD - WILLIAM CLEMENTS - 2019.11.12
9013_CON01E_20191111 Picton East (Concept 1) - DRAWN: A. GLASKIN - DATE CREATED: 2019.11.11 - PROJECTION: MGA50 GDA94 - CADASTE: LANDGATE

APPENDIX 1
CERTIFICATES OF TITLE

ROWE GROUP DESIGN

WESTERN AUSTRALIA

REGISTER NUMBER	
103/D96575	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
2	20/9/2011

VOLUME 2152 FOLIO 572

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

REGISTRAR OF TITLES WESTERN AUSTRALIA

LAND DESCRIPTION:

LOT 103 ON DIAGRAM 96575

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

HARRIS RD PTY LTD OF SUITE 2, MAJESTIC RISE, 16 MOREAU MEWS, APPLECROSS
(T K315375) REGISTERED 22/8/2007

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

1. F810521 EASEMENT TO ELECTRICITY CORPORATION. SEE SKETCH ON VOL 2152 FOL 572. REGISTERED 20/2/1995.
2. EASEMENT BURDEN CREATED UNDER SECTION 27A OF T. P. & D. ACT - SEE DIAGRAM 96575.
3. L732578 MORTGAGE TO COMMONWEALTH BANK OF AUSTRALIA REGISTERED 13/9/2011.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	2152-572 (103/D96575)
PREVIOUS TITLE:	2044-265
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AUTHORITY:	SHIRE OF DARDANUP

WESTERN AUSTRALIA

REGISTER NUMBER	
603/DP246179	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
2	20/9/2011

VOLUME 2044 FOLIO 266

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

REGISTRAR OF TITLES WESTERN AUSTRALIA

LAND DESCRIPTION:

LOT 603 ON DEPOSITED PLAN 246179

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

HARRIS RD PTY LTD OF SUITE 2, MAJESTIC RISE, 16 MOREAU MEWS, APPLECROSS
(T K315375) REGISTERED 22/8/2007

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

1. THE LAND THE SUBJECT OF THIS CERTIFICATE OF TITLE EXCLUDES ALL PORTIONS OF THE LOT DESCRIBED ABOVE EXCEPT THAT PORTION SHOWN IN THE SKETCH OF THE SUPERSEDED PAPER VERSION OF THIS TITLE.
2. F810521 EASEMENT TO ELECTRICITY CORPORATION. SEE SKETCH ON VOL 2044 FOL 266. REGISTERED 20/2/1995.
3. L732578 MORTGAGE TO COMMONWEALTH BANK OF AUSTRALIA REGISTERED 13/9/2011.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	2044-266 (603/DP246179)
PREVIOUS TITLE:	1667-877
PROPERTY STREET ADDRESS:	96 MARTIN-PELUSEY RD, PICTON EAST.
LOCAL GOVERNMENT AUTHORITY:	SHIRE OF DARDANUP

NOTE 1: A000001A LAND PARCEL IDENTIFIER OF WELLINGTON LOCATION 603 (OR THE PART THEREOF) ON SUPERSEDED PAPER CERTIFICATE OF TITLE CHANGED TO LOT 603 ON DEPOSITED PLAN 246179 ON 23-SEP-02 TO ENABLE ISSUE OF A DIGITAL CERTIFICATE OF TITLE.

END OF PAGE 1 - CONTINUED OVER

NOTE 2: THE ABOVE NOTE MAY NOT BE SHOWN ON THE SUPERSEDED PAPER CERTIFICATE OF TITLE OR ON THE CURRENT EDITION OF DUPLICATE CERTIFICATE OF TITLE.

WESTERN AUSTRALIA

REGISTER NUMBER	
110/DP61589	
DUPLICATE EDITION **N/A**	DATE DUPLICATE ISSUED **N/A**

VOLUME **2741** FOLIO **234**

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

REGISTRAR OF TITLES WESTERN AUSTRALIA

LAND DESCRIPTION:

LOT 110 ON DEPOSITED PLAN 61589

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

WESTIM PTY LTD OF 57 TRIUMPH AVENUE, WANGARA

(AF L379582) REGISTERED 21/7/2010

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

1. *J720704 MORTGAGE TO NATIONAL AUSTRALIA BANK LTD REGISTERED 1/5/2006.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

----------END OF CERTIFICATE OF TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	DP61589
PREVIOUS TITLE:	1441-327
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AUTHORITY:	SHIRE OF DARDANUP

NOTE 1: L379582 THIS LOT/TITLE CREATED AFTER PORTION OF THE LAND TAKEN FROM THE FORMER LOT WITHOUT PRODUCTION OF THE DUPLICATE TITLE BY TAKING ORDER L379582. CURRENT DUPLICATE FOR THE WITHIN LAND IS STILL VOL.1441 FOL.327 EDITION 2.

APPENDIX 2

CLAUSE 54 CERTIFICATES

ROWE GROUP DESIGN

Western Australian Planning Commission

Enquiries: Trevor Servaas (08) 6551 9110
Our Ref: 53 / 59715541
Your Ref: 9013

GREG ROWE PTY LTD
LEVEL 3, 369 NEWCASTLE STREET
NORTHBRIDGE
6007 WA

Dear Sir/Madam

CERTIFICATE UNDER CLAUSE 53 OF THE GREATER BUNBURY REGION SCHEME ISSUED BY THE WESTERN AUSTRALIAN PLANNING COMMISSION

In reply to your request, please find enclosed
Certificate Number: 59715541

It is advised that the enclosed Certificate has been prepared to conform with the current Statutory requirements (as at the date of signature) of the Greater Bunbury Region Scheme

Yours faithfully,

Ms Sam Fagan
Secretary
Western Australian Planning Commission

14 August 2019

Postal address: Locked Bag 2506 Perth WA Street address: 140 William Street Perth WA 6000
Tel: (08) 6551 8002 Fax: (08) 6551 9001 TTY: 6551 9007 Infoline: 1800 626 477
info@dplh.wa.gov.au www.dplh.wa.gov.au
ABN 35 482 341 493

Western Australian Planning Commission

Greater Bunbury Region Scheme

Form 5

Scheme Certificate

In accordance with clause 53 of the *Greater Bunbury Region Scheme* the following information relates to:

Certificate: 59715541

Receipt: None

Date: 14/08/2019

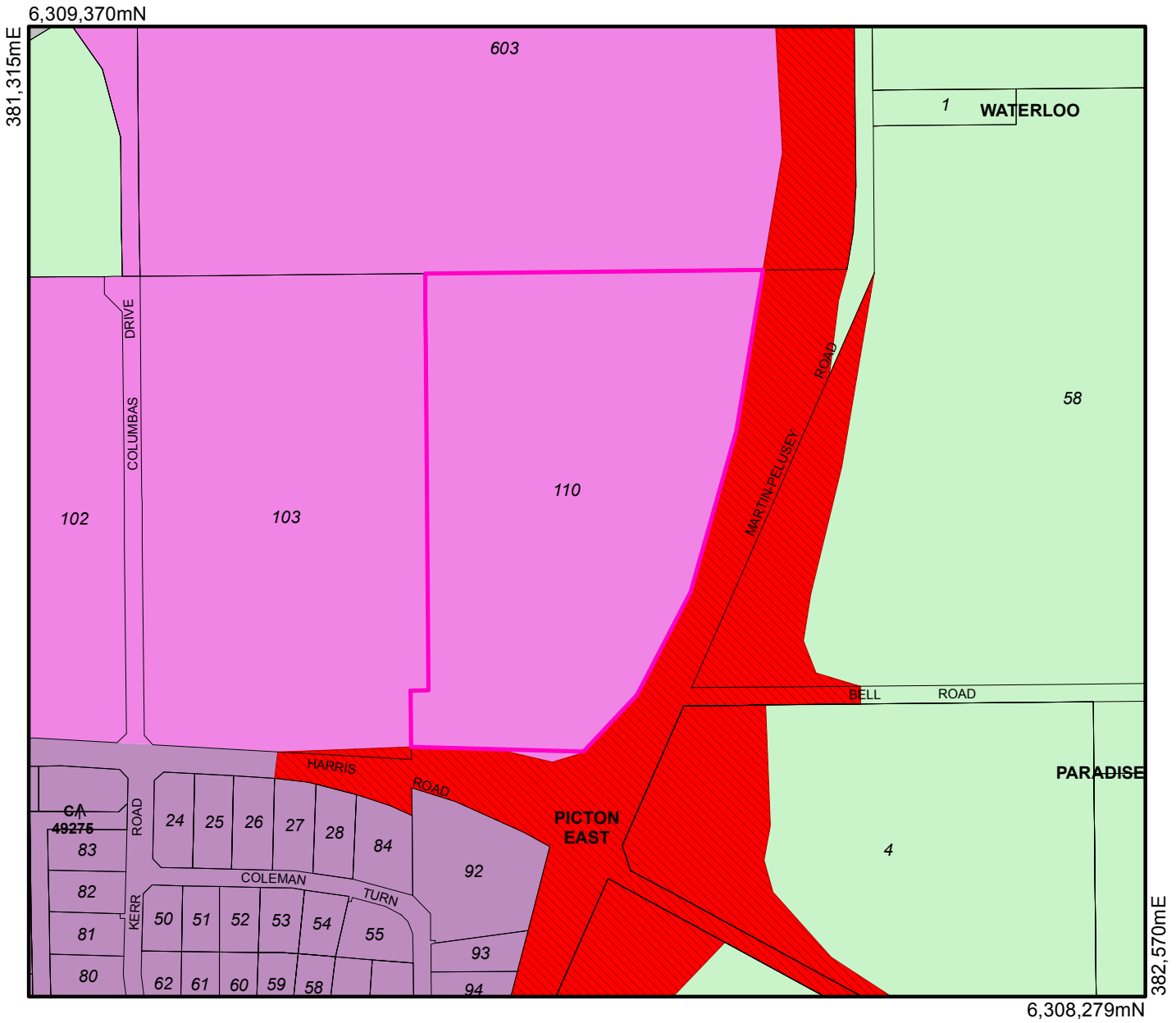
Location:

Certificate of Title: Vol: 2741 Folio:234

Deposited Plan: 61589

Legend for reserved land and zones

- Environmental conditions
- Industrial
- Industrial deferred
- Primary regional roads
- Railways
- Rural



This certificate relates only to the provisions of the:

Greater Bunbury Region Scheme

and does not claim to indicate the land use allocation under any local government provision.

Produced by Data Analytics,
Department of Planning, Lands and Heritage, Perth WA.

Base information supplied by:
Western Australian Land Information Authority SLIP 1096-2018-1

N

0 70 140 210 280

metres

Coordinates based on MGA Zone 50 (GDA 94)
All dimensions are in metres
Subject to survey

Ms Sam Fagan
Secretary
Western Australian Planning Commission

Western Australian Planning Commission

Enquiries: Trevor Servaas (08) 6551 9110
Our Ref: 53 / 59683025
Your Ref: 9013

GREG ROWE PTY LTD
LEVEL 3, 369 NEWCASTLE STREET
NORTHBRIDGE
6007 WA

Dear Sir/Madam

CERTIFICATE UNDER CLAUSE 53 OF THE GREATER BUNBURY REGION SCHEME ISSUED BY THE WESTERN AUSTRALIAN PLANNING COMMISSION

In reply to your request, please find enclosed
Certificate Number: 59683025

It is advised that the enclosed Certificate has been prepared to conform with the current Statutory requirements (as at the date of signature) of the Greater Bunbury Region Scheme

Yours faithfully,

Ms Sam Fagan
Secretary
Western Australian Planning Commission

5 August 2019

Western Australian Planning Commission

Greater Bunbury Region Scheme

Form 5

Scheme Certificate

In accordance with clause 53 of the

Greater Bunbury Region Scheme the following information relates to:

Certificate: 59683025

Receipt: None

Date: 6/08/2019

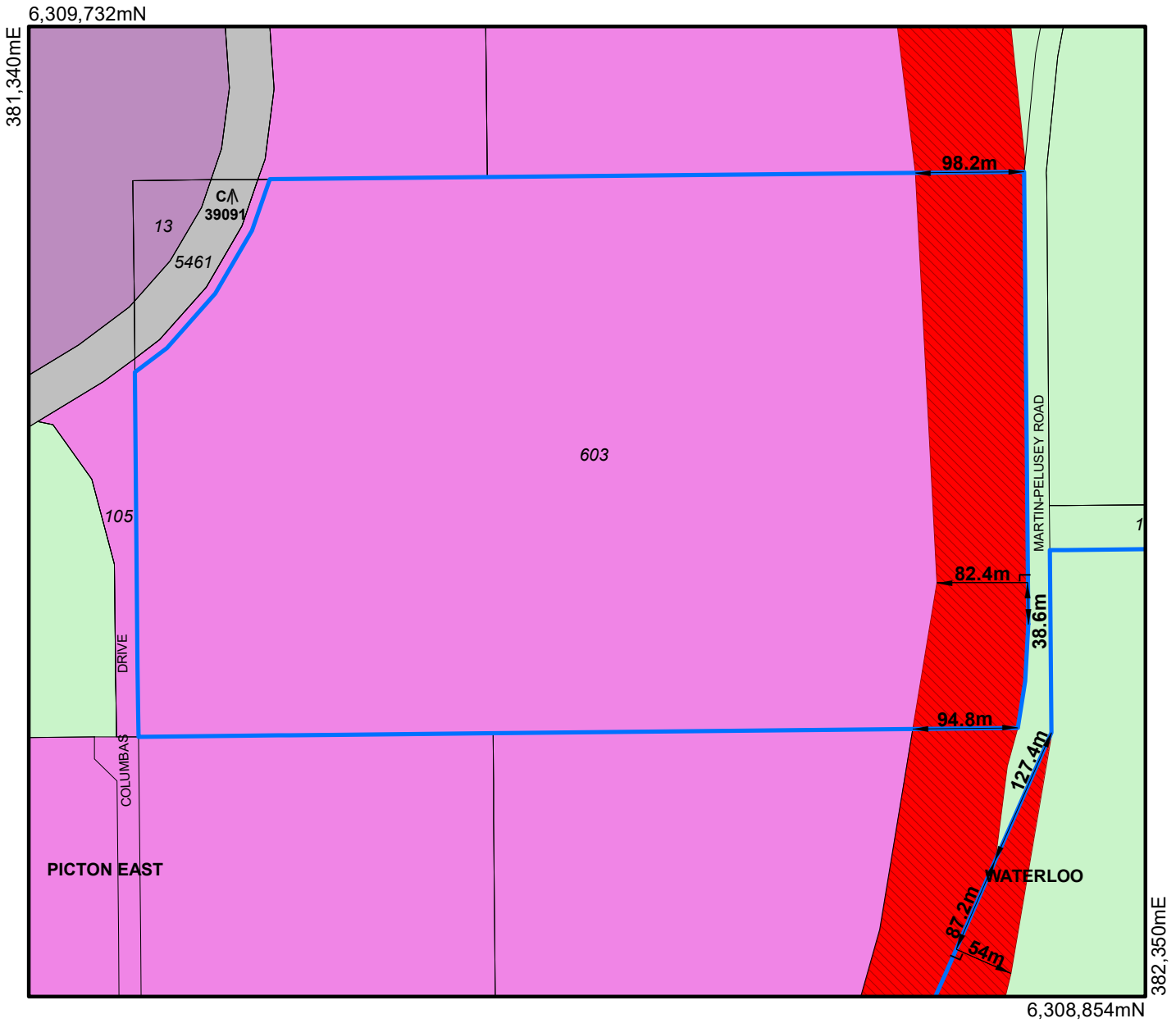
Location: Martin-Pelusey Rd, Picton East

Certificate of Title: Vol: 2044 Folio:266

Deposited Plan: 246179

Legend for reserved land and zones

- Environmental conditions
- Industrial
- Industrial deferred
- Primary regional roads
- Railways
- Rural



This certificate relates only to the provisions of the:

Greater Bunbury Region Scheme

and does not claim to indicate the land use allocation under any local government provision.

Produced by Data Analytics,
Department of Planning, Lands and Heritage, Perth WA.

Base information supplied by:
Western Australian Land Information Authority SLIP 1096-2018-1

N

0 60 120 180 240

metres

Coordinates based on MGA Zone 50 (GDA 94)
All dimensions are in metres
Subject to survey

Ms Sam Fagan
Secretary
Western Australian Planning Commission

GOVERNMENT OF WESTERN AUSTRALIA

Statement No.

000697

MINISTER FOR THE ENVIRONMENT; SCIENCE

STATEMENT THAT A SCHEME MAY BE IMPLEMENTED (PURSUANT TO THE PROVISIONS OF DIVISION 3 OF PART IV OF THE ENVIRONMENTAL PROTECTION ACT 1986)

GREATER BUNBURY REGION SCHEME

Scheme Purpose: To guide and regulate the use and development of land and to make provisions for regional infrastructure and regional open space within the Greater Bunbury Region.

Responsible Authority: Western Australian Planning Commission

Responsible Authority Address: 469 Wellington Street, PERTH WA 6000

Assessment Number: 1048

Report of the Environmental Protection Authority: Bulletin 1108

Subject to the following conditions, there is no known environmental reason why the Greater Bunbury Region Scheme to which the above report of the Environmental Protection Authority relates should not be implemented:

1 Additional Land to be Reserved

1-1 All or portions of the following sites shall be reserved for conservation, in accordance with the requirements set out in Attachment 1 of the Minister for the Environment's "Statement that a Scheme may be Implemented" No. 000697 published on (date):

1) Reserve 35061 Paris Road, Australind - Decommissioned Wastewater Treatment Plant
2) Reserve 31012 Harewoods Road, Dalyellup
3) Foreshore adjoining Port Installations Reserve
4) Twin Rivers - Pt Lot 211 Barnes Avenue, Australind
5) College Grove - Lot 1000 Bussell Highway
6) Pt Loc 632 Parade Road, Glen Padden
7) Reserve 670 North Boyanup Road, Davenport
8) Picton Waters – Environmental Protection Policy Lake on portion of Lots 40-44 Jeffery Road, Picton
9) Pt Lot 1 North Boyanup Road, Davenport
10) Lot 317 Harewoods Road, Dalyellup
11) Lot 1, Dalyellup Boulevard, Dalyellup

Published on

31 OCT 2005

29th FLOOR, ALLENDALE SQUARE, 77 ST. GEORGE'S TERRACE, PERTH 6000
TELEPHONE: (08) 9220 5050 FACSIMILE: (08) 9221 4665
E-MAIL: judy-edwards@dpc.wa.gov.au
WEBSITE: www.ministers.wa.gov.au/edwards

2 Realignment of Primary Regional Roads Reserves

2-1 Portions of the following Primary Regional Roads Reserves shall be realigned, in accordance with the requirements set out in Attachment 1 of the Minister for the Environment's "Statement that a Scheme may be Implemented" No. 000697 published on (date):

1) Port Access Road
2) Bunbury Outer Ring Road

CONDITIONS TO BE INCORPORATED INTO THE SCHEME BY INSERTION OF PROVISIONS IN SCHEME TEXT

3 Management Plans

3-1 The following Environmental Management Plans may be required in accordance with the specifications set out in Attachment 1 in the Minister for the Environment's "Statement that a Scheme may be Implemented" No. 000697 published on (insert date), and shall be subsequently implemented in accordance with the provisions of the Management Plans, to the satisfaction of the Western Australian Planning Commission:

1) Environmental Management Plans for schemes, subdivisions and developments which impact on Regional Open Space in the scheme, Crown conservation or nature reserves, a National Park or bushland, waterways, wetlands or other land that may be part of an ecological linkage;
2) Environmental Management Plans for industrial development within the Kemerton Industrial Area and Special Control Area No. 2;
3) Drainage, Nutrient and Water Management Plans in areas where the Average Maximum Groundwater Level is less than 1.2 metres below the natural ground surface or where any proposed off-site drainage could lead to degradation of wetlands or waterways; and
4) Acid Sulfate Soil Management Plans where the presence of acid sulphate soils is confirmed or there is likely to be a significant risk of disturbing acid sulphate soils.

4 Biological Survey

4-1 As part of a scheme amendment or application to subdivide or develop land which has the potential to impact on regionally significant native remnant vegetation or native fauna, the Western Australian Planning Commission or local government, as the case requires, may require a biological survey, including a search for Declared Rare Flora and Fauna, Priority Flora, Threatened Flora Communities and Threatened Fauna, to be undertaken.

The biological survey shall be undertaken to the satisfaction of the Western Australian Planning Commission or local government, as the case requires, having due regard for advice from relevant government agencies, and shall be taken into account when considering the rezoning and subsequent subdivision and development applications.

5 Provision of Environmental Offsets

5-1 Prior to construction of the Port Access Road and Bunbury Outer Ring Road, an environmental offset strategy shall be prepared to mitigate unavoidable impacts on wetlands and native vegetation associated with the Port Access Road and Bunbury Outer Ring Road to the satisfaction of the Western Australian Planning Commission on advice of the Environmental Protection Authority. With respect to the Port Access Road, the strategy shall include a foreshore management plan for the Ferguson River in the vicinity of the road. With respect to the Bunbury Outer Ring Road, the strategy shall include rehabilitation of the strip of land adjacent to the road in the vicinity of Lot 15 North Boyanup Road (South Western Highway) and design of the intersection with the Australind Bypass to minimize impacts on environmental values of the area.

Dr Judy Edwards MLA
MINISTER FOR THE ENVIRONMENT; SCIENCE

31 OCT 2005

STATEMENT THAT A SCHEME MAY BE IMPLEMENTED – GREATER BUNBURY REGION SCHEME

SPECIFICATIONS FOR ENVIRONMENTAL MANAGEMENT PLANS, ADDITIONAL LAND TO BE RESERVED AND REALIGNMENT OF PRIMARY REGIONAL ROAD RESERVES

1 Environmental Management Plans for Schemes, Subdivisions and Developments

1-1 Prior to amending local town planning schemes, or finally approving subdivisions or developments (whichever is sooner), the Western Australian Planning Commission or local government, as the case requires, may require an Environmental Management Plan to be prepared and implemented to achieve the objective of managing the potential impacts of the proposed subdivision or development on the following:

1) land which is reserved as Regional Open Space in the Scheme;

2) a Crown conservation or nature reserve;

3) a National Park; or

4) bushland, waterway, wetland or land that may be part of an ecological linkage.

The Environmental Management Plan shall include:

i) a description of existing environmental values, and the identification of the environmental outcome to be achieved through the implementation of the Plan;

ii) clear delineation of boundaries of significant areas to be protected;

iii) fire management;

iv) drainage and nutrient management;

v) management of access and rehabilitation;

vi) vegetation and/or wetland mitigation strategies;

vii) a program for implementation;

viii) allocation of responsibilities and identification of timing and duration of implementation;

ix) provision for routine monitoring of environmental values; and

x) provision of details of contingency plans in the event that the monitoring surveys indicate that the development is having or has had an adverse impact upon environmental values.

1-2 Environmental Management Plans required by condition 1-1 shall be prepared to the satisfaction of the Western Australian Planning Commission or local government, as the case requires, having due regard for advice from relevant government agencies and shall be implemented in accordance with a program defined in the Environmental Management Plan.

2 Environmental Management Plans for Industrial Development within the Kemerton Industrial Area and Special Control Area No. 2

2-1 Prior to approving subdivision or development within the Kemerton Industrial Area and the Special Control Area No. 2, the Western Australian Planning Commission or local government, as the case requires, may require an Environmental Management Plan to be prepared and implemented to achieve the objective of managing the potential impacts of the proposed development.

The Environmental Management Plan shall include:

1) a description of existing environmental values (including vegetation, fauna and wetlands) and the identification of the environmental outcome to be achieved through the implementation of this Plan;
2) management of potential impacts on visual amenity;
3) clear delineation of significant areas to be protected;
4) a program for implementation;
5) allocation of responsibilities and identification of timing and duration of implementation;
6) provision for routine monitoring of environmental values; and
7) provision of details of contingency plans in the event that the monitoring surveys indicate that the subdivision or development is having or has had an adverse impact upon environmental values.

2-2 An Environmental Management Plan required by condition 2-1 shall be prepared to the satisfaction of the Western Australian Planning Commission or local government, as the case requires, having due regard for advice from relevant government agencies and shall be implemented in accordance with a program defined in the Environmental Management Plan.

3 Drainage, Nutrient and Water Management Plans

3-1 Prior to amending local town planning schemes, or finally approving subdivision or developments (including those for intensive horticulture), whichever is sooner, in areas where the Average Maximum Groundwater Level is less than 1.2 metres below the natural ground surface, or where any proposed off-site drainage could lead to degradation of wetlands or waterways, the Western Australian Planning Commission or local government, as the case requires, may require a Drainage, Nutrient and Water Management Plan to be prepared and implemented.

3-2 A Drainage, Nutrient and Water Management Plan, if required, shall ensure that there is no net increase in nitrogen export to the Leschenault Estuary as a result of development within the Greater Bunbury Region.

3-3 The Drainage, Nutrient and Water Management Plan shall be prepared to the satisfaction of the Western Australian Planning Commission or local government, as the case requires, having due regard for advice from relevant government agencies, and shall be implemented in accordance with a program defined in the Drainage, Nutrient and Water Management Plan.

4 Acid Sulfate Soil Management Plans

4-1 Prior to amending local town planning schemes, or finally approving subdivisions or development, the Western Australian Planning Commission or local government, as the case requires, may require a Preliminary Acid Sulfate Soils Assessment to be prepared where there is likely to be a significant risk of disturbing acid sulfate soils.

4-2 Where the presence of acid sulfate soils is confirmed, an Acid Sulphate Soil Management Plan shall be prepared to the satisfaction of the Western Australian Planning Commission or local government, as the case requires, having due regard for advice from relevant government agencies and implemented in accordance with a program defined in the Acid Sulphate Soil Management Plan.

5 Additional Land to be Reserved

5-1 Reserve 35061 Paris Road, Australind - Decommissioned Wastewater Treatment Plant

Land shall be reserved for conservation purposes to protect the integrity, function and environmental value of the bushland on the northern and western portions of Reserve 35061 Paris Road, Australind, to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority, and shall only be used for conservation and complementary purposes.

5-2 Reserve 31012 Harewoods Road, Dalyellup

Land shall be reserved for conservation purposes to protect the integrity, function and environmental value of the bushland on the northern portion of Reserve 31012 Harewoods Road, Dalyellup to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority and shall only be used for conservation, landscape and recreational purposes.

5-3 Foreshore adjoining Port Installations Reserve

Land shall be reserved for conservation purposes to protect the integrity, function and environmental value of the foreshore adjacent to the Port Installations Reserve to the requirements of the Western Australian Planning Commission on advice of the

Environmental Protection Authority and shall only be used for conservation and complementary purposes.

5-4 **Twin Rivers - Pt Lot 211 Barnes Avenue, Australind**

A portion of Pt Lot 211 Barnes Avenue as detailed in the Minister for the Environment's determination of appeals relating to the Environmental Protection Authority's report and recommendations on the Scheme, dated 30 November 2004, shall be reserved for conservation purposes to protect the integrity, function and environmental values of the land to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority, and shall only be used for conservation and complementary purposes.

5-5 **Picton Waters – Environmental Protection Policy Lake on Portion of Lots 40-44 Jeffery Road, Picton**

Land shall be reserved for conservation purposes to protect the integrity, function and environmental value of the wetland on Lots 40-44 Jeffery Road, Picton, to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority, and shall only be used for conservation and complementary purposes. The land requirements shall include an appropriate buffer to protect the core wetland.

5-6 **College Grove – Lot 1000 Bussell Highway**

A portion of Lot 1000, Bussell Highway, as detailed in the Minister for the Environment's determination of appeals relating to the Environmental Protection Authority's report and recommendations on the Scheme, dated 30 November 2004, shall be reserved for conservation purposes to protect the integrity, function and environmental values of the land to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority, and shall only be used for conservation and complementary purposes.

5-7 **Pt Loc 632 Parade Road, Glen Padden**

Land shall be reserved for conservation purposes to protect the integrity, function and environmental value of the bushland on Pt Loc 632 Parade Road, Glen Padden, to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority, and shall only be used for conservation and complementary purposes.

5-8 **Reserve 670 North Boyanup Road, Davenport**

Land shall be reserved for conservation purposes to protect the integrity, function and environmental value of the bushland on Reserve 670 North Boyanup Road, Davenport to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority, and shall only be used for conservation and complementary purposes.

5-9 **Pt Lot 1 North Boyanup Road, Davenport**

Land shall be reserved for conservation purposes to provide an appropriate buffer to the Preston River on Pt Lot 1, North Boyanup Road, Davenport to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority, and shall only be used for conservation and complementary purposes.

5-10 **Lot 317 Harewoods Road, Dalyellup**

Lot 317 Harewoods Road, Dalyellup shall be reserved for conservation purposes to protect the integrity, function and environmental value of the bushland on the land to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority, and shall only be used for conservation and complementary purposes.

5-11 **Lot 1 Dalyellup Boulevard, Dalyellup**

Lot 1 Dalyellup Boulevard, Dalyellup shall be reserved for conservation purposes to protect the integrity, function and environmental values of the land to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority and shall only be used for conservation and complementary purposes.

6 Realignment of Primary Regional Roads Reserves

6-1 **Port Access Road**

The Port Access Road Primary Regional Roads Reserve shall be realigned in accordance with the Minister for the Environment's determination of appeals relating to the Environmental Protection Authority's report and recommendations on the Scheme, dated 30 November 2004.

6-2 **Bunbury Outer Ring Road**

The Bunbury Outer Ring Road Primary Regional Roads Reserve shall be realigned in accordance with the Minister for the Environment's determination of appeals relating to the Environmental Protection Authority's report and recommendations on the Scheme, dated 30 November 2004.

Western Australian Planning Commission

Enquiries: Trevor Servaas (08) 6551 9110
Our Ref: 53 / 59715584
Your Ref: 9013

GREG ROWE PTY LTD
LEVEL 3, 369 NEWCASTLE STREET
NORTHBRIDGE
6007 WA

Dear Sir/Madam

CERTIFICATE UNDER CLAUSE 53 OF THE GREATER BUNBURY REGION SCHEME ISSUED BY THE WESTERN AUSTRALIAN PLANNING COMMISSION

In reply to your request, please find enclosed
Certificate Number: 59715584

It is advised that the enclosed Certificate has been prepared to conform with the current Statutory requirements (as at the date of signature) of the Greater Bunbury Region Scheme

Yours faithfully,

Ms Sam Fagan
Secretary
Western Australian Planning Commission

14 August 2019

Postal address: Locked Bag 2506 Perth WA Street address: 140 William Street Perth WA 6000
Tel: (08) 6551 8002 Fax: (08) 6551 9001 TTY: 6551 9007 Infoline: 1800 626 477
info@dplh.wa.gov.au www.dplh.wa.gov.au
ABN 35 482 341 493

Western Australian Planning Commission

Greater Bunbury Region Scheme

Form 5

Scheme Certificate

In accordance with clause 53 of the

Greater Bunbury Region Scheme the following information relates to:

Certificate: 59715584

Receipt: None

Date: 14/08/2019

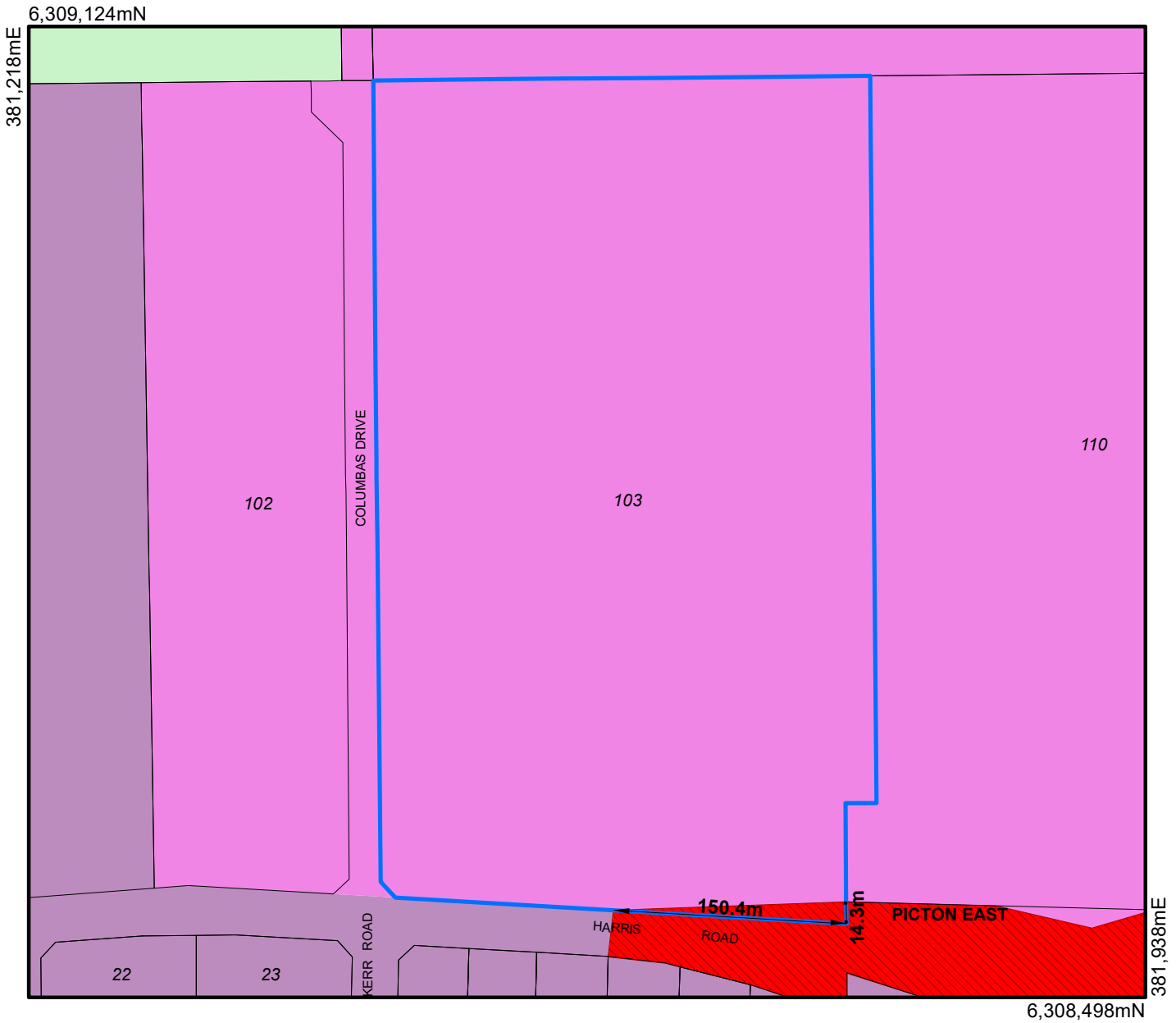
Location:

Certificate of Title: Vol: 2152 Folio:572

Diagram: 96575

Legend for reserved land and zones

- Environmental conditions
- Industrial
- Industrial deferred
- Primary regional roads
- Rural



This certificate relates only to the provisions of the:

Greater Bunbury Region Scheme

and does not claim to indicate the land use allocation under any local government provision.

Produced by Data Analytics,
Department of Planning, Lands and Heritage, Perth WA.

Base information supplied by:
Western Australian Land Information Authority SLIP 1096-2018-1

N

0 40 80 120 160

metres

Coordinates based on MGA Zone 50 (GDA 94)
All dimensions are in metres
Subject to survey

Ms Sam Fagan
Secretary
Western Australian Planning Commission

GOVERNMENT OF WESTERN AUSTRALIA

Statement No.

000697

MINISTER FOR THE ENVIRONMENT; SCIENCE

STATEMENT THAT A SCHEME MAY BE IMPLEMENTED (PURSUANT TO THE PROVISIONS OF DIVISION 3 OF PART IV OF THE ENVIRONMENTAL PROTECTION ACT 1986)

GREATER BUNBURY REGION SCHEME

Scheme Purpose: To guide and regulate the use and development of land and to make provisions for regional infrastructure and regional open space within the Greater Bunbury Region.

Responsible Authority: Western Australian Planning Commission

Responsible Authority Address: 469 Wellington Street, PERTH WA 6000

Assessment Number: 1048

Report of the Environmental Protection Authority: Bulletin 1108

Subject to the following conditions, there is no known environmental reason why the Greater Bunbury Region Scheme to which the above report of the Environmental Protection Authority relates should not be implemented:

1 Additional Land to be Reserved

1-1 All or portions of the following sites shall be reserved for conservation, in accordance with the requirements set out in Attachment 1 of the Minister for the Environment's "Statement that a Scheme may be Implemented" No. 000697 published on (date):

1) Reserve 35061 Paris Road, Australind - Decommissioned Wastewater Treatment Plant
2) Reserve 31012 Harewoods Road, Dalyellup
3) Foreshore adjoining Port Installations Reserve
4) Twin Rivers - Pt Lot 211 Barnes Avenue, Australind
5) College Grove - Lot 1000 Bussell Highway
6) Pt Loc 632 Parade Road, Glen Padden
7) Reserve 670 North Boyanup Road, Davenport
8) Picton Waters – Environmental Protection Policy Lake on portion of Lots 40-44 Jeffery Road, Picton
9) Pt Lot 1 North Boyanup Road, Davenport
10) Lot 317 Harewoods Road, Dalyellup
11) Lot 1, Dalyellup Boulevard, Dalyellup

Published on

31 OCT 2005

29th FLOOR, ALLENDALE SQUARE, 77 ST. GEORGE'S TERRACE, PERTH 6000
TELEPHONE: (08) 9220 5050 FACSIMILE: (08) 9221 4665
E-MAIL: judy-edwards@dpc.wa.gov.au
WEBSITE: www.ministers.wa.gov.au/edwards

2 Realignment of Primary Regional Roads Reserves

2-1 Portions of the following Primary Regional Roads Reserves shall be realigned, in accordance with the requirements set out in Attachment 1 of the Minister for the Environment's "Statement that a Scheme may be Implemented" No. 000697 published on (date):

1) Port Access Road
2) Bunbury Outer Ring Road

CONDITIONS TO BE INCORPORATED INTO THE SCHEME BY INSERTION OF PROVISIONS IN SCHEME TEXT

3 Management Plans

3-1 The following Environmental Management Plans may be required in accordance with the specifications set out in Attachment 1 in the Minister for the Environment's "Statement that a Scheme may be Implemented" No. 000697 published on (insert date), and shall be subsequently implemented in accordance with the provisions of the Management Plans, to the satisfaction of the Western Australian Planning Commission:

1) Environmental Management Plans for schemes, subdivisions and developments which impact on Regional Open Space in the scheme, Crown conservation or nature reserves, a National Park or bushland, waterways, wetlands or other land that may be part of an ecological linkage;
2) Environmental Management Plans for industrial development within the Kemerton Industrial Area and Special Control Area No. 2;
3) Drainage, Nutrient and Water Management Plans in areas where the Average Maximum Groundwater Level is less than 1.2 metres below the natural ground surface or where any proposed off-site drainage could lead to degradation of wetlands or waterways; and
4) Acid Sulfate Soil Management Plans where the presence of acid sulphate soils is confirmed or there is likely to be a significant risk of disturbing acid sulphate soils.

4 Biological Survey

4-1 As part of a scheme amendment or application to subdivide or develop land which has the potential to impact on regionally significant native remnant vegetation or native fauna, the Western Australian Planning Commission or local government, as the case requires, may require a biological survey, including a search for Declared Rare Flora and Fauna, Priority Flora, Threatened Flora Communities and Threatened Fauna, to be undertaken.

The biological survey shall be undertaken to the satisfaction of the Western Australian Planning Commission or local government, as the case requires, having due regard for advice from relevant government agencies, and shall be taken into account when considering the rezoning and subsequent subdivision and development applications.

5 Provision of Environmental Offsets

5-1 Prior to construction of the Port Access Road and Bunbury Outer Ring Road, an environmental offset strategy shall be prepared to mitigate unavoidable impacts on wetlands and native vegetation associated with the Port Access Road and Bunbury Outer Ring Road to the satisfaction of the Western Australian Planning Commission on advice of the Environmental Protection Authority. With respect to the Port Access Road, the strategy shall include a foreshore management plan for the Ferguson River in the vicinity of the road. With respect to the Bunbury Outer Ring Road, the strategy shall include rehabilitation of the strip of land adjacent to the road in the vicinity of Lot 15 North Boyanup Road (South Western Highway) and design of the intersection with the Australind Bypass to minimize impacts on environmental values of the area.

Dr Judy Edwards MLA
MINISTER FOR THE ENVIRONMENT; SCIENCE

31 OCT 2005

STATEMENT THAT A SCHEME MAY BE IMPLEMENTED – GREATER BUNBURY REGION SCHEME

SPECIFICATIONS FOR ENVIRONMENTAL MANAGEMENT PLANS, ADDITIONAL LAND TO BE RESERVED AND REALIGNMENT OF PRIMARY REGIONAL ROAD RESERVES

1 Environmental Management Plans for Schemes, Subdivisions and Developments

1-1 Prior to amending local town planning schemes, or finally approving subdivisions or developments (whichever is sooner), the Western Australian Planning Commission or local government, as the case requires, may require an Environmental Management Plan to be prepared and implemented to achieve the objective of managing the potential impacts of the proposed subdivision or development on the following:

1) land which is reserved as Regional Open Space in the Scheme;

2) a Crown conservation or nature reserve;

3) a National Park; or

4) bushland, waterway, wetland or land that may be part of an ecological linkage.

The Environmental Management Plan shall include:

i) a description of existing environmental values, and the identification of the environmental outcome to be achieved through the implementation of the Plan;

ii) clear delineation of boundaries of significant areas to be protected;

iii) fire management;

iv) drainage and nutrient management;

v) management of access and rehabilitation;

vi) vegetation and/or wetland mitigation strategies;

vii) a program for implementation;

viii) allocation of responsibilities and identification of timing and duration of implementation;

ix) provision for routine monitoring of environmental values; and

x) provision of details of contingency plans in the event that the monitoring surveys indicate that the development is having or has had an adverse impact upon environmental values.

1-2 Environmental Management Plans required by condition 1-1 shall be prepared to the satisfaction of the Western Australian Planning Commission or local government, as the case requires, having due regard for advice from relevant government agencies and shall be implemented in accordance with a program defined in the Environmental Management Plan.

2 Environmental Management Plans for Industrial Development within the Kemerton Industrial Area and Special Control Area No. 2

2-1 Prior to approving subdivision or development within the Kemerton Industrial Area and the Special Control Area No. 2, the Western Australian Planning Commission or local government, as the case requires, may require an Environmental Management Plan to be prepared and implemented to achieve the objective of managing the potential impacts of the proposed development.

The Environmental Management Plan shall include:

1) a description of existing environmental values (including vegetation, fauna and wetlands) and the identification of the environmental outcome to be achieved through the implementation of this Plan;
2) management of potential impacts on visual amenity;
3) clear delineation of significant areas to be protected;
4) a program for implementation;
5) allocation of responsibilities and identification of timing and duration of implementation;
6) provision for routine monitoring of environmental values; and
7) provision of details of contingency plans in the event that the monitoring surveys indicate that the subdivision or development is having or has had an adverse impact upon environmental values.

2-2 An Environmental Management Plan required by condition 2-1 shall be prepared to the satisfaction of the Western Australian Planning Commission or local government, as the case requires, having due regard for advice from relevant government agencies and shall be implemented in accordance with a program defined in the Environmental Management Plan.

3 Drainage, Nutrient and Water Management Plans

3-1 Prior to amending local town planning schemes, or finally approving subdivision or developments (including those for intensive horticulture), whichever is sooner, in areas where the Average Maximum Groundwater Level is less than 1.2 metres below the natural ground surface, or where any proposed off-site drainage could lead to degradation of wetlands or waterways, the Western Australian Planning Commission or local government, as the case requires, may require a Drainage, Nutrient and Water Management Plan to be prepared and implemented.

3-2 A Drainage, Nutrient and Water Management Plan, if required, shall ensure that there is no net increase in nitrogen export to the Leschenault Estuary as a result of development within the Greater Bunbury Region.

3-3 The Drainage, Nutrient and Water Management Plan shall be prepared to the satisfaction of the Western Australian Planning Commission or local government, as the case requires, having due regard for advice from relevant government agencies, and shall be implemented in accordance with a program defined in the Drainage, Nutrient and Water Management Plan.

4 Acid Sulfate Soil Management Plans

4-1 Prior to amending local town planning schemes, or finally approving subdivisions or development, the Western Australian Planning Commission or local government, as the case requires, may require a Preliminary Acid Sulfate Soils Assessment to be prepared where there is likely to be a significant risk of disturbing acid sulfate soils.

4-2 Where the presence of acid sulfate soils is confirmed, an Acid Sulphate Soil Management Plan shall be prepared to the satisfaction of the Western Australian Planning Commission or local government, as the case requires, having due regard for advice from relevant government agencies and implemented in accordance with a program defined in the Acid Sulphate Soil Management Plan.

5 Additional Land to be Reserved

5-1 Reserve 35061 Paris Road, Australind - Decommissioned Wastewater Treatment Plant

Land shall be reserved for conservation purposes to protect the integrity, function and environmental value of the bushland on the northern and western portions of Reserve 35061 Paris Road, Australind, to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority, and shall only be used for conservation and complementary purposes.

5-2 Reserve 31012 Harewoods Road, Dalyellup

Land shall be reserved for conservation purposes to protect the integrity, function and environmental value of the bushland on the northern portion of Reserve 31012 Harewoods Road, Dalyellup to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority and shall only be used for conservation, landscape and recreational purposes.

5-3 Foreshore adjoining Port Installations Reserve

Land shall be reserved for conservation purposes to protect the integrity, function and environmental value of the foreshore adjacent to the Port Installations Reserve to the requirements of the Western Australian Planning Commission on advice of the

Environmental Protection Authority and shall only be used for conservation and complementary purposes.

5-4 **Twin Rivers - Pt Lot 211 Barnes Avenue, Australind**

A portion of Pt Lot 211 Barnes Avenue as detailed in the Minister for the Environment's determination of appeals relating to the Environmental Protection Authority's report and recommendations on the Scheme, dated 30 November 2004, shall be reserved for conservation purposes to protect the integrity, function and environmental values of the land to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority, and shall only be used for conservation and complementary purposes.

5-5 **Picton Waters – Environmental Protection Policy Lake on Portion of Lots 40-44 Jeffery Road, Picton**

Land shall be reserved for conservation purposes to protect the integrity, function and environmental value of the wetland on Lots 40-44 Jeffery Road, Picton, to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority, and shall only be used for conservation and complementary purposes. The land requirements shall include an appropriate buffer to protect the core wetland.

5-6 **College Grove – Lot 1000 Bussell Highway**

A portion of Lot 1000, Bussell Highway, as detailed in the Minister for the Environment's determination of appeals relating to the Environmental Protection Authority's report and recommendations on the Scheme, dated 30 November 2004, shall be reserved for conservation purposes to protect the integrity, function and environmental values of the land to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority, and shall only be used for conservation and complementary purposes.

5-7 **Pt Loc 632 Parade Road, Glen Padden**

Land shall be reserved for conservation purposes to protect the integrity, function and environmental value of the bushland on Pt Loc 632 Parade Road, Glen Padden, to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority, and shall only be used for conservation and complementary purposes.

5-8 **Reserve 670 North Boyanup Road, Davenport**

Land shall be reserved for conservation purposes to protect the integrity, function and environmental value of the bushland on Reserve 670 North Boyanup Road, Davenport to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority, and shall only be used for conservation and complementary purposes.

5-9 **Pt Lot 1 North Boyanup Road, Davenport**

Land shall be reserved for conservation purposes to provide an appropriate buffer to the Preston River on Pt Lot 1, North Boyanup Road, Davenport to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority, and shall only be used for conservation and complementary purposes.

5-10 **Lot 317 Harewoods Road, Dalyellup**

Lot 317 Harewoods Road, Dalyellup shall be reserved for conservation purposes to protect the integrity, function and environmental value of the bushland on the land to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority, and shall only be used for conservation and complementary purposes.

5-11 **Lot 1 Dalyellup Boulevard, Dalyellup**

Lot 1 Dalyellup Boulevard, Dalyellup shall be reserved for conservation purposes to protect the integrity, function and environmental values of the land to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority and shall only be used for conservation and complementary purposes.

6 Realignment of Primary Regional Roads Reserves

6-1 **Port Access Road**

The Port Access Road Primary Regional Roads Reserve shall be realigned in accordance with the Minister for the Environment's determination of appeals relating to the Environmental Protection Authority's report and recommendations on the Scheme, dated 30 November 2004.

6-2 **Bunbury Outer Ring Road**

The Bunbury Outer Ring Road Primary Regional Roads Reserve shall be realigned in accordance with the Minister for the Environment's determination of appeals relating to the Environmental Protection Authority's report and recommendations on the Scheme, dated 30 November 2004.

APPENDIX 3

ENVIRONMENTAL ASSESSMENT AND MANAGEMENT STRATEGY

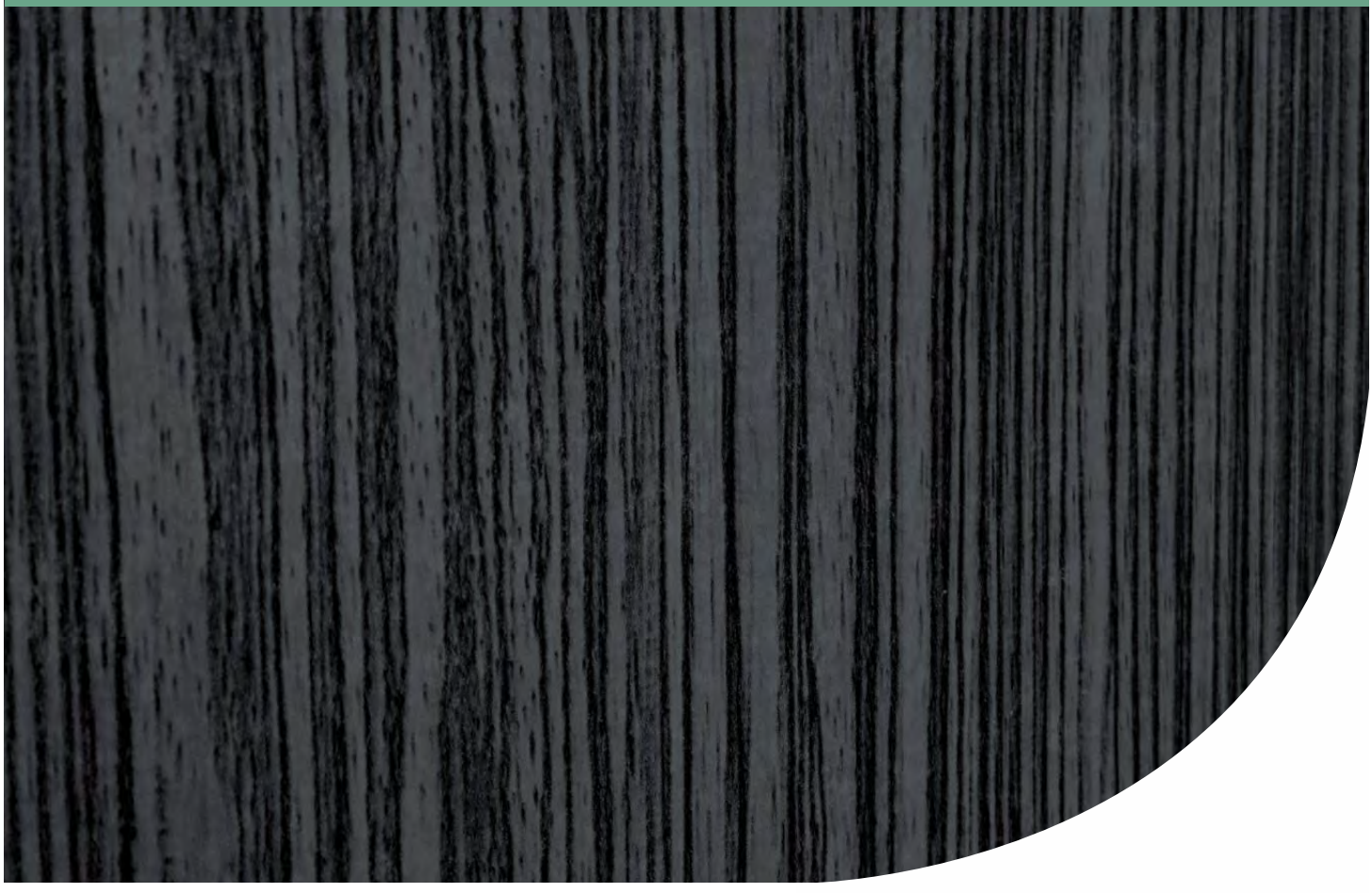
ROWE GROUP DESIGN

Environmental Assessment and Management Strategy

Local Structure Plan, Lots 103, 110 and 603, Picton East

Project No: EP12-039(03)

Prepared for Harris Road Pty Ltd
January 2020



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Doc name:	Environmental Assessment and Management Strategy Local Structure Plan, Lots 103, 110 and 603, Picton East				
Doc no.:	**EP12-039(03)--015a**				
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	Report issued to client for review.				
A	January 2020	Kirsten Knox	KK	Kirsten Knox	KK
	Amended to include further detail on environmental assessment methodology and clarification on retention of vegetation and fauna habitat.				

Executive Summary

This *Environmental Assessment and Management Strategy* (EAMS) has been prepared on behalf of Harris Road Pty Ltd (the proponent) for Lots 103, 110 and 603, Picton East within the Shire of Dardanup, herein referred to as 'the site'. Rowe Group, on behalf of the proponent, have prepared the Lots 103, 110 and 603, Picton East Local Structure Plan, which is intended to guide the future industrial development of the site.

This EAMS has been prepared to address the requirements of the Western Australian Planning Commission's (WAPC) *Structure Plan Framework* (WAPC 2015b) to support the preparation and implementation of the structure plan. This report provides a synthesis of information from a range of sources regarding the environmental features, attributes and values of the site.

The site comprises a total area of approximately 73 hectares (ha) and is located within the Shire of Dardanup. It is bounded by Martin-Pelusey Road to the east, undeveloped industrial land to the north, a freight railway to the north-west, Columbas Drive to the west and Harris Road and existing industrial land uses to the south.

The relevant environmental attributes and values of the site are summarised as follows:

- The majority of the site has been historically cleared or modified to allow for agricultural activities, primarily grazing.
- Topography across the site ranges from 12.0 m Australian Height Datum (AHD) to 23.0 m AHD along the western and northern boundaries of the site.
- The entire site is classified as having a 'moderate to low risk' of acid sulfate soils (ASS) occurring within 3 m of the natural soil surface. Site specific investigations (Strategen 2010) undertaken within a portion of the site did not detect potential for ASS as part of field sampling.
- Given historic clearing and associated agricultural land uses, flora and vegetation within the site has been significantly modified, with all areas containing remnant native vegetation in the site identified as being in 'completely degraded'.
- No threatened ecological communities (TECs) were identified within the site, nor are any likely to occur based on the degraded nature of vegetation within the site (Ekologica Pty Ltd 2009).
- No threatened or priority flora species have been identified within the site, nor are any likely to occur based on the degraded nature of vegetation within the site (Ekologica Pty Ltd 2009).
- A number of conservation significant fauna species were identified as utilising vegetation within the site including western ringtail possum and the three black cockatoo species (Carnaby's, Baudin's and forest red-tailed) (Harewood 2009).
- Based on the *Geomorphic Wetlands of the Swan Coastal Plain* (DBCA 2019a) dataset, three multiple use wetlands (MUW) were identified within the site.
- No registered Aboriginal or non-indigenous heritage sites were mapped within the site. One Other Heritage Place is identified 20 m south of the site.
- Areas of bushfire hazard have been identified both within and outside the site, associated with the proposed public open space within the north-west corner of the site, and existing private landholdings surrounding the site.

The structure plan design has responded to site-specific environmental considerations where necessary and possible, including retention of existing vegetation within an area of public open space (which is in addition to the conservation significant areas identified by the EPA (2008) and DPLH (2018), but was identified for retention in the LSP due to the habitat values); and accommodation of stormwater within drainage reserves.

As part of future development, a number of environmental attributes/values will require management to minimise potential impacts in accordance with the relevant federal, state and local requirements. The key requirements of future management for the site as part of subdivision are summarised as follows:

- **Acid sulfate soils**: it is possible that future investigations and management considerations will be required at subdivision, particularly if services are likely to be installed below the permanent groundwater table.
- **Native vegetation**: ensuring a road interface is provided between the public open space area containing retained remnant vegetation (to ensure lots do not directly back onto this area), and confirming tree retention opportunities (in addition to the area of public open space proposed to retain remnant vegetation) in consideration of final development design and bulk earthworks requirements, and protection vegetation proposed for retention as part of works. Where clearing of native vegetation is proposed, clearing will need to be undertaken in accordance with a valid exemption or a clearing a permit will need to be attained pursuant to Part V of the *Environmental Protection Act 1986*.
- **Native fauna**: confirming tree retention (i.e. fauna habitat) retention opportunities (in addition to the area of public open space proposed to retain remnant vegetation) in consideration of the final development design and bulk earthworks requirements. Fauna management protocols will likely need to be implemented prior to and during clearing activities, particularly with regard to western ringtail possums.
- **Hydrology**: stormwater management requirements to be implemented as outlined within the Local Water Management Strategy (LWMS), and will include preparation of an Urban Water Management Plan (UWMP) for each stage of future subdivision. Spatial provision will need to be made for the drainage reserves at subdivision to accommodate stormwater.
- **Wastewater**: Requirement to design and install appropriate onsite wastewater disposal, likely to be in the form of aerobic treatment units (ATUs) for domestic effluent and storage/treatment of industrial process wastewater.
- **Bushfire risks**: Provision of appropriate separation between future built form and bushfire hazards will need to be accommodated as part of subdivision design (and proposed location of the integrator roads has demonstrated this can be achieved); and drainage and road reserves will be designed and maintained to low threat (in order to not be a hazard). Vehicle access will also need to accommodate access to at least two destinations. This will be addressed as part of future bushfire management plans supporting subdivision

Overall, the environmental attributes and values of the site can be accommodated within the structure plan design, or can be managed appropriately through the future subdivision and development phases in line with the relevant state and local government legislation, policies and guidelines and best management practices.

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List of Abbreviations

Table A1: Abbreviations – General terms

General terms	
AHD	Australian Height Datum
AHIS	Aboriginal Heritage Inquiry System
ANZECC	Australian and New Zealand Environment and Conservation Council (
ASS	Acid Sulfate Soil
ASSDMP	Acid Sulfate Soil and Dewatering Management Plan
BBC	Baudin's black cockatoo
CBC	Carnaby's black cockatoo
DBH	Diameter at Breast Height
EAMS	Environmental Assessment and Management Strategy
ESA	Environmentally sensitive area
FRTBC	Forest red-tailed black cockatoo
IBRA	Interim Biogeographic Regionalisation of Australia
LWMS	Local Water Management Strategy
PEC	Priority ecological community
PF	Priority flora
PDWSA	Public drinking water source area
TEC	Threatened ecological community
TF	Threatened flora
UWMP	Urban Water Management Plan

Table A2: Abbreviations – Legislation and policies

Legislation and policies	
AH Act	*Aboriginal Heritage Act 1972*
BC Act	*Biodiversity Conservation Act 2016*
EP Act	*Environmental Protection Act 1986*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*

Table A3: Abbreviations – Organisations

Organisations	
DBCA	Department of Biodiversity Conservation and Attractions
DoEE	Department of Environment and Energy
DoW	Department of Water (now known as Department of Water and Environmental Regulation)
DPAW	Department of Parks and Wildlife (now known as Department of Biodiversity Conservation and Attractions)
DPLH	Department of Planning, Lands and Heritage
DWER	Department of Water and Environmental Regulation
EPA	Environmental Protection Authority
WAPC	Western Australian Planning Commission

Table A4: Abbreviations – Planning and building terms

Planning and building terms	
GBRS	Greater Bunbury Region Scheme
LSP	Local Structure Plan
TPS	Town Planning Scheme

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1 Introduction

1.1 Background

Harris Road Pty Ltd (the proponent) are in the process of preparing a local structure plan for Lots 103, 110 and 603, Picton East (herein referred to as 'the site'), to support future industrial development, as shown in the structure plan in **Appendix A**. The site is shown in **Figure 1** and consists of an area approximately 73 ha and is located within the Shire of Dardanup. It is bounded by Martin-Pelusey Road to the east, undeveloped industrial-zoned land to the north, a freight railway to the north-west, Columbas Drive to the west and Harris Road and existing industrial land uses to the south.

The site is currently zoned 'Industrial Deferred' under the Greater Bunbury Region Scheme (GBRS), as shown in **Figure 2**. Lots 103 and 603 are zoned 'General Farming' and Lot 110 is zoned 'Restricted Use 10' (for timber sales and storage) under Shire of Dardanup Town Planning Scheme No. 3 (TPS 3).

1.2 Purpose of this report

The purpose of this Environmental Assessment and Management Strategy (EAMS) is to provide a synthesis of information regarding the environmental values and attributes of the site. Specifically, this report:

- Identifies the existing environmental values and attributes of the site (**Section 2**)
- Discusses the land use and environmental planning context for the structure plan area (**Section 3**)
- Discusses how the structure plan layout responds to the existing environmental features and values, and future environmental management requirements as part of the future planning and development process (**Section 4**)
- Provides an implementation framework for future environmental management requirements as part of the future planning and development process (**Section 5**)

The EAMS is the key supporting environmental document for the structure plan, to ultimately facilitate consideration of relevant environmental issues by the local government and various state government agencies and authorities. It is consistent with the requirements for environmental reporting as outlined in the Western Australian Planning Commission's (WAPC's) *Structure Plan Framework* (WAPC 2015b).

1.3 Assessment scope

Emerge Associates (Emerge) was engaged to undertake this environmental assessment to document the existing environmental attributes and values of the site and ensure that any relevant environmental values can be accommodated within the structure plan, and/or managed through future stages of planning and development of the site. This involved utilising a range of information sources including local and regional reports, databases, mapping and site-specific investigations, including:

- Various publicly available databases and information sources
- *Picton Industrial Park Southern Precinct District Structure Plan* (DPLH 2018)
- *Waterloo Industrial Park District Structure Plan (draft)* (WAPC 2019)
- *Shire of Dardanup Local Biodiversity Strategy Discussion Paper (draft)* (Ironbark Environmental & Eco Logical Australia 2009)
- *Local Structure Plan Lot 105 Columbas Drive, Picton* (RPS 2010)
- *Terrestrial Fauna Survey (Level 1) of Lots 1, 2, 11, 102-104 and 603 Picton (East)* (Harewood 2009)
- *Preliminary Acid Sulphate Soil Investigation, Picton East* (Strategen 2010)
- *Report for Preston South, Eastern Precinct – Environmental Assessment for Potential Land Development* (GHD 2011)
- *Report on a Level 1 flora and vegetation survey at various lots at Picton East* (Ekologica Pty Ltd 2009)
- Various environmental investigations associated with the Bunbury Outer Ring Road EPBC Act referral.

In addition to the above, Emerge have conducted a number of site-specific investigations (outlined further below), as well as a comprehensive desktop review of the available information on environmental conditions within and surrounding the site. The investigations undertaken by Emerge include:

- *Bushfire Management Plan* (Emerge Associates 2019a)
- *Local Water Management Strategy* (Emerge Associates 2019b)

2 Existing Environment

2.1 General location and site context

The site is located on the Swan Coastal Plain (SCP) in the Shire of Dardanup and is situated approximately 10 km south-east of the Bunbury town centre. The site is generally located in an area that has historically supported a mixture of agricultural land uses, however is transitioning to industrial land uses.

Based on publicly available aerial imagery, prior to 1996, a majority of the remnant vegetation in the southern half of the site was removed, with patches of remnant trees remaining in the northern half of the site. The site is currently used for predominantly grazing purposes, with a timber saleyard located within Lot 110, in the southern portion of the site.

2.2 Landform and soils

2.2.1 Topography

The site ranges from 12.0 m Australian Height Datum (AHD) to 23.0 m AHD. The higher elevations and steeper slopes are located along the western and northern boundaries of the site. The lowest areas are generally consistent with the existing drainage channels and farm dams. Topographic contours across the site are shown in **Figure 3.**

2.2.2 Landform, soils and geology

The surface geology associated with the site is dominated by undifferentiated consolidated Cainozoic sedimentary rocks; sandstone, limestone, conglomerate and siltstone. Regional mapping by Gozzard (1981) indicated the site is underlain by the Guildford formation, consisting of clay, silt, sand and gravels, with some Bassendean Sand outcrops and includes the following types (as shown in **Figure 4**):

- Qpa – Guildford formation: mainly alluvial sandy clay
- QPb – Bassendean Sand: low rounded dunes
- Qpb/Qpa – thin bassendean sand over Guildford formation.

As part of soil investigations undertaken historically by Strategen (2010), the following was observed:

- In the low-lying areas of the site, soils were observed to be light brown or yellow brown to grey brown in colour, consisting of fine to medium grained sands, with clayey sands below depths of 1 m.
- In the higher areas/northern ridge (associated with sample location BH4), soils were observed to be yellow sand to the maximum installation depth of 2.25 m.

The sample locations from the investigation are shown in **Figure 4**, and the results generally align with the regional mapping.

2.2.3 Acid sulfate soils

Acid sulfate soils (ASS) is the name commonly given to naturally occurring soils and sediment containing iron sulphide (iron pyrite) materials. In their natural state, ASS are generally present in waterlogged and/or anoxic conditions and do not present any risk to the environment. ASS can pose issues when oxidised, producing sulphuric acid, which can present a range of risks for the surrounding environment, infrastructure and human health.

The Department of Water and Environment Regulation (DWER) provides broad-scale mapping indicating areas of potential ASS risk (DWER 2019). A review of the DWER mapping indicates that the site is classified as having a 'moderate to low risk' of ASS occurring within 3 m of the natural soil.

A Preliminary Acid Sulfate Soil Investigation undertaken for the site (Strategen 2010) and attached in **Appendix B**, found that based on the field tests, the potential for ASS was not detected within the sample locations in the site (BH4 and BH9, shown in **Figure 4**). Sample locations to the north and east of the site did show potential for ASS to occur, however further investigations would need to be undertaken to understand if management would be required.

2.3 Biodiversity and natural area assets

2.3.1 Flora and vegetation

2.3.1.1 Regional context

Native vegetation can be described and mapped at different scales or units in order to illustrate general patterns in its distribution. At a continental scale the *Interim Biogeographic Regionalisation of Australia* (IBRA) divides the Swan Coastal Plain into two floristic subregions, the Perth Plateau and the Dandaragan Plateau (Environment Australia 2000).

Vegetation complex mapping undertaken by Heddle *et al.* (1980) which uses a combination of landform, soil and rainfall parameters, indicate the site, for the major part, is within the Guildford Complex, with the north-west corner of the site located within the Southern River Complex.

The Guildford Complex is described as an open forest to tall open forest of *Corymbia calophylla – Eucalyptus wandoo – Eucalyptus marginata* and woodland of *Eucalyptus wandoo* (with rare occurrences of *Eucalyptus lane-poolei*). Minor components include *Eucalyptus rudis* and *Melaleuca rhaphiophylla* (Heddle *et al* 1980).

The Southern River Complex is described as open woodland of *Corymbia calophylla - Eucalyptus marginata - Banksia* spp. with fringing woodland of *Eucalyptus rudis - Melaleuca rhaphiophylla* along creek beds (Heddle *et al* 1980).

2.3.1.2 Site specific surveys and investigations

A level 1 flora and vegetation survey was carried out in October 2009 for the Picton East industrial park area (including Lots 1, 2, 11, 103, 603, 102 and 104) by Ekologica Pty Ltd (2009), and included the site. Due to the time that has elapsed since this survey was completed, Emerge Associates have undertaken a detailed review of the survey outcomes as well as a database review and a reconnaissance site visit in November 2019 to support preparation of the LSP. This was to ensure that all relevant conservation significant values, particularly those pursuant to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Biodiversity Conservation Act 2016* (BC Act) were appropriately considered.

The assessment methodology for the flora, vegetation and fauna values within the site is outlined further in **Appendix C**.

2.3.1.3 Vegetation units

The flora and vegetation survey undertaken by Ekologica Pty Ltd (2009), identified 44 species of native flora within the broader survey area, noting that non-native species were not recorded as these had been comprehensively covered in the surveys undertaken to support the *Advice on areas of conservation significance in the Preston Industrial Park* (EPA 2008). A copy of the flora and vegetation survey is provided in **Appendix D**.

Four vegetation units were identified within the survey area by Ekologica Pty Ltd (2009), with only three of these units identified within the site. A description of the vegetation units identified within the site has been provided in **Table 1** and is also shown in **Plate 1**.

Table 1: Vegetation units identified by Ekologica Pty Ltd (2009) within the site

Unit no.	Vegetation unit	Description
2	*Melaleuca* woodland/shrubland	Woodland or tall shrubland of *Melaleuca rhaphiophylla* or *M.preissiana* over shrubland of *M. lateritia* and/or *M. teretifola.*
3	JMA parkland	Woodland to open woodland of Jarrah, Marri and *Agonis flexuosa* over pasture species and weeds.
4	Plantation	Mixed plantings of eucalypts and other species with scattered original tree species.

The reconnaissance site visit by Emerge Associates in November 2019 confirmed that the vegetation observed within the site appears to largely align with the vegetation units identified within the previous survey (Ekologica Pty Ltd (2009), noting that:

- The area identified as a plantation has since been removed and now consists of paddock grasses. No updated aerials were available showing this.
- Within the *Melaleuca* woodland/shrubland unit in the northern central portion of the site (see **Plate 1**) some *Eucalyptus rudis* (flooded gum) individuals were observed in addition to the *Melaleuca* species.

Photos of the vegetation observed within the site as part of the reconnaissance site visit has been included in **Plate 2** and **Plate 3**.

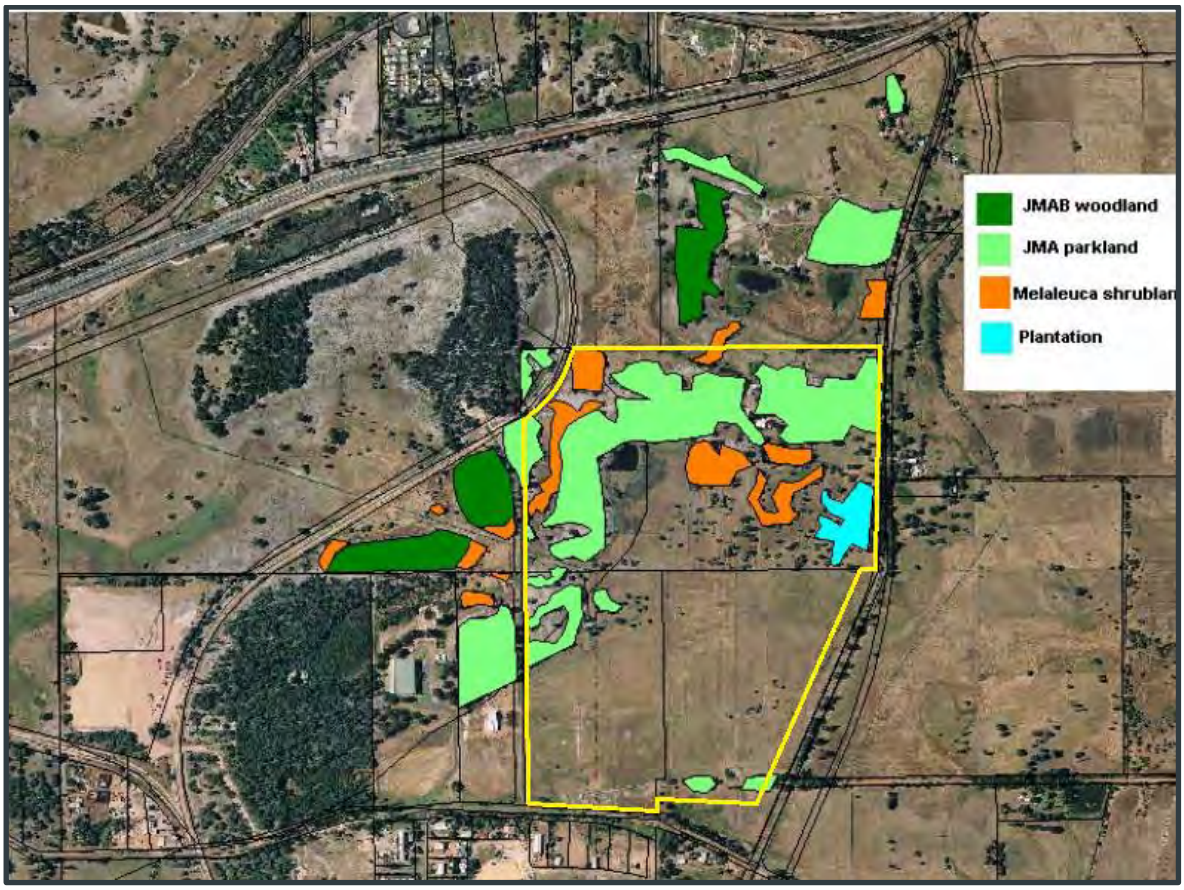

Plate 1: Excerpt from the level 1 flora and vegetation survey (Ekologica Pty Ltd 2009), showing the vegetation units identified within the site. The approximate site boundary is shown in yellow outline.

Plate 2: Example of 'JMA Parkland' vegetation unit, taken during the reconnaissance site visit November 2019

Plate 3: Example of 'Melaleuca woodland/shrubland' vegetation unit with Eucalyptus rudis (flooded gum) in foreground.

2.3.1.4 Vegetation condition

Vegetation condition within the site was assessed by Ekologica Pty Ltd (2009) using methods from Keighery (1994) which is still a relevant method for assessing vegetation condition.

Ekologica Pty Ltd (2009) found that due to the long history of grazing and partial clearing most of the native species (particularly ground covers, and mid storey species) had been replaced by pasture species and annual and perennial weeds associated with agriculture. Areas where native vegetation have been identified within the site (associated with overstorey species such as *Eucalyptus marginata*, *Agonis flexuosa* and *Corymbia calophylla*) have been assessed as in 'completely degraded' condition (Ekologica Pty Ltd 2009), and is shown in **Plate 4**.

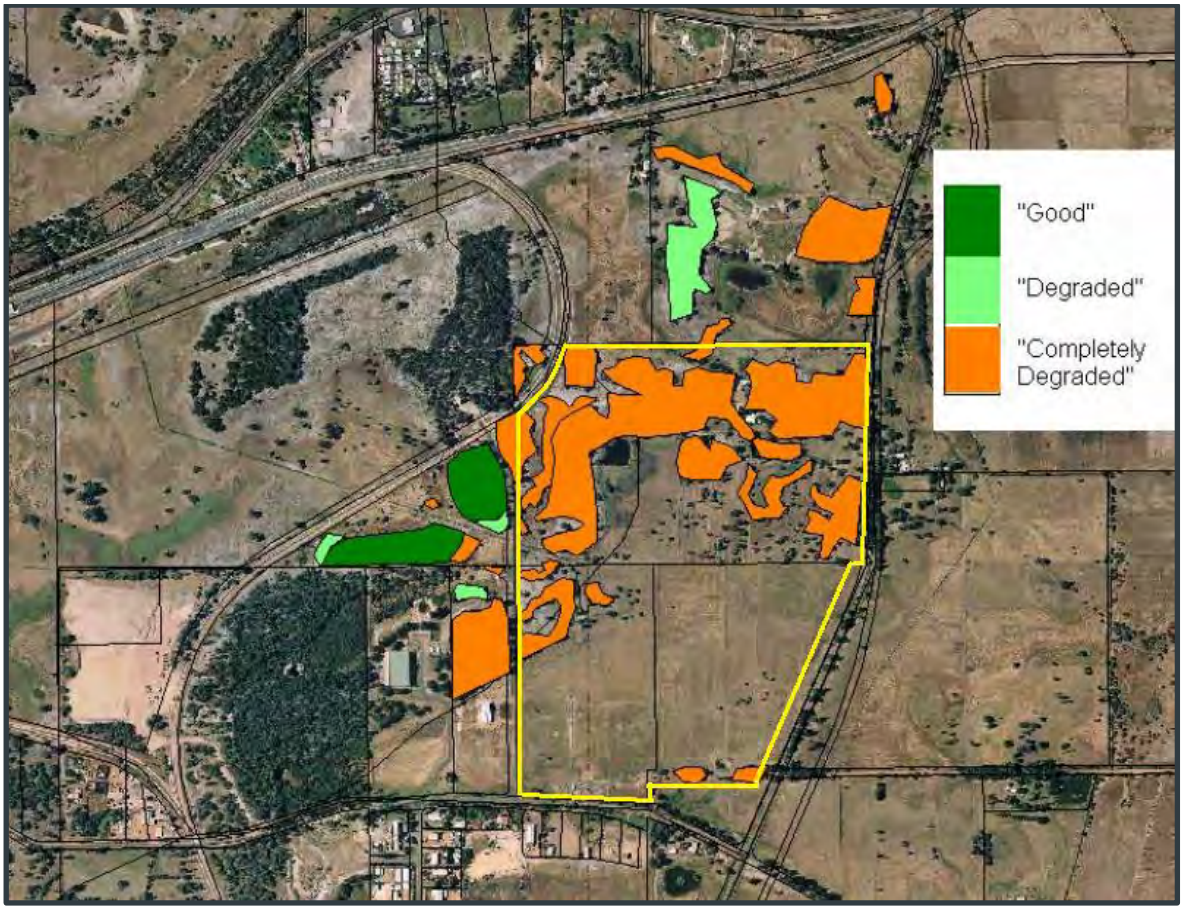

Plate 4: Excerpt from the Level 1 flora and vegetation survey (Ekologica Pty Ltd 2009) showing vegetation condition based on the method of Keighery (1994). The approximate site boundary is shown in yellow outline.

The reconnaissance site visit be Emerge Associates in November 2019 confirmed that the vegetation condition generally aligned with that documented in the Ekologica Pty Ltd (2009) survey.

2.3.1.5 Threatened and priority ecological communities

Generally, ecological communities can be described as vegetation communities that are assemblages of species that occur together in a particular type of habitat. An ecological community's structure, composition and distribution are determined by a range of environmental factors. 'Threatened ecological communities' (TECs) are ecological communities that are recognised as rare or under threat and therefore warrant special protection.

Selected TECs are afforded statutory protection at a Commonwealth level under the EPBC Act. TECs listed under the EPBC Act are categorised as either 'critically endangered', 'endangered' or 'vulnerable'. Any action likely to have a significant impact on a TEC listed under the EPBC Act (either critically endangered or endangered TECs) requires approval from the Commonwealth Minister for the Environment.

Within Western Australia TECs are determined by the Western Australian Threatened Ecological Communities Scientific Advisory Committee (WATECSAC) and endorsed by the State Minister for the Environment. The WATECSAC is an independent group comprised of representatives from organisations including tertiary institutions, the Western Australian Museum and DBCA. The TECs endorsed by the State Minister are published by DBCA (DBCA 2018b). TECs are afforded direct statutory protection at a State level under the BC Act and Biodiversity Conservation Regulations 2018 (BC regulations). Ecological communities are listed under Section 27(1) and 33 of the BC Act (although at the time this report was prepared no TECs had been formerly listed).

Their significance is also acknowledged through other state environmental approval processes such as 'environmental impact assessment' pursuant to Part IV of the *Environmental Protection Act 1986* (EP Act) and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

Section 43 of the BC Act requires that an occurrence of a threatened species or threatened ecological community is reported to DBCA where the occurrence has been identified as part of field work completed:

- as part of an assessment under Part IV of the *Environmental Protection Act 1986*; or
- in relation to an application for a clearing permit under the *Environmental Protection Act 1986* section 51E(1)(d).

Penalties apply to individuals and organisations that fail to provide accurate reports of threatened species or communities.

The *Biodiversity Conservation Regulations 2018* (BC Regulations 2018) came into effect on January 1 2019. The BC Regulations include provisions for licencing, charges, penalties and other provisions associated with the BC Act.

An ecological community under consideration for listing as a TEC in Western Australia, but which does not yet meet survey criteria or has not been adequately defined, or which is rare but not currently threatened, is referred to as a 'priority ecological community' (PEC). Whilst PECs are not afforded statutory protection in Western Australia, they are considered during the approval process.

The level 1 flora and vegetation survey (Ekologica Pty Ltd 2009) identified four TECs occurring within 10 km of the survey area. Given the time that has elapsed since the flora and vegetation survey was completed, the results of the survey have been compared to the status and current known locations of TECs and PECs within 10 km of the site.

TECs and PECs were searched for using the publicly available *Weed and native flora dataset* (Keighery *et al.* 2012), *Protected Matters Search Tool* (Department of Environment and Energy (DoEE) 2018) and Department of Biodiversity Conservation Attraction (DBCA) *NatureMap* (DBCA 2019c) and current lists of threatened and priority ecological communities (DBCA 2018; DBCA 2019a). These search results indicate that five TECs or PECs were identified as potentially occurring within 10 km of the site and are listed in **Table 2**. Within **Table 2**, Emerge Associates have indicated whether the flora and vegetation survey (Ekologica Pty Ltd 2009) considered the TECs or PECs identified as potentially occurring within the site.

Table 2: TECs and PECs potentially occurring within 10 km of the site based on relevant database searches and indication of whether these were considered within the Ekologica Pty Ltd (2009) survey.

TECs and PECs identified based upon database searches	Considered as part of previous survey (Ekologica Pty Ltd 2009)	Potential to occur within the site based on habitat preferences
Threatened ecological community (TEC) (state or federally listed)		
Banksia woodlands of the Swan Coastal Plan (SCP)	-	Yes
Clay Pans of the SCP, including the state listed communities: • Herb rich shrublands in clay pans (SCP08 – SCP community type 8) • Dense shrublands on clay flats (SCP09 – SCP community type 9).	✔	Yes
Corymbia calophylla – Xanthorrhoea preissii woodlands and shrublands of the SCP (EPBC Act)	✔	Yes
Corymbia calophylla woodlands on heavy soils of the southern Swan Coastal Plain (State)	-	Yes
Shrublands on calcareous silts of the SCP (State)	✔	Yes
Subtropical and temperate coastal saltmarsh (EPBC Act)	-	No
Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the SCP (EPBC Act)	-	Yes
Priority ecological community (PEC) (state listed)		
Banksia dominated woodlands of the Swan Coastal Plain IBRA region (Priority 3) (associated with the Banksia Woodlands of the Swan Coastal Plain TEC)	-	Yes
Low lying *Banksia attenuata* woodlands or shrublands ('floristic community type 21c') (Priority 3) (associated with the Banksia Woodlands of the Swan Coastal Plain TEC)	✔	Yes
Southern Banksia attenuata woodlands ('community type 21b') (Priority 3) (associated with the Banksia Woodlands of the Swan Coastal Plain TEC)	✔	Yes

Table 2: TECs and PECs potentially occurring within 10 km of the site based on relevant database searches and indication of whether these were considered within the Ekologica Pty Ltd (2009) survey. (continued)

TECs and PECs identified based upon database searches	Considered as part of previous survey (Ekologica Pty Ltd 2009)	Potential to occur within the site based on habitat preferences
Priority ecological community (PEC) (state listed) (continued)		
Southern *Eucalyptus gomphocephala - Agonis flexuosa* woodlands (associated with the Banksia Woodlands of the Swan Coastal Plain TEC)	-	No
Quindalup *Eucalyptus gomphocephala* and/or *Agonis flexuosa* woodlands	-	No

The flora and vegetation survey (Ekologica Pty Ltd 2009) did not identify any TECs or PECs as occurring within the site. It is relevant to note that as part of the *Advice on areas of conservation significance in the Preston Industrial Park* (EPA 2008), the EPA also did not identify any TECs as occurring within the study area (including the site).

As outlined within **Appendix C**, since the flora and vegetation survey (Ekologica Pty Ltd 2009) was completed, new TECs and PECs have been listed, in particular the 'Subtropical and temperate coastal saltmarsh' TEC, 'Banksia woodlands of the SCP' TEC and the 'Tuart woodlands and forests of the SCP' TEC. The reconnaissance site visit was undertaken to confirm the presence of key indicator species or features that would indicate these (or the other identified) communities may be present within the site.

The outcomes of the reconnaissance site visit (outlined in **Appendix** C) and review of existing site-specific data indicate the:

- Banksia woodland of the Swan Coastal Plain TEC is not likely to be present given no Banksia sp. are present within the site.
- *Corymbia calophylla* woodlands on heavy soils of the southern Swan Coastal Plain TEC is not likely to occur given relevant indicator species are not present.
- Subtropical and temperate coastal saltmarsh TEC is not likely to be present given suitable habitat relevant to this community is not present within the site.
- Tuart woodland and forest of the Swan Coastal Plain TEC is not likely to be present given no tuarts were observed within the site.

Therefore, based on the observations from the visit and data collected during the previous flora and vegetation survey, none of the TECs or PECs listed in **Table 2** are likely to occur within the site.

2.3.1.6 Significant flora

Certain flora species that are considered to be rare or under threat warrant special protection under Commonwealth and/or State legislation. At a Commonwealth level, flora species may be listed as 'threatened' pursuant to the EPBC Act and any action likely to have a significant impact on a listed threatened species requires approval from the Commonwealth Minister for the Environment.

In Western Australia flora species may also be classed as 'threatened' under the BC Act. It is an offence to 'take' or 'disturb' threatened flora listed under the BC Act without Ministerial approval.

Section 5(1)1 of the Act defines to take as including "… to gather, pluck, cut, pull up, destroy, dig up, remove, harvest or damage flora by any means" or to cause or permit the same to be done.

A search was conducted for threatened and priority flora within a 5 km radius of the site using the *Protected Matters Search Tool* (DoEE 2019b), *NatureMap* (DBCA 2019b) and searches conducted for the Bunbury Outer Ring Road (BORR Team 2019). A total of 8 threatened and 24 priority flora species were identified as occurring or potentially occurring in the wider local area. It is important to note that these searches do not take into account the types and condition of habitat occurring in the site, but are based on the proximity of the site to known occurrence of significant species.

Table 3: Threatened and priority flora occurring within 5 km of the site based on relevant database searches and indication of whether these were also considered within the previous survey (Ekologica Pty Ltd 2009)

Threatened and priority flora species based upon database searches	Conservation status		Species considered as part of previous survey (Ekologica Pty Ltd 2009)
	State	Federal	
Austrostipa jacobsiana	Critically endangered	Critically endangered	-
Caladenia huegelii	Critically endangered	Endangered	-
Drakaea elastica	Critically endangered	Endangered	-
Austrostipa bronwenae	Endangered	Endangered	-
Drakaea micrantha	Endangered	Vulnerable	-
Diuris drummondii (Tall Donkey Orchid)	Vulnerable	Vulnerable	✔
Diuris micrantha	Vulnerable	Vulnerable	
Eleocharis keigheryi	Vulnerable	Vulnerable	-
Synaphea odocoileops	Priority 1	-	-
Craspedia sp. Waterloo (G.J. Keighery 13724)	Priority 2	-	-
Grevillea rosieri	Priority 2	-	-
Leptomeria furtiva	Priority 2	-	-
Leucopogon sp. Busselton (D. Cooper 243)	Priority 2	-	-
Schoenus loliac	Priority 2	-	-
Angianthus drummondii	Priority 3	-	-
Carex tereticaulis	Priority 3	-	✔
Chamaescilla gibsonii	Priority 3	-	✔
Dillwynia dillwynioides	Priority 3	-	-
Lasiopetatum membranaceum	Priority 3	-	✔
Platysace ramosissima	Priority 3	-	-
Schoenus benthamii	Priority 3	-	-
Schoenus capilifolius	Priority 3	-	✔

Table 3: Threatened and priority flora occurring within 5 km of the site based on relevant database searches and indication of whether these were also considered within the previous survey (Ekologica Pty Ltd 2009) (continued)

Threatened and priority flora species based upon database searches	Conservation status		Species considered as part of previous survey (Ekologica Pty Ltd 2009)
	State	Federal	
Verdicordia attenuata	Priority 3	-	✔
Acacia flagelliformis	Priority 4	-	✔
Acacia semitrullata	Priority 4	-	-
Aponogeton hexatepatus (Stalked Water Ribbons)	Priority 4	-	✔
Caladenia speciose	Priority 4	-	-
Eucalyptus rudis subsp. cratyantha	Priority 4	-	-
Ornduffia submersa	Priority 4	-	-
Pultenaea skinneri	Priority 4	-	✔
Rumex drummondii	Priority 4	-	-
Stylidium longitubum (Jumping Jacks)	Priority 4	-	-

The flora survey undertaken by Ekologica Pty Ltd (2009) did not record any threatened or priority flora species within the site.

Based on the reconnaissance site visit which confirmed the highly disturbed nature of the site as a result of historical clearing and long-term use of the site for agricultural (predominantly grazing) purposes, it is considered highly unlikely that any occurrences of threatened or priority flora species would be found within the site.

2.3.2 Ecological linkages

Ecological linkages are linear landscape elements that allow the movement of fauna, flora and genetic material between areas of remnant habitat. The movement of fauna and the exchange of genetic material between vegetation remnants improve the viability of those remnants by allowing greater access to breeding partners and food sources, refuge from disturbances such as fire and maintenance of genetic diversity of plant communities and populations. Ecological linkages are ideally continuous or near-continuous as the more fractured a linkage is, the less ease flora and fauna have in moving within the corridor (Alan Tingay and Associates 1998).

The Perth Biodiversity Project, supported by the Western Australia Local Government Association (WALGA), have identified and mapped regional ecological linkages within the Perth Metropolitan Region (WALGA and PBP 2004). The study was extended beyond the Perth Metropolitan Region through the South West Biodiversity Project, resulting in the identification and mapping of the South West regional ecological linkages (Molloy *et al.* 2009).

There are no mapped ecological linkages within the site. One regional ecological linkage (no. 215) is mapped approximately 870 m west of the site, extending in a north-south direction. The facilitation

of this ecological linkage is considered as part of the vegetation retention within the *Picton Industrial Park Southern Precinct District Structure Plan* (DPLH 2018)

2.3.3 Environmentally sensitive areas

'Environmentally sensitive areas' (ESAs) are prescribed under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* and have been identified to protect native vegetation values of areas surrounding significant, threatened or scheduled flora, vegetation communities or ecosystems. Exemptions under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* do not apply within ESAs. However, exemptions under Schedule 6 of the EP Act still apply, including any clearing in accordance with a subdivision approval under the *Planning and Development Act 2005* (a recognised exemption under the Schedule 6 of the EP Act).

No ESAs occur within or in close proximity to the site based upon a review of the *Clearing Regulations – Environmentally Sensitive Areas* dataset (DWER 2017).

2.3.4 Local biodiversity strategy

A *Local Biodiversity Strategy Discussion Paper* (Ironbark Environmental & Eco Logical Australia 2009) has been prepared for the Shire of Dardanup, to identify significant natural areas and determine how these areas could be protected as part of future development. Areas of remnant vegetation within the site have been identified as part of a 'Local Natural Area'. As part of ongoing management, the *Local Biodiversity Strategy Discussion Paper* (Ironbark Environmental & Eco Logical Australia 2009) recommends that the Shire of Dardanup Local Planning Scheme make provision for the protection of the 'Subdivision/Rezoning Areas' and 'Restoration and Enhancement Areas' identified by the EPA (2008) in *Advice on areas of conservation significance in the Preston Industrial Park*.

None of the areas recommended by the EPA (2008) for protection or enhancement are identified within the site. Considerations around biodiversity values are discussed further in **Section 4.2**.

2.3.5 Terrestrial fauna

A level 1 fauna survey was carried out by qualified zoologist Greg Harewood in December 2009 for the Picton East industrial park area (including Lots 1, 2, 11, 103, 603, 102 and 104). The survey included a targeted western ringtail possum survey in addition to a targeted black cockatoo habitat assessment in accordance with the technical guidance relevant at the time of the survey. A copy of the fauna assessment is provided in **Appendix E** and the outcomes summarised in the section below.

As outlined further above, due to the time that has elapsed since the survey was completed, Emerge Associates have undertaken a detailed review of the survey outcomes as well as a database review and a reconnaissance site visit in November 2019 to support preparation of the LSP. This was to ensure that all relevant conservation significant values, particularly those pursuant to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Biodiversity Conservation Act 2016* (BC Act) were appropriately considered. The assessment methodology applied to the preparation of the EAMS is outlined further in **Appendix C**.

2.3.5.1 Species of conservation significance

Certain fauna species that are considered to be rare or under threat warrant special protection under state and/or federal legislation. At a federal level, fauna species may be listed as 'threatened' pursuant to the EPBC Act and any action likely to have a significant impact on a listed threatened species requires approval from the Commonwealth Minister for the Environment.

In Western Australia, fauna taxa may be classed as 'specially protected' under the BC Act which is enforced by DBCA. Specially protected fauna species are listed under Schedules 1 to 7 according to their conservation status. It is an offence to 'take' or 'disturb' threatened fauna without Ministerial approval.

Fauna species that do not currently meet the criteria for listing as threatened but are potentially rare or threatened may be added to the DBCA's *Priority Fauna List*. These species are classified into 'priority' levels based on threat. Whilst priority species are not under direct statutory protection, they are considered during State approval processes.

To understand the extent of significant fauna species that are likely to occur within the local area, searches were undertaken of the DBCA's NatureMap database (DBCA 2019c) and the DoEE Protected Matters database (DoEE 2019b). It is important to note that these searches do not take into account the types and condition of fauna habitat occurring on the site, but are based on the proximity of the site to known occurrence of significant species. The conservation significant fauna species identified as potentially occurring within the site and the current conservation status are listed below in **Table 4**.

Table 4 also indicates whether any of the species listed below were identified during the level 1 fauna survey, the potential for suitable habitat to be present within the site and the potential impact of the proposed development on the habitat. It is relevant to note, that where a species was not identified and/or discussed within the level 1 fauna survey (Harewood 2009), the potential for suitable habitat to be present within the site has been based on desktop assessment of the habitat requirements and a consideration of site conditions observed during the reconnaissance site visit.

Table 4: Conservation fauna known to occur within the vicinity of the site based upon database searches and fauna identified during the Level 1 fauna survey (Harewood 2009) Conservation codes are outlined within Harewood (2009).

Species		Conservation status		Habitat present in site ((Harewood 2009) and desktop search)	Potential impact on habitat ((Harewood 2009 and desktop review))	Species identified utilising the broader survey area (Harewood 2009)
Common name	Scientific name	State	Federal			
Australasian Bittern	*Botaurus poiciloptilus*	EN	EN	No	None	-
Red Knot	*Calidris canutus*	EN	EN & MI	No	None	-
Curlew Sandpiper	*Calidris ferruginea*	CR	CR & MI	No	None	-
Forest Red-tailed Black Cockatoo	*Calyptorhynchu banksia naso*	VU	VU	Yes	Loss of low value foraging and potential breeding habitat	✔
Baudin's Cockatoo	*Calyptorhynchus baudinii*	EN	EN	Yes	Loss of low value foraging and potential breeding habitat	✔
Carnaby's cockatoo	*Calyptorhynchus latirostris*	EN	EN	Yes	Loss of low value foraging and potential breeding habitat	✔
Eastern Curlew	*Numenius madagascariensis*	CR	CR & MI	No	None	-
Australian Painted-snipe	*Rostratula australis*	EN	EN	No	None	-
Australian Fairy Tern	*Sternula nereis nereis*	VU	VU	No	None	-
Balston's Pygmy Perch	*Nannatherina balstoni*	VU	VU	No	None	-
Chudtich	*Dasyurus geoffroii*	VU	VU	No	None	-
Western Ringtail Possum	*Pseudocheirus occidentalis*	CR	CR	Yes	Loss of foraging, refuge and dispersal habitat	✔
Fork-tailed Swift	*Apus pacificus*	MI	MI	Yes	None	-
Grey wagtail	*Motacilla cinereal*	MI	MI	No	None	-
Common Sandpiper	Actitis hypoleucos	MI	MI	No	None	-

Table 4: Conservation fauna known to occur within the vicinity of the site based upon database searches and fauna identified during the Level 1 fauna survey (Harewood 2009) Conservation codes are outlined within Harewood (2009).(continued)

Species		Conservation status		Habitat present in site ((Harewood 2009 and desktop search))	Potential impact on habitat ((Harewood 2009 and desktop review))	Species identified utilising the broader survey area (Harewood 2009)
Common name	Scientific name	State	Federal			
Sharp-tailed Sandpiper	*Calidris acuminata*	MI	MI	Yes (flooded paddocks)	None	-
Pectoral Sandiper	Calidris melanotos	MI	MI	No	None	-
Osprey	*Pandion haliaetus*	S5	MI	No	None	-
Cattle Egret	*Ardea ibis*	S4	MI	Yes (flooded paddocks)	Loss of some degraded foraging habitat	-
Great Egret	*Ardea alba*	S4	MI	Yes (flooded paddocks)	Loss of some degraded foraging habitat	✔
White-bellied sea eagle	*Haliaeetus leucogaster*	S3	MI	No	None	-
Rainbow Bee-eater	*Merops ornatus*	MI	MI	Yes	Loss of potential breeding habitat	✔
Painted snipe	*Rostratula benghalensis (sensu lato)*	EN	EN	Potentially	None	-

Six fauna species of conservation significance were identified as utilising the survey area as part of the level 1 fauna survey (Harewood 2009), including:

- **Western ringtail possum**. the presence of western ringtail possum throughout the survey area (including the site) was identified through scats and dreys, with the location of these observations shown in **Plate 5** and **Plate 6**. The remnant vegetation in the north-western portion of the site contained a number of dreys as well as scats, and linked with areas of use identified outside the site. It is possible that the evidence observed may be the result of transient individuals temporarily residing in the area as opposed to a viable resident population (Harewood 2009). Protection of habitat values is considered further in **Section 4.3**.
- **Three black cockatoo species**. foraging evidence by the three black cockatoo species (Carnaby's, Baudin's and forest red-tailed) was identified within the survey area in the form of chewed marri nuts with three FRTBC's also observed during the survey. A number of trees with hollows were identified within the survey area (including at least one with a large hollow in the western portion of the site) that may possibly be suitable for nesting (i.e. a large enough hollow), although no evidence of actual breeding was observed at the time (Harewood 2009). No roosting trees were identified as part of the survey (Harewood 2009). Protection of habitat values is considered further in **Section 4.3**.

- **Great Egret**. A Great Egret was observed in the broader survey area; however, it is unlikely to breed in the area and the site is unlikely to provide significant habitat.
- **Rainbow Bee-eater**. A Rainbow Bee-eater was observed foraging and roosting within the broader survey area during the survey period, with the potential to breed in some areas based on the identified characteristics. This species is widespread and therefore development of the site is unlikely to significantly impact the species.

Other species of conservation significance identified as having habitat present, including the fork tailed-swift, sharp-tailed sandpiper, pectoral sandpiper and cattle egret, are unlikely to breed in the site and the site is unlikely to provide significant habitat. Therefore, development is unlikely to impact these species.

Overall, while fauna species of conservation significance were identified utilising the site, the site is considered to have overall low biodiversity value from a fauna perspective due to the degraded nature of the vegetation (i.e. completely degraded) and associated habitat (Harewood 2009), and this was supported by observations during the 2019 reconnaissance site visit.

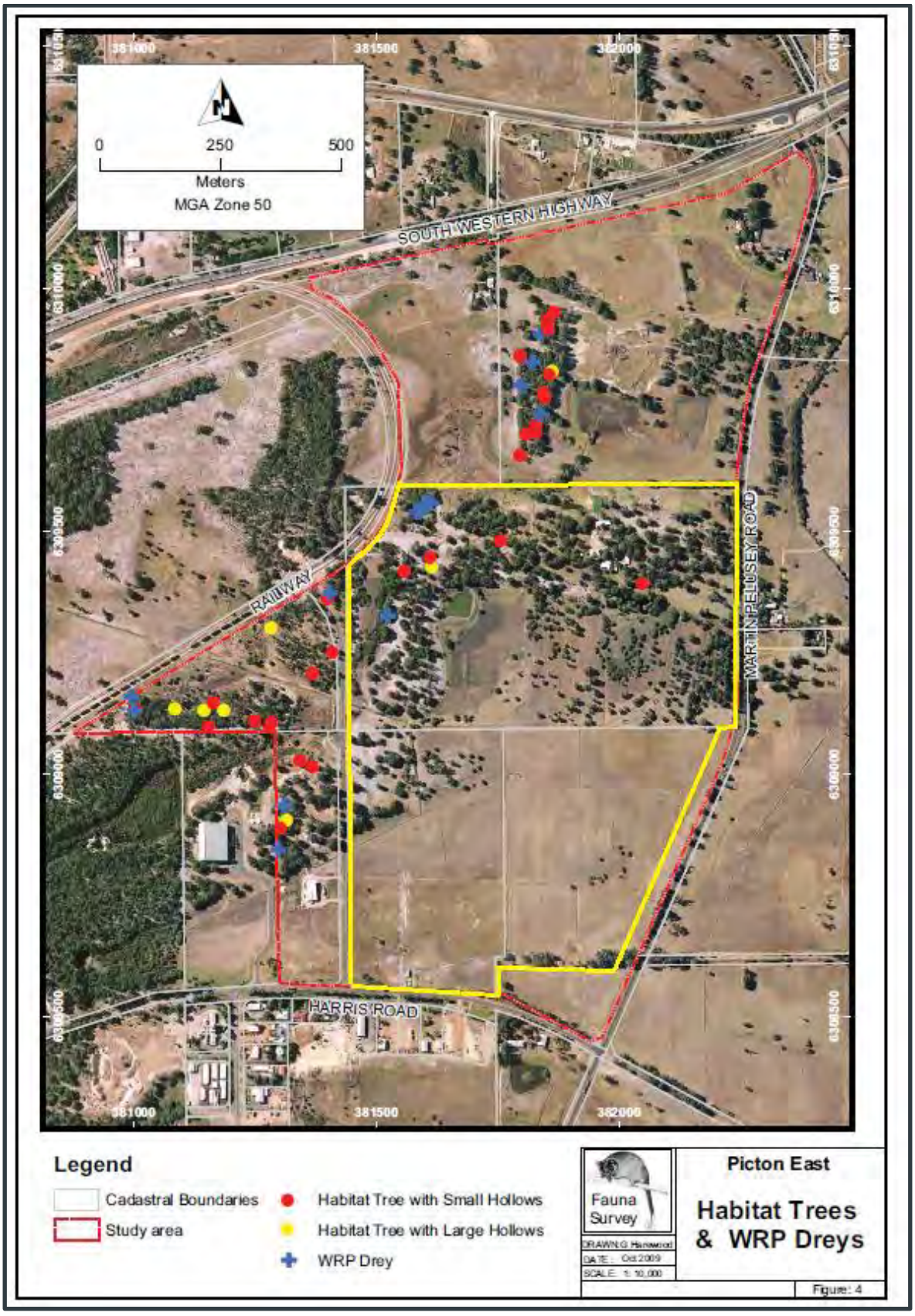

Plate 5: Excerpt from the Level 1 fauna survey (Harewood 2009) showing the location of habitat trees and western ringtail possum dreys. The approximate site boundary is shown in yellow outline

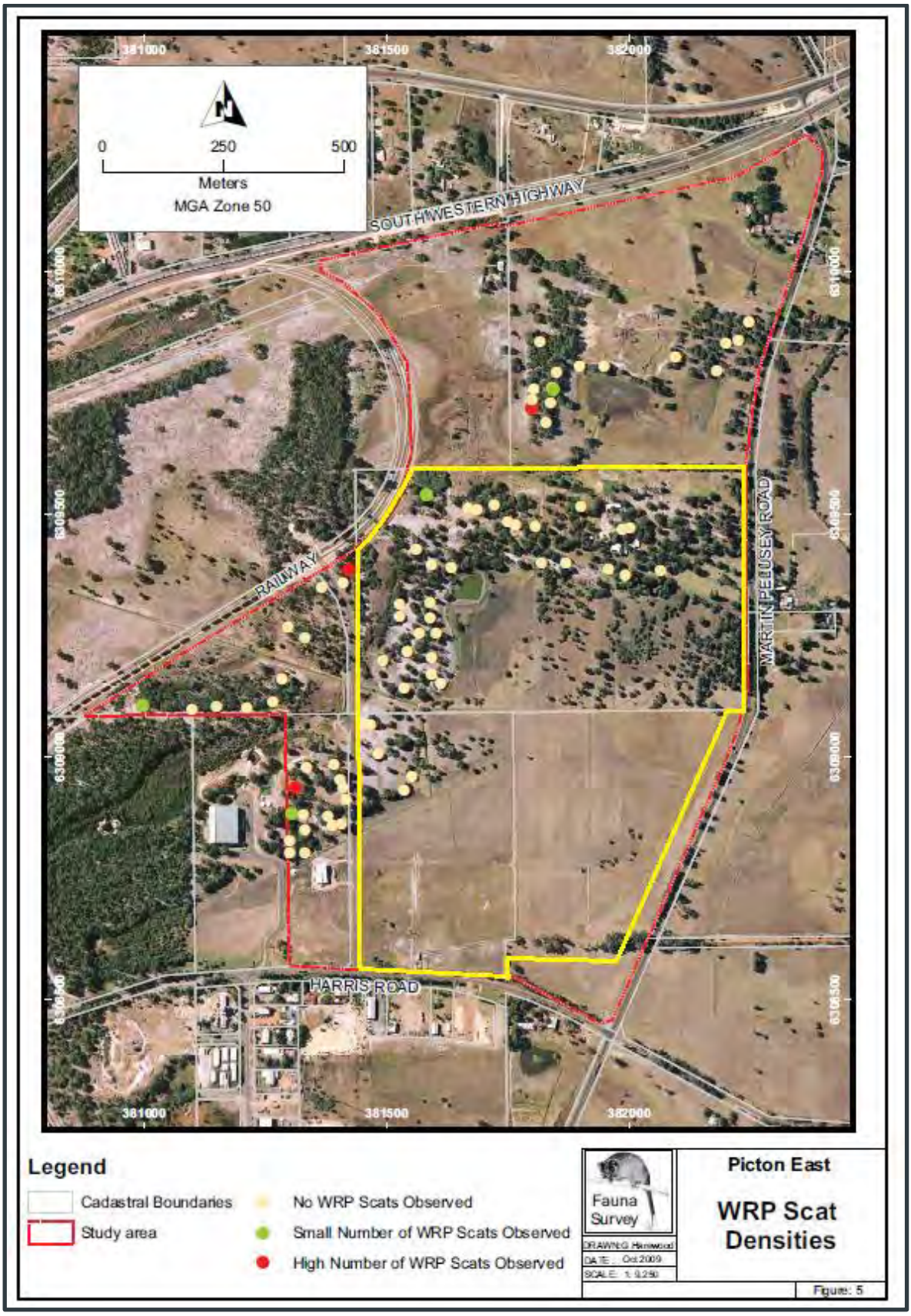

Plate 6: Excerpt from the Level 1 fauna survey (Harewood 2009) showing western ringtail possum scat densities The approximate site boundary is shown in yellow outline

2.4 Hydrology

2.4.1 Groundwater

Information on the regional groundwater resources obtained from the *Water Register* (DWER 2019c) indicates that the site is underlain by a multi-layered aquifer system comprised of the Perth – Superficial Swan, Perth – Leederville and Perth – Yarragadee South resources.

Groundwater level monitoring was carried out by TME (2012) between October 2010 and December 2012 at nine monitoring bores installed within Lot 103 and Lot 603, as shown in **Figure 3**. This monitoring program captured two winter peaks and one summer low. The monitoring indicated that depth to groundwater from the natural surface over 2011 and 2012 ranged from 0.05 m to 3.4 m, with seasonal fluctuation across the bores ranging from 0.25 m to 2.7 m (TME 2012). The monitoring indicated the groundwater generally flowed from the south-east to the north-west corner of the site (TME 2012).

Measured maximum groundwater level (MGL) occurred in August 2011 in seven bores and in September 2011 in two bores. The depth to MGL at each bore ranged from 0.05 m to 0.9 m below natural surface (TME 2012). MGL contours across the site are shown on **Figure 3.**

Given the date of the pre-development monitoring program. Groundwater levels within the bores was measured again on the 22nd August 2019 (Emerge Associates 2019b). While Bore 8 was destroyed, depth to groundwater at the other bores ranged from 0.06 to 1.1 m below natural surface. These are generally consistent with winter groundwater levels measured in 2011 and 2012, but are still lower than the MGL measured in 2011. Therefore, the MGL contours derived from data collected in 2011-2012 are still valid and are shown in **Figure 3**.

Groundwater is generally close to the surface and consequently, groundwater quality is a reasonable indicator of likely surface water quality. Groundwater monitoring of the nine bores by TME (2012) included sampling for physio-chemical parameters in situ and laboratory analysis of nutrient, metal and salinity concentrations. Measured groundwater quality is provided in **Appendix F**. The analysis of groundwater found that Total Nitrogen (TN) and Total Phosphorus (TP) levels beneath Lot 103 and Lot 603 exceeded ANZECC and ARMCANZ (2000) default trigger values for slightly disturbed ecosystems in the south-west coast, however is not unexpected given the historic agricultural land uses within the site (TME 2012).

2.4.2 Surface water

The site is located within the Leschenault Estuary Catchment, which is included within the *Leschenault Estuary Water Quality Improvement Plan* (DoW 2012).

Small farm drains and dams occur across the site and ultimately contribute to the East Picton Main Drain located to the west of the site, which is currently managed by the Water Corporation. Indicative mapping of these features from the *Hydrography linear* dataset (DWER 2019b) are shown in **Figure 5**. This dataset does not capture all of the existing farm drains or dams located across the site.

The site either discharges directly into East Picton Sub Drain C, or into a tributary (East Picton Sub-Section D and East Picton Sub-Section E). The site then ultimately discharges to the East Picton Main Drain and then the Ferguson River before entering the Preston River. The Ferguson River is located approximately 900 m south of the site.

2.4.3 Wetlands

Wetlands are areas which are permanently, seasonally or intermittently waterlogged or inundated with water. Naturally occurring wetland features are common across the Swan Coastal Plain and can contain fresh or salty water, which may be flowing or still. Wetlands can be further categorised based on their hydrological characteristics and physical structure.

The location, mapped boundaries and management categories of wetlands across the Swan Coastal Plain were originally identified in the *Wetlands of the Swan Coastal Plain: Wetland Mapping, Classification and Evaluation* (Hill et al. 1996). This information was subsequently converted into the publicly available *Geomorphic Wetlands of the Swan Coastal Plain* database, which is maintained by the Department of Biodiversity, Conservation and Attractions (DBCA). The management categories of wetlands are conservation, resource enhancement and multiple use, and are detailed in **Table 2**.

Table 5: Geomorphic Wetlands of the Swan Coastal Plain management categories (Hill et al. 1996)

Management category	Description of wetland	Management objectives
Conservation (CCW)	Support high levels of attributes	Preserve wetland attributes and functions through reservation in national parks, crown reserves and state-owned land. Protection provided under environmental protection policies.
Resource Enhancement (REW)	Partly modified but still supporting substantial functions and attributes	Restore wetland through maintenance and enhancement of wetland functions and attributes. Protection via crown reserves, state or local government owned land, environmental protection policies and sustainable management on private properties.
Multiple Use (MUW)	Few wetland attributes but still provide important hydrological functions	Use, development and management considered in the context of water, town and environmental planning through land care.

A review of the *Geomorphic Wetlands on the Swan Coastal Plain* dataset (DBCA 2019b) indicates that there are a number of geomorphic wetlands within the site. The geomorphic wetlands are shown in **Figure 5.** These wetlands are identified as multiple use wetlands and include UFI #14329, UFI #1554, and UFI #1555.

2.4.4 Public drinking water source areas

Public drinking water source areas (PDWSAs) are proclaimed by the Department of Water and Environmentally Regulation (DWER) to protect identified drinking water sources, including surface water and groundwater sources (DoW 2009b). They are proclaimed under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* or the *Country Areas Water Supply Act 1947* as Water Reserves, Catchment Areas or Underground Water Pollution Control Areas. PDWSAs provide the population with the majority of its drinking water supplies and can be vulnerable to contamination from a range of land uses. Once an area is identified as a PDWSA, consideration needs to be given to the intended land use and associated activities to ensure that they are appropriate in meeting the water protection quality objectives of the area.

The site is not located within a PDSWA nor are there any wellhead protection zones (where public drinking water is extracted from) in the vicinity of the site.

2.5 Heritage

2.5.1 Indigenous heritage

The Aboriginal Heritage Inquiry System (AHIS) is maintained pursuant to Section 38 of the *Aboriginal Heritage Act 1972* (AHA) by the Department of Planning, Lands and Heritage, containing information on Registered Aboriginal Heritages Sites and Other Heritage Places throughout Western Australia.

In accordance with the *Aboriginal Heritage Due Diligence Guidelines* (DAA 2013), a search of the AHIS online database (DAA 2015) was undertaken. No Registered Aboriginal Heritage Sites have been identified within the site. Approximately 20 m to the south of the site is an identified 'Other Heritage Place' Site ID 18886 Bunbury Bypass Archaeological Site 3.

The site falls within an area where a number of heritage surveys have been completed, including:

- Survey area 19390 (1) –Bunbury Bypass Road
- Survey area 104608 (1) – Bunbury Wellington Regional Planning Study: Aboriginal Heritage and Planning Survey: working paper no. 6.
- Survey area 20283 (1) – an addendum to a desktop preliminary Aboriginal heritage survey for Water Corporations proposed development of the Yarragadee aquifer extending to the Blackwood groundwater area.

Based on extent of disturbance (i.e. clearing and cultivation of the land) and the extent of previous surveys completed within the area, it is unlikely any Aboriginal heritage sites exist within the site. However, it is important to note that if during construction Aboriginal artefacts or sites are uncovered, these are protected under the AHA and works should cease and a suitably qualified expert should be brought in to survey the potential site. If required, based on the outcomes of the survey, permission under the AHA to manage and disturb sites should be sought.

2.5.2 Non-Indigenous heritage

A desktop search of the Australian Heritage Database (Department of the Environment 2019), the State Heritage Office database (Heritage Council 2019) and the Shire of Dardanup Local Government Inventory (Shire of Dardanup 2003) indicated there are no registered heritage sites within the site.

2.6 Other land use considerations

2.6.1 Historic and existing land uses

Based on a review of publicly available historic aerial imagery (Landgate 2019), the majority of the site was historically cleared of native vegetation prior to 1996 and has largely been used for agricultural purposes. Minimal regrowth of native vegetation has occurred within the site since clearing occurred.

The northern portion of the site contains a number of existing buildings and sheds, with the majority of the land predominately used for agricultural purposes including grazing and plantations, while a timber saleyard currently operates within Lot 110 (and is likely to remain in the future).

2.6.2 Potential site contamination

A review of the DWER *Contaminated Sites Database* indicates that the site is not registered as a contaminated site pursuant to the *Contaminated Sites Act 2003*, nor are other registered sites located nearby. In addition, a review of the Department of Defence Unexploded Ordinance (UXO) search tool did not identify any potential risk of UXO occurring within the site. Historic agricultural land uses, primarily low-intensity activities such as grazing, and plantations, are considered unlikely to raise any significant contamination risk concerns for the site.

2.6.3 Surrounding land uses

The site forms part of the Picton Industrial Park Southern Precinct area (DPLH 2018) while the Waterloo Industrial District Structure Plan (WAPC 2019) is located immediately to the east of Martin-Pelusey Road, with the Wanju District Structure Plan (prepared to support residential development) further to the north. The site forms part of a larger industrial area that has been earmarked for development since the mid 1990's (EPA 2008) and is zoned 'general industry', which could include a range of industrial land uses including service stations, storage and transport depots as an example.

The current land uses and zoning surrounding the site include:

- Land zoned 'industrial deferred' under the GBRS to the north of the site and is currently used for agricultural purposes.
- Land immediately to the north-west zoned 'railway' and is currently used as a freight line.
- Areas to the west zoned 'industrial' and 'rural', with Columbas Drive located immediately to the west of the site, and current agricultural land uses further west.
- Land zoned 'industrial' to the south, with existing industrial land uses operating south of Harris Road.
- Land zoned 'primary regional roads' immediately to the east of the site associated with the previous proposed alignment of the Bunbury Outer Ring Road. The land to the east of Martin

Pelusey Road is currently used for agricultural purposes, however is zoned for future industrial land use (as part of the Waterloo Industrial District Structure Plan (WAPC 2019)) .

There are no land uses identified surrounding the site that would be incompatible with the proposed future industrial development within the site.

2.7 Bushfire hazards

The site and surrounding areas have been identified as bushfire prone under the *Map of Bush Fire Prone Areas* (OBRM 2019), as shown in **Plate 7**.

The identification of bushfire prone areas within any portion of the site requires a further assessment of the bushfire hazard implications on development proposed within the site to be undertaken in accordance with *State Planning Policy 3.7 Planning in Bushfire Prone Areas* (SPP 3.7) (WAPC 2015a) and the *Guidelines for Planning in Bushfire Prone Areas Version 1.3* (the Guidelines) (WAPC and DFES 2017). This has been addressed through the preparation of a Bushfire Management Plan (BMP) (Emerge Associates 2019a).

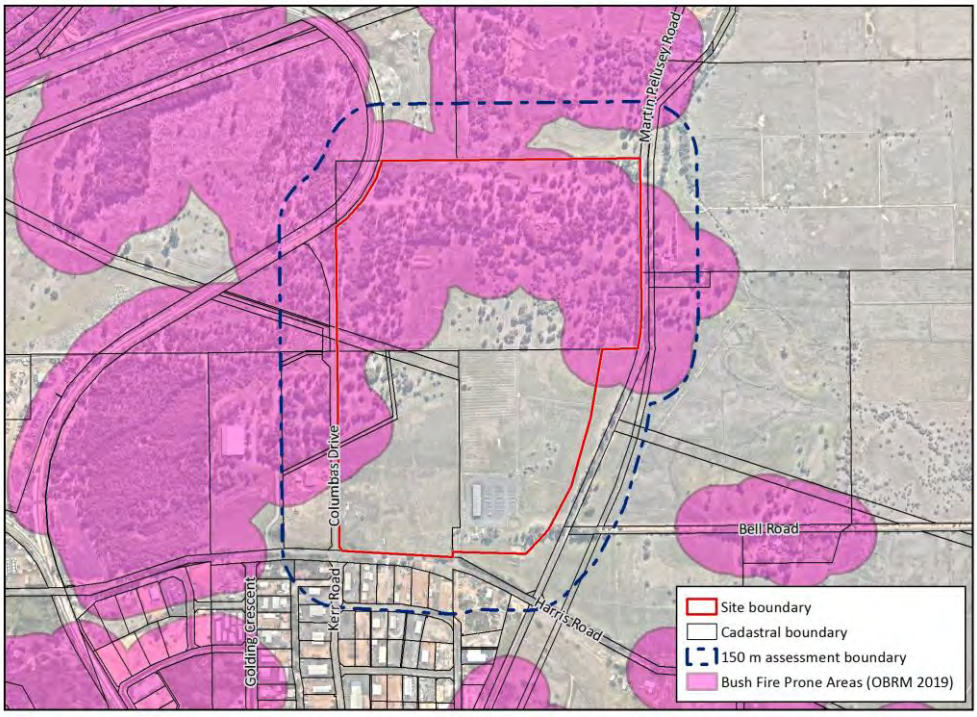

Plate 7: Areas within and surrounding the site identified as 'bushfire prone areas' (as indicated in purple) under the state-wide Map of Bush Fire Prone Areas (OBRM 2019).

All areas within the site and surrounding 150 m have been assessed for the presence of bushfire prone vegetation which has been classified as per Table 2.5 of *Australian Standard 3959-2018 Construction of buildings in bushfire prone areas* (AS 3959) (Standards Australia 2018) to determine the associated bushfire hazard rating levels in accordance with the Guidelines. The pre-development vegetation classifications is shown in **Figure 6**.

The bushfire hazards (associated with areas of 'classified' vegetation) likely to affect development within the site are largely associated with areas of:

- Existing forest vegetation to the north-west of the site, as well as an area of proposed public open space in the north-west corner of the site which is currently a 'woodland' classification by will be revegetated as part of the proposed development and will be revegetated to a forest classification.
- Woodland vegetation within private landholdings surrounding the site to the east, west and north.
- Scrub vegetation located to the north-west of the site.
- Grassland vegetation largely associated with private landholdings to the east, south, west and north of the site.

All vegetation except the areas of forest vegetation are associated with areas proposed for future industrial development, so are likely to be removed in the long-term.

2.8 Summary of relevant environmental factors

Table 6 provides a summary of the environmental values/factors that have been investigated for the site and outlines those that will require further specific consideration as part of future development within the site, and if applicable these are discussed further in **Section 4**.

Table 6: Relevant environmental values/factors and considerations for the site.

Environmental value/ factor	Relevant considerations
Landform and soils	Regional ASS risk mapping indicates the site is located within an area identified as having a 'moderate to low' risk of ASS occurring within 3 m of the natural soil surface. The previous investigation (Strategen 2010) undertaken for the site did not detect potential for ASS within the site as part of field sampling, however the sampling was not extensive and this factor requires further consideration and is addressed in **Section 4.1.**
Flora and vegetation	No conservation significant flora and vegetation values have been identified within the site. However, the retention of native vegetation values within the site is a relevant consideration and is addressed further in **Section 4.2.**
Ecological linkages	No ecological linkages have been identified within the site. Maintaining linkages with vegetation values surrounding the site is considered in **Section 4.2**, and no further specific consideration of this factor is provided as part of this EAMS.
Environmentally sensitive areas (ESAs)	There are no ESAs mapped as being present within the site. Development within the site is not proposed to impact on any identified ESAs, and accordingly no further consideration of this factor is required as part of this EAMS.
Terrestrial fauna	The proposed development has the potential to impact conservation significant fauna species. Protection and management of these species and associated habitat is addressed further in **Section 4.3.**

Table 6: Relevant environmental values/factors and considerations for the site.

Environmental value/ factor	Relevant considerations
Groundwater	Depth to MGL ranges between 0.05 m in the south-west and 0.9 m in the northern portion of the site. Management of groundwater is considered as part of the Local Water Management Strategy (LWMS) (Emerge Assocaites 2019b) and is discussed further in **Section 4.4**.
Surface water	The site either discharges directly into East Picton Sub Drain C, or into a tributary (East Picton Sub-Section D and East Picton Sub-Section E). The site then ultimately discharges to the East Picton Main Drain and then the Ferguson River before entering the Preston River. Management of stormwater will be a consideration for future development and is discussed further in the LWMS and **Section 4.4.**
Wetlands	A number of multiple use wetlands (Unique Feature Identifier (UFI) 14329, 1554, and 1555) have been identified within the site. The presence of multiple use wetlands within the site does not require a specific spatial response as part of the structure plan as this management category contains few wetland attributes and is suitable for development if hydrological considerations are addressed appropriately. The standard urban water management process (applied through the planning process) will address the hydrological considerations and are considered in **Section 4.4**.
PDWSAs	The site is not located within a PDSWA nor are there any wellhead protection zones in the vicinity of the site, and accordingly no further consideration of this factor is required as part of this EAMS.
Aboriginal heritage	No further specific consideration for Aboriginal heritage is detailed within this EAMS. While no Aboriginal sites were identified within the site, it is important to note that if during construction Aboriginal artefacts or sites are uncovered, these are protected under the AHA and works should cease and a suitably qualified expert should be brought in to survey the potential site. If required, based on the outcomes of the survey, permission under the AHA to manage and disturb sites should be sought.
Non-indigenous heritage	No non-indigenous heritage values have been identified within, or in close proximity to the site and therefore no further consideration of this factor is provided as part of this EAMS.
Historic and existing land uses	The site has historically been used for a range of agricultural land uses, including grazing and plantations, with Lot 110 currently used as a timber saleyard. No further consideration of this factor is provided as part of this EAMS.
Potential site contamination	No registered contaminated sites were identified within or in proximity to the site, and previous land uses are not likely to have resulted in contamination. No further consideration of this factor is required as part of this EAMS.
Surrounding land uses	Given the site is located within a broader area that will be subject to future industrial development, it is unlikely that industrial activities within the site will result in noise, odour, air emission of amenity impacts on sensitive land uses. No further consideration of this factor is provided as part of the EAMS. Where industrial land uses are likely to have noise, odour or air emission impacts, these will be largely associated with activities that are prescribed pursuant to Part V of the EP Act and can be managed appropriately through this process. .
Bushfire hazard	Classified vegetation has been identified within the site and surrounds. Management of bushfire hazards is further considered in the BMP and **Section 4.6.**

3 Planning Framework and Proposal

3.1 Historic planning and environmental assessment context

The site is located in the Preston Industrial area, an area that has been planned for industrial development since the mid 1990's within a number of planning strategies, including the *Bunbury Wellington Plan* (WAPC 1995), *Industry 2030-Greater Bunbury Industrial Land and Port Access Planning* (WAPC 2000), *Picton Industrial Park Southern Precinct District Structure Plan* (DPLH 2018) and the Waterloo Industrial District Structure Plan (WAPC 2019). The preparation of these planning strategies has been based on strategic advice (pursuant to Section 16(e) of the EP Act) provided by the Environmental Protection Authority (EPA) and in particular *Bulletin 1282 Advice on areas of conservation significance in the Preston Industrial Park* (EPA 2008).

This advice specifically considered the remnant native vegetation values in this area and identified areas within the Preston Industrial Park area for retention and protection, including rezoning. The northern and western portion of the site were identified as part of 'Investigation Area 6', which included degraded and completely degraded condition vegetation of the Guildford and Southern River complexes, as well as habitat for threatened fauna species. However, while identified as part of an Investigation Area, none of the vegetation within the site was recommended for retention. Areas recommended for retention by the EPA are located immediately to the north-west and west of the site, as shown in **Figure 7**.

In addition to the consideration of native vegetation values, the EPA also indicated the following would need to be considered as part of future planning and development:

- Wetland buffers, where conservation category or resource enhancement wetlands are identified.
- Air quality, associated with emissions from industrial development. While air emissions will need to be considered, this will need to be addressed by individual industrial developments and can be managed through Part V of the EP Act.
- Noise, associated with industrial activities. Given the site is located within an area surrounded by future industrial development, noise impacts on sensitive land uses is unlikely to be a significant consideration and/or will be managed through individual industrial developments approvals pursuant to Part V of the EP Act.
- Water quality and quantity. This is considered through the preparation of the Local Water Management Strategy (LWMS) (Emerge Associates 2019b) and discussed in **Section 4.4**.
- Flood way mapping. No waterways or rivers are located in close proximity to the site, and stormwater management is considered within the LWMS (Emerge Associates 2019b) and discussed in **Section 4.4**.
- Solid and liquid waste disposal. Management of wastewater effluent disposal and industrial process wastewater is considered within the LWMS (Emerge Associates 2019b) and discussed in **Section 4.4.** Solid and liquid waste will also need to be addressed by individual industries in accordance with approvals pursuant to Part V of the EP Act.
- Acid sulfate soils. The site is identified as having a low to moderate risk of ASS and is considered further in **Section 4.1**.

- Requirement for construction materials, and in particular fill material to provide separation to groundwater. This has been considered as part of the LWMS (Emerge Associates 2019b) and in determining separation between finished floor levels and groundwater.
- Development priority, and progressing appropriate structure planning. The structure plan for the site has been prepared in consideration of the Department of Planning, Lands and Heritage development priorities and connects with existing development that has been progressed since the EPA's advice was prepared.

3.2 Picton Industrial Park Southern Precinct District Structure Plan

The DPLH and Western Australian Planning Commission (WAPC) prepared the *Picton Industrial Park Southern Precinct District Structure Plan* (2018) to support the development of the land in accordance with the industrial zoning under the Greater Bunbury Region Scheme and the broader Preston Industrial Park. As part of the DSP, it was the following would need to be considered as part of future development:

- Fauna habitat surveys to identify habitat for the western ringtail possum and red-tailed black cockatoos, and management plans where appropriate. Previous survey work (Harewood 2009) has identified use of remnant vegetation within the site by these species and is considered further in **Section 4.**
- Management plans for wetlands and remnant vegetation to be developed concurrently with any bushfire management plans. No wetlands of conservation significance are identified within the site or nearby and no areas of remnant vegetation were identified for retention within the site as part of the DSP, however the BMP (Emerge Associates 2019a) has been prepared in consideration of the outlined requirements. This is considered further in **Section 4**.
- Fill and draining of the land at the subdivision stage is to demonstrate that retained vegetation will be protected where possible and not impact upon water quantity and quality of wetlands. This is considered further in **Section 4** and the LWMS (Emerge Associates 2019b).
- A bushfire risk assessment/management plan is to be developed and must take into account the long-term revegetation outcomes associated with any wetlands and remnant vegetation management plans and the Ferguson River foreshore management plan. This has been considered as part of the BMP prepared for the site.
- A local water management strategy for local structure plan areas must be prepared to the satisfaction of the Department of Water and Environmental Regulation, in consultation with the local authorities, Department of Biodiversity, Conservation and Attractions and Water Corporation. An LWMS has been prepared for the site and is discussed in **Section 4** (and provided separately as part of the LSP).
- No industrial lots are permitted to directly back onto areas of remnant vegetation, wetlands or the Ferguson River. Sufficient setback should be provided between all new development abutting native remnant vegetation, taking account of any revegetation and/or changes to buffers/foreshores as a result of development of management plans for remnant vegetation, wetlands or the Ferguson River. This has been considered as part of preparing the LSP and is discussed in **Section 4**.

The LSP design and how the above requirements have been (or will be) addressed as part of future development is considered further in **Section 4**.

3.3 Proposed local structure plan

The proposed structure plan for the site will facilitate the future subdivision and development of the site for industrial purposes and is provided in **Appendix A**. The structure plan is intended to support:

- A number of industrial lots ranging in size from approximately 0.65 ha to 4.6 ha, with an approximate overall yield of 47 lots.
- An area of public open space approximately 3.9 ha in size in the north-west corner of the site that will be revegetated.
- Approximately 4.7 ha of drainage reserves, located across a number of different areas.
- An interconnected road network, including three 25 m integrator road reserves, and a number of 20 m wide local access roads.

3.4 Future planning approval process

Subject to approval and endorsement of the structure plan by the Shire of Dardanup and WAPC, industrial development of the site would be progressed through subdivision and/or development approvals (collectively referred to as 'future planning stages'). The key environmental values and attributes that require further consideration as part of future planning stages have been outlined in **Table 6** and **Section 4** of this report and include:

- Acid sulfate soils, and management during construction.
- Native vegetation, including protection and retention of existing vegetation
- Native fauna, including protection and retention of fauna habitat and management of fauna during construction.
- Hydrology (in particular stormwater) and wastewater.
- Bushfire risks, and provision of appropriate setbacks.

The WAPC can impose conditions on subdivision applications to ensure subdivision incorporates all the appropriate environmental management measures. These conditions are usually determined in accordance with WAPC's *Model Subdivision Conditions Schedule 2019* and include those relating to environmental considerations. It is envisaged that there would be future subdivision conditions applied for any subdivision within the site, that would deal with environmental, hydrological and bushfire related requirements.

4 Environmental Assessment and Management Strategy

This section outlines spatial layout considerations that should be accommodated within the structure plan to respond to environmental attributes and values within the site, as well as any future environmental management requirements that will need to be accommodated within future planning and development stages. Only those environmental values and attributes that require specific consideration based on their presence within the site, and/or the applicable legislation and policy requirements have been included in this section.

4.1 Acid sulfate soils

4.1.1 Policy framework, site context and management objectives

The Department of Water and Environmental Regulation (DWER), through the WAPC, ensures ASS are adequately managed during the land use planning and development process. The objective of the DWER's ASS policy framework is to manage ASS appropriately to prevent the release of metals, nutrients and acidity into the soil and groundwater system that may adversely affect the natural and built environment and human health.

The regional mapping produced by DWER indicates that the site is located within an area identified as 'moderate – low' threat of ASS occurring within 3 m of the natural soil surface. A limited field sampling program undertaken within the site (Strategen 2010) did not detect the potential for ASS within the samples taken from the site.

The principal management objective for acid sulfate soils within the site is to ensure that any future development that may disturb acid sulfate soils is appropriately managed to avoid impacts on the environment.

4.1.2 Structure plan layout considerations for acid sulfate soils

ASS management does not require any spatial consideration within the structure plan, and any ASS risk can be appropriately managed through future development planning.

4.1.3 Future acid sulfate soils management requirements

While the risk of ASS is 'moderate to low' within the site, ASS is only likely to be a consideration if excavation (primarily for services) extends below the permanent groundwater table. It is possible, depending upon the extent of fill within the site and location of services, that excavation could occur below the permanent groundwater table and if this is the case, additional ASS investigations may be required and could include the preparation of an Acid Sulfate Soils and Dewatering Management Plan.

The WAPC can include a standard condition on subdivision applications (model subdivision condition EN8 (WAPC and DPLH 2019)), which states:

An acid sulphate soils self-assessment form and, if required as a result of the self-assessment an acid sulphate soils report and an acid sulphate soils management plan shall be submitted to and approved

by the Department of Water and Environmental Regulation (DWER) before any subdivision works or development are commenced. Where an acid sulphate soil management plan is required to be submitted, all subdivision works shall be carried out in accordance with the approved management plan (Department of Water and Environmental Regulation).

The requirement for further ASS management will be confirmed in accordance with any subdivision conditions and/or as part of future development once detailed design has progressed.

4.2 Flora and vegetation

4.2.1 Policy framework, site context and management objectives

In the context of environmental impact assessment, the EPA objective for flora and vegetation is '*to protect flora and vegetation so that biological diversity and ecological integrity are maintained*' (EPA 2016a). Where a proposal may potentially impact upon flora and vegetation values, the following mitigation hierarchy should be applied to minimise potential impacts:

1. **Avoid** impacts
2. **Minimise** impacts
3. **Offset** impacts.

The vegetation across the majority of the site is in a 'completely degraded' condition, dominated by non-native grasses and weeds, with areas of native overstorey vegetation including *Corymbia calophylla*, *Eucalyptus marginata, Agonis flexuosa* and *Melaleuca* sp. No vegetation within the site has been identified as containing conservation significant values (i.e. TEC or threatened flora) based on the site-specific investigations, including the reconnaissance site visit. Furthermore, no areas within the site have been identified by the EPA (2008) or within the *Picton Industrial Park Southern Precinct District Structure Plan* (DPLH 2018) for retention or as a strategic ecological linkage.

The objective for future management of flora and vegetation within the site will be principally focused around maximising the retention of vegetation in public open space and opportunistically retaining paddock trees in road reserves and/or potentially lots.

4.2.2 Structure plan layout considerations for flora and vegetation

A portion of the remnant vegetation in the north-west corner of the site was identified to contain fauna habitat values, namely western ringtail dreys and potential black cockatoo nesting hollows. This area of vegetation is shown in **Figure 7** and is proposed to be protected and retained as part of public open space. It is not proposed to contain any drainage in order to minimise alteration of existing ground levels to enable the protection of vegetation (i.e. the drainage reserves are separate areas).

This area of public open space is located immediately adjacent to areas recommended for long-term retention to the west and north-west of the site as part of the EPA strategic advice (EPA 2008) *Picton Industrial Park Southern Precinct District Structure Plan* (DPLH 2018), and therefore contributes to the conservation of regionally significant vegetation values, even though no vegetation was recommended for retention within the site.

In order to ensure industrial lots do not back directly onto areas of retained remnant vegetation (as per the requirements of the *Picton Industrial Park Southern Precinct District Structure Plan* (DPLH 2018)), a road interface is proposed between the area of public open space containing remnant native vegetation and the future industrial lots, as shown in **Figure 7**.

Existing individual paddock trees may be identified for retention within lots and/or as part of road reserves, however will need to respond to site constraints such as level changes (i.e. the provision or removal of fill) and health/longevity considerations.

4.2.3 Future flora and vegetation management requirements

The remnant vegetation proposed to be retained within the public open space (as shown in **Figure 7**) will be protected and enhanced as part of future development, to improve the biodiversity values of the area (which is largely trees over paddock grasses) and improve ecological linkages across the landscape. The specific plant species and revegetation program will be confirmed as part of future detailed design through the subdivision process, as will any management measures to ensure protection of this vegetation as part of construction activities.

Any additional opportunities to retain the existing paddock trees within the site (that are outside the identified area of vegetation retention in **Figure 7**) will be considered as part of the detailed civil design process, to determine if it is possible and practical based on drainage requirements, fill material, location of road reserves and land requirements for incoming industrial development.

It is expected that a number of future subdivision approval conditions will ensure protection of the proposed area of remnant vegetation, including model subdivision condition EN2 and EN4 (WAPC and DPLH 2019), which requires:

EN2 - Measures being taken to ensure the identification and protection of any vegetation on the site worthy of retention that is not impacted by subdivisional works, prior to commencement of subdivisional works. (Local Government)

EN4 - Measures being taken to ensure vegetation within the proposed Regional Open Space Reserve as identified in the plan dated [INSERT VALUE], is protected prior to the commencement of subdivisional works. (Local Government)

Should bulk earthworks or any other works be commenced within the site that requires clearing of native vegetation before subdivision approvals are gained, a clearing permit pursuant to Part V of the EP Act will be required. Otherwise, subdivision approval and associated authorised subdivision works will provide an exemption from the requirements for a clearing permit.

4.3 Native fauna

4.3.1 Policy framework, site context and management objectives

In the context of environmental impact assessment, the EPA's objective for terrestrial fauna is *'to protect fauna so that biological diversity and ecological integrity are maintained'* (EPA 2016b). The application of the mitigation hierarchy should be applied to avoid or minimise impacts to terrestrial fauna where possible.

The EPBC Act also provides protection for listed 'threatened' species, including western ringtail possums and black cockatoos, which may potentially use habitat within the site. Any proposed action which is considered likely to result in a 'significant' impact upon these species, identified by the DoEE as Matters of National Environmental Significance (MNES), should be referred to the Commonwealth Department of Environment and Energy.

While conservation significant fauna species have been identified as utilising habitat within the site, particularly western ring tail possum and the three black cockatoo species, the site is considered to have low biodiversity value from a fauna perspective due to the degraded nature of the vegetation (i.e. trees over paddock grasses). As outlined within **Section 4.2**, no areas within the site have been identified by the EPA (2008) or within the *Picton Industrial Park Southern Precinct District Structure Plan* (DPLH 2018) for retention or as a strategic ecological linkage.

The management objective for fauna within the site will be principally focused around maximising retention of existing vegetation values within public open space, the retention of paddock trees where appropriate and ensuring development works are undertaken in a manner that minimises harm to native fauna.

4.3.2 Structure plan layout considerations for terrestrial fauna

Spatial consideration has been given to the areas of remnant vegetation located within the north-west corner of the site (see **Figure 7**) , with this area proposed to be retained and protected within public open space and revegetated. This area was identified to contain the majority of conservation significant habitat, with a number of potential nesting hollows for black cockatoo species observed in this area. This is in addition to the areas recommended for retention and protection by the EPA (2008) and within *Picton Industrial Park Southern Precinct District Structure Plan* (DPLH 2018), as shown in **Figure 7**. As outlined above, this area of public open space is located immediately adjacent to areas recommended for long-term retention to the west and north-west of the site as part of the EPA strategic advice (EPA 2008), and therefore contributes to the conservation of regionally significant vegetation values.

As outlined in **Section 4.2**, no drainage is proposed within the public open space proposed to support the retention of remnant vegetation, and in order to ensure industrial lots do not back directly onto areas of retained remnant vegetation (as per the requirements of the *Picton Industrial Park Southern Precinct District Structure Plan* (DPLH 2018)), a road interface is proposed between the area of public open space containing remnant native vegetation and the future industrial lots, as shown in **Figure 7**.

Existing individual paddock trees may be identified for retention within lots and/or as part of road reserves, however will need to respond to site constraints such as level changes (i.e. the provision or removal of fill) and health/longevity considerations.

4.3.3 Future terrestrial fauna management requirements

Conservation significant species (including western ringtail possum and the three black cockatoo species) were identified as utilising habitat within the site, and the proponent will need to consider their potential obligations pursuant to the EPBC Act prior to vegetation being cleared within the site. This can be addressed separately to the LSP (prior to physical disturbance of remnant vegetation) and therefore obligations pursuant to the EPBC Act are not considered further as part of this EAMS.

The location of the proposed public open space within the site, associated with the protection of remnant vegetation values, will retain and protect areas identified to contain habitat values through the site-specific investigations, and is located adjacent to other areas of remnant vegetation recommended for retention by the EPA (2008) and the *Picton Industrial Park Southern Precinct District Structure Plan* (DPLH 2018), see **Figure 7**.

The area of public open space proposed to support the retention of remnant vegetation is proposed to be revegetated which will enhance its fauna habitat values and the ecological linkage function, particularly for western ringtail possum. Where possible, the revegetation should consider opportunities to utilise black cockatoo food plants, specifically *Eucalyptus, Corymbia, Banksia, Hakea* and *Allocasuarina* species. The final selection of species should be determined in consultation with the Shire of Dardanup and DBCA and can be resolved through the standard subdivision process. In addition to this, and as previously outlined within **Section 4.2**, paddock trees outside the area of public open space will be opportunistically retained where possible and practical.

Some areas of remnant vegetation will be modified or removed as part of the proposed development and fauna may be disturbed as part of this process. Management of fauna as part of the detailed design and construction for the proposed development will be based on minimising harm to fauna (in particular western ringtail possums) through the preparation and implementation of a fauna management plan. Measures to be implemented may include:

- Bunting/flagging of trees to be retained so that it is clear which trees are to be avoided.
- Undertaking preclearing inspections of tree/vegetation proposed for removal/modification. This may include a trapping and relocation program for western ringtail possums.
- Using a fauna spotter during demolition and clearing works to avoid impacts to fauna wherever possible and to rescue trans-locatable fauna that are disturbed during clearing works to assist them to disperse safely or capture them for later translocation as appropriate.
- Application of correct fauna handling procedures to reduce stress on any captured animals.

It is likely that this will be a condition of future subdivision approval, based on application of model subdivision condition EN1 (WAPC and DPLH 2019), which requires:

EN1 - Prior to the commencement of subdivisional works a foreshore/ environmental/ bushland/ tree/wetland/wildlife protection [DELETE AS APPLICABLE] management plan for [INSERT VALUE] is to be prepared and approved to ensure the protection and management of the sites environmental assets with satisfactory arrangements being made for the implementation of the approved plan. (Department of Water and Environmental Regulation) OR (Local Government) OR (Department of Biodiversity, Conservation and Attractions) [DELETE AS APPLICABLE]

4.4 Hydrology

4.4.1 Policy framework, site context and management objectives

In the context of environmental impact assessment, the EPA's objective for inland waters is *'to maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected'* (EPA 2018).

In addition, the *State Water Strategy for Western Australia* (Government of WA 2003) and *Better Urban Water Management* (WAPC 2008) endorses the promotion of integrated water cycle management and application of water sensitive urban design (WSUD) principles to provide improvements in the management of stormwater, and to increase the efficient use of other existing water supplies. Of particular relevance to the wetland habitat that occurs outside of the site is the *Better Urban Water Management* criteria for ecological protection, which requires development to maintain or restore desirable environmental flows and/or hydrological cycles.

Based on the values identified and the requirements of the *Picton Industrial Park Southern Precinct District Structure Plan* (DPLH 2018), the principal management objective for hydrology in the site will be to ensure that groundwater and surface water is appropriately infiltrated and treated to not impact on the broader area.

4.4.2 Structure plan layout considerations for hydrology

In accordance with the Local Water Management Strategy (LWMS) (Emerge Associates 2019b) that has been prepared for the site, the structure plan has accommodated flood mitigation, flow management and treatment of surface water by providing appropriately sized road and drainage reserves to convey and store stormwater.

4.4.3 Future management requirements

The LWMS provides a framework for the future delivery of a best practice approach to integrated water cycle management utilising water sensitive urban design (WSUD) principles and provides for the management of groundwater and surface water within the site. It has been prepared in accordance with relevant DWER requirements and considers the site-specific values. The LWMS will be a key document guiding future development and can be referred to for further detail, particularly with regard to determined water management criteria and water quality management objectives.

The WAPC can include a standard condition on subdivision applications (model subdivision condition D2 (WAPC and DPLH 2019)), requiring the preparation of an Urban Water Management Plan (UWMP) which states:

Prior to the commencement of subdivisional works, an urban water management plan is to be prepared and approved, in consultation with the Department of Water and Environmental Regulation, consistent with any approved Local Water Management Strategy. (Local Government).

Generally, an UWMP will address the following considerations:

- The detailed drainage design based on civil designs
- Imported fill specifications and requirements
- Implementation of water conservation strategies
- Non-structural water quality improvement measures
- Management and maintenance requirements
- Construction period management strategy
- Monitoring and evaluation program.

4.5 Wastewater management

4.5.1 Policy framework, site context and management objectives

Effluent or domestic wastewater is derived from bathrooms, kitchens, laundries and toilets. It contains human waste (containing pathogens), paper, soap, detergent residues and food scraps (DoW 2010). Industrial wastewater refers to any liquid, solid or gaseous refuse from a business, industry, warehouse or manufacturing premises other than domestic sewage, stormwater, or unpolluted water. Industrial wastewater may include contaminated stormwater, cooling water, process waters and wash-down waters (DoW 2009b).

The *Government Sewerage Policy* (DPLH 2019) provides a best practice approach to the provision of onsite sewage treatment and disposal and should be undertaken in accordance with *Australian/New Zealand Standard 1547 On-site domestic wastewater management*.

It is understood that no existing reticulated sewerage network is located in close proximity to the site. The Water Corporation has advised that the site is within two future wastewater pump station catchment areas, though neither are planned to be constructed within the next five years (WGE 2019). As such, it is anticipated that reticulated sewer will not be available for the site in the near future (WGE 2019). Accordingly, onsite wastewater management will be required, and domestic wastewater effluent and industrial process wastewater will have different considerations.

The site is located within a sewage sensitive area (specifically within the estuary catchments on the Swan and Scott Coastal Plains) (DPLH 2019c). Therefore, all lots will be required to install a secondary treatment system (i.e. an ATU) for the management of waste from buildings/site offices consistent with the *Government Sewerage Policy* (DPLH 2019) to ensure discharge is of sufficient quality to protect downstream environments.

The principle management objective for wastewater is to enable the onsite treatment and disposal of both domestic and industrial wastewater without endangering public health or the environment.

4.5.2 Structure plan layout considerations for wastewater

No specific spatial response is required within the structure plan for the management of domestic and industrial wastewater. However spatial consideration for the management of industrial wastewater and treatment effluent will be required within each individual lot following subdivision and as part of development approval.

4.5.3 Future management requirements

As part of managing industrial wastewater and onsite effluent disposal, at the development application stage individual lots will be required to outline how each will be managed in accordance with the relevant guidelines. A summary of the primary considerations has been provided below.

Industrial wastewater management

Any wastewater produced on lots from industrial processes (additional to general building/domestic wastewater effluent, discussed below) will be required to be treated appropriately on lot. Where appropriate treatment is not achievable on lot, either due to the volumes or contaminants contained therein, industrial process wastewater will need to be captured and removed from site to an appropriate treatment facility. This approach is consistent with industrial sites across Western Australia, even where deep sewer connection is provided.

Any onsite industrial wastewater treatment plants associated with specific lot uses should be designed and constructed in accordance with *Water Quality Protection Note 51: Industrial wastewater management and disposal* (DoW 2009a) The recommendations relating to the design and construction of industrial lots include, but are not limited to:

- Manage stormwater runoff effectively, in accordance with an approved UWMP.
- Industrial wastewater and the materials used for its treatment should be stored and used within weatherproof, chemically resistant or sealed containment compounds. Compounds should be built using low permeability materials, have chemically resistant or sealed surfaces, and be capable of storing at least 110% of the volume of the largest contained fluid storage vessel, plus 25% of the volume of all other containers within the compound.
- Containment compounds should effectively capture leaking tank contents, contaminated stormwater, jetting fluids and residues from equipment misuse.
- Contaminated fluids should be disposed of by draining into an internal collection sump for appropriate treatment, recovery or offsite disposal at an approved site.
- Fuelling facilities for vehicles, and machinery used for the treatment and disposal of wastewater should be constructed and operated to drain any spillage into holding tanks or well-maintained fuel recovery systems.
- Fuels, solvents, explosives and dangerous goods should be controlled and stored in accordance with the *Dangerous Goods Safety Act 2004*.

For prescribed premises, industrial process wastewater will be managed through the works approval and licence process pursuant to Part V of the EP Act. For other industry that may not be subject to Part V of the EP Act, development approval will need to address industrial process wastewater and/or demonstrate that any proposed wastewater management system can appropriately address the volumes and type of wastewater without impacting the environment. This is a typical requirement of development approval for industrial development.

On-site effluent disposal

Given the site is located within a sewage sensitive area, as a minimum ATUs will be required to be installed to manage domestic wastewater effluent. It is assumed that domestic wastewater requirements will be consistent with general office uses (i.e. toilets, sinks, showers etc.) with wastewater loading rates consistent with those stipulated in Table 2 of the Department of Health Western Australia (DoH) *Supplement to Regulation 29 and Schedule 9 - Wastewater system loading rates* (DoH 2019a). DoH approved systems, as listed in the *Approved secondary treatment systems* (DoH 2019b) will be utilised and installation will be carried out in line with the *Code of Practice for the Design, Manufacture, Installation and Operation of Aerobic Treatment Units* (DoH 2015) or where larger systems are required designs will be assessed and approved by DoH on a case by case basis.

ATUs are an advanced alternative to conventional septic tanks which provide improved quality of effluent treatment. ATUs differ from conventional septic tanks in that the wastewater is treated with oxygen to assist in the breakdown of bacteria into fine organic material. The effluent is then treated with chlorine to reduce the number of bacteria in the final effluent. The final treated effluent can then be disposed of within dedicated irrigation areas. The irrigation areas should:

- Be sized appropriately depending upon the size of the ATU system and number of people serviced.
- Include buffer areas (to be determined as a part of site-specific assessment) and fencing between the irrigation area and areas of human use. These buffer areas may be reduced by use of subsurface dripper irrigation systems.
- Include warning signs advising that effluent is being used and is not suitable for human contact or consumption.
- Be accessible for maintenance.
- Be planted out with salt and nutrient resistant plants to avoid pooling or run off of effluent.
- Have a minimum clearance from maximum groundwater of 500 mm.

In addition to the requirements for irrigation disposal areas, a number of factors must be considered prior to the installation of ATUs on the site. These are outlined in the *Code of Practice for the Design, Manufacture, Installation and Operation of Aerobic Treatment Units* (DoH 2015). An ATU should be at least:

- 1.2 m from any lot boundaries or buildings.
- 1.8 m from the irrigation disposal area.
- 6 m from any well, bore, dam or watercourse.

Design specifications of ATUs, including the location and discharge mechanisms (i.e. land application areas or discharge outlets), will need to be confirmed through a site and soil evaluation (DoH 2019; DPLH 2019). This will consider the specific site constraints present on the lot including the estimated hydraulic load, soil texture and category, location of WSUD strategies and subsoil drains, clearances to groundwater etc. Lot owners will be informed of these requirements prior to the purchase of lots and as part of development approval will need to apply to construct or install a wastewater system.

4.6 Bushfire management

4.6.1 Policy framework, site context and management objectives

State Planning Policy 3.7 Planning in Bushfire Prone Areas (SPP3.7) (WAPC 2015a) stipulates that any development proposal which occurs partly or wholly within a designated bushfire prone area is required to be accompanied by a bushfire management plan (BMP). The preparation of a BMP is required to incorporate the following tasks:

- Classification of existing vegetation types and effective slope within the site and surrounding 150 m, in accordance with *Australia Standard 3959-2018 Construction of buildings in bushfire-prone areas* (AS 3959) (Standards Australia 2018).
- Assessment of bushfire hazard levels within the site and surrounding 150 m, in accordance with the *Guidelines for Planning in Bushfire Prone Areas* (WAPC and DFES 2017).
- Completion of an indicative Bushfire Attack Level (BAL) assessment and preparation of an associated BAL contour plan.
- Assessment of the structure plan design against the bushfire protection criteria, in accordance with the *Guidelines for Planning in Bushfire Prone Areas* (WAPC and DFES 2017).

Policy objective 5.4 of SPP 3.7 specifies that development is required to:

'achieve an appropriate balance between bushfire risk management measures and biodiversity conservation values, environmental protection and biodiversity management and landscape amenity'.

This policy objective ensures that future development appropriately considers the bushfire risks, and provides appropriate separation from any identified risks without negatively impacting existing environmental values.

The external hazards surrounding the site have been assumed to remain in their current state and will remain a bushfire hazard to the site, even though in the long term some of these hazards will be removed permanently as industrial development progresses. In addition to the hazards external to the site, retained vegetation within the proposed public open space in the north-west of the site will be a bushfire hazard to future development within the site. The bushfire hazard assessment has considered potential changes to the existing vegetation (i.e. when it is revegetated as part of future development) when considering any required setbacks and management measures, as per the requirements of the *Picton Industrial Park Southern Precinct District Structure Plan* (DPLH 2018).

The principal management objective for the bushfire risk to the site is to ensure that the risk to future people, property and infrastructure is appropriately minimised without negatively impacting on environmental values within or surrounding the site.

4.6.2 Structure plan layout considerations for bushfire management

In accordance with the BMP (Emerge Associates 2019a) prepared for the site, the structure plan has provided an appropriate spatial response to bushfire risk through:

- Ensuring future development areas will be able to accommodate the separation necessary to ensure built form is able to achieve a bushfire attack level (BAL) rating of BAL-29 or less without requiring clearing or modification of vegetation in areas where remnant vegetation is proposed to be retained. This has been achieved through the location of proposed roads and drainage areas between future lots and areas of bushfire hazard and/or providing lots of an appropriate size to accommodate necessary separation.
- An integrated internal road network that connects with the existing external public road network and provides access to multiple destinations, supporting appropriate emergency evacuation and response.

4.6.3 Future bushfire management requirements

The BMP (Emerge Associates 2019a) demonstrates that SPP 3.7 and the bushfire protection criteria (outlined within the Guidelines (WAPC and DFES 2017)) can be satisfied through an 'acceptable solution' approach. Going forward and based on satisfying the bushfire protection criteria, detailed design and construction will need to consider the following:

- *Element 1 Location*: all future built form should be located in an area subject to a low or moderate bushfire hazard, which can be achieved given buildings will be located within areas identified as low threat in accordance with Clause 2.2.3.2(e) of AS 3959.
- *Element 2 Siting and Design*: provision of appropriate separation to ensure future built form can achieve a BAL rating of BAL-29 or less. This can be achieved through the location of road and drainage reserves (assuming these will be design and managed to low threat in accordance with Section 2.2.3.2 of AS 3959), and /or provision of appropriately sized lots enabling in-lot setbacks.
- *Element 3 Vehicular Access*: provision of an integrated road network that provides access to at least two different destinations, with roads to comply with the technical requirements outlined in Table 6 of Appendix Four in the Guidelines (WAPC & DFES 2017), including roads widths of at least 6 m. If development is staged, temporary turn-around areas may be required.
- *Element 4 Water*: the site is located within the current reticulated network and therefore, will be provided with a permanent and secure reticulated water supply, which is to be installed in accordance with the Aqwest specifications. Additional fire-fighting infrastructure may be required on individual lots, including the installation of tanks and pumps given the potential water pressure may not be sufficient for fire-fighting purposes.

A revised BMP is likely to be required to support any future subdivision applications, particularly if the development layout is different to that outlined within the BMP (Emerge Associates 2019a), and will need to respond to the subdivision design (and/or stage of development).

It is likely that the WAPC will include a standard condition on subdivision applications (model subdivision condition F1 (WAPC and DPLH 2019)) which states:

Information is to be provided to demonstrate that the measures contained in the bushfire management plan [NAME/DATE] that address the following [LIST AS REQUIRED] have been implemented during subdivisional works. This information should include a notice of 'Certification by Bushfire Consultant'.

It is possible that future industrial land uses within the site may be considered high risk land use in accordance with Clause 6.6 of SPP 3.7 (WAPC 2015a), including (but not limited to) uses such as service stations, bulk storage of hazardous materials and fuel depots. If high risk land uses are proposed within the site and are located within a designated bushfire prone area, the associated development application for the proposed use will need to be supported by a bushfire management plan and risk management plan for the specific proposed use.

5 Implementation Framework

A summary of how the structure plan responds to the environmental values and attributes within the site is provided in **Table 7**. The table also outlines the future management likely to be required as part of the subdivision and development process.

Table 7: Environmental management framework implementation table

Factor	Structure plan phase (completed)	Subdivision phase	Part of development works
Acid sulfate soils	• Consider ASS Risk mapping as prepared by DWER. No spatial response in LSP required.	• If required, completion of the ASS self-assessment form (as prepared by the DPLH). • If required, preparation of an Acid Sulfate Soil and Dewatering Management Plan.	• If required, implementation of an Acid Sulfate Soil and Dewatering Management Plan.
Native vegetation	• Assessment of flora and vegetation values and preliminary consideration of potential retention opportunities. • Provision for public open space to retain vegetation in the north-west portion of the site.	• Undertake detailed analysis of final subdivision layout and engineering design to determine tree retention opportunities. • Provision for public open space in the north-west portion of the site to retain identified vegetation (or as agreed). • Provision for road network around perimeter of retained remnant vegetation (see **Figure 7**) to ensure no lots directly back onto retained remnant vegetation. • Consideration of potential requirement for Clearing Permit if clearing undertaken prior to subdivision approval.	• Ensure areas of retention (both public open space and trees in road reserves etc.) are protected, accommodate these as part of construction and landscaping works. • Undertake revegetation work as required.
Native fauna	• Assessment of fauna habitat and preliminary consideration of potential retention opportunities. • Provision for public open space to retain vegetation in the north-west portion of the site.	• Undertake detailed analysis of final subdivision layout and engineering design to determine further potential tree retention opportunities. • Provision for public open space in the north-west portion of the site to retain identified vegetation (or as agreed). • Provision for road network around perimeter of retained remnant vegetation (see **Figure 7**) to ensure no lots directly back onto retained remnant vegetation.	• Ensure areas of retention are protected, accommodate these as part of construction and landscaping works. • Implement pre-clearance checks and/or management plan requirements to ensure fauna is managed appropriately to minimise harm. • If required, obtain and implement licences pursuant to the *Biodiversity Conservation Act 2016* to disturb/relocate fauna prior to works commencing.
Hydrology	• Preparation of a Local Water Management Strategy. • Spatial providing for drainage reserves to accommodate stormwater.	• Preparation of an Urban Water Management Plan. • Provision for drainage reserves.	• Implementation of the UWMP. • Design and implementation of drainage reserves/management features as per the requirements of the UWMP.

Table 7: Environmental management framework implementation table (continued)

Factor	Structure plan phase (completed)	Subdivision phase	Part of development works
Wastewater	• Preparation of a Local Water Management Strategy. • Identification of likely sewage disposal requirements	• Preparation of an Urban Water Management Plan.	• Implementation of the UWMP. • Application for wastewater disposal as part of development approvals. • Implementation of wastewater treatment and disposal in accordance with relevant approvals.
Bushfire risk	• Preparation of a Bushfire Management Plan. • Provision for road and drainage reserves and appropriately sized development areas to accommodate setbacks to achieve BAL-29 or less. • Provision for a road network that connects the site to the public road network and provides access to at least two destinations.	• Complete detailed BAL assessment to determine the separation requirements necessary to achieve BAL-29 or less and confirm subdivision layout can accommodate this. • Provision for an appropriate road network that provides access to at least two destinations. • If required, prepare an updated BMP to support the subdivision application.	• Drainage reserves and road reserves to be designed and maintained as low threat in accordance with Clause 2.2.3.2(f) of AS 3959. • If industrial land use is likely to be considered 'high risk' (as per Clause 6.6 of SPP 3.7), development approval to be supported by a BMP and risk management plan.

6 Conclusions

This EAMS has been prepared on behalf of the proponent for to support the Local Structure Plan (Rowe Group 2019) prepared for Lots 103, 110 and 603, Picton East, to guide the proposed industrial development within the site. This EAMS has been prepared to support the structure plan, together with:

- *Bushfire Management Plan (Emerge Associates 2019a)*
- *Local Water Management Strategy (Emerge Associates 2019b)*

The structure plan design has responded to site-specific environmental considerations where necessary and possible, including accommodation of stormwater within drainage reserves consistent with the LWMS; retaining existing vegetation within an area of public open space in the north-west corner of the site (which is in addition to the conservation significant areas identified by the EPA (2008) and DPLH & WAPC (2018), but was identified for retention in the LSP due to the habitat values); and providing appropriate separation between future built form and areas of bushfire hazard within and external to the site.

This document provides an outline of the management requirements that will need to be considered as part of future subdivision and development stages. The key management considerations are summarised as follows.

- **Acid sulfate soils**: it is possible that future investigations and management considerations will be required at subdivision, particularly if services are likely to be installed below the permanent groundwater table.
- **Native vegetation**: ensuring a road interface is provided between the public open space area containing retained remnant vegetation (to ensure lots do not directly back onto this area), and confirming tree retention opportunities (in addition to the area of public open space proposed to retain remnant vegetation, shown in **Figure 7**) in consideration of final development design and bulk earthworks requirements, and protection vegetation proposed for retention as part of works. Where clearing of native vegetation is proposed, clearing will need to be undertaken in accordance with a valid exemption or a clearing a permit will need to be attained pursuant to Part V of the *Environmental Protection Act 1986*.
- **Native fauna**: confirming tree retention (i.e. fauna habitat) retention opportunities (in addition to the area of public open space proposed to retain remnant vegetation, shown in **Figure 7**) in consideration of the final development design and bulk earthworks requirements. Fauna management protocols will likely need to be implemented prior to and during clearing activities, particularly with regard to western ringtail possums.
- **Hydrology**: stormwater management requirements to be implemented as outlined within the Local Water Management Strategy (LWMS), and will include preparation of an Urban Water Management Plan (UWMP) for each stage of future subdivision. Spatial provision will need to be made for the drainage reserves at subdivision to accommodate stormwater.
- **Wastewater**: Requirement to design and install appropriate onsite wastewater disposal, likely to be in the form of aerobic treatment units (ATUs) for domestic effluent and storage/treatment of industrial process wastewater.

- **Bushfire risks**: Provision of appropriate separation between future built form and bushfire hazards will need to be accommodated as part of subdivision design (and proposed location of the integrator roads has demonstrated this can be achieved); and drainage and road reserves will be designed and maintained to low threat (in order to not be a hazard). Vehicle access will also need to accommodate access to at least two destinations. This will be addressed as part of future bushfire management plans supporting subdivision.

Overall, the environmental attributes and values of the site can be accommodated through the structure plan design, or can be managed appropriately through the future subdivision and development phases in line with the relevant state and local government legislation, policies and guidelines and best management practices.

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Figures

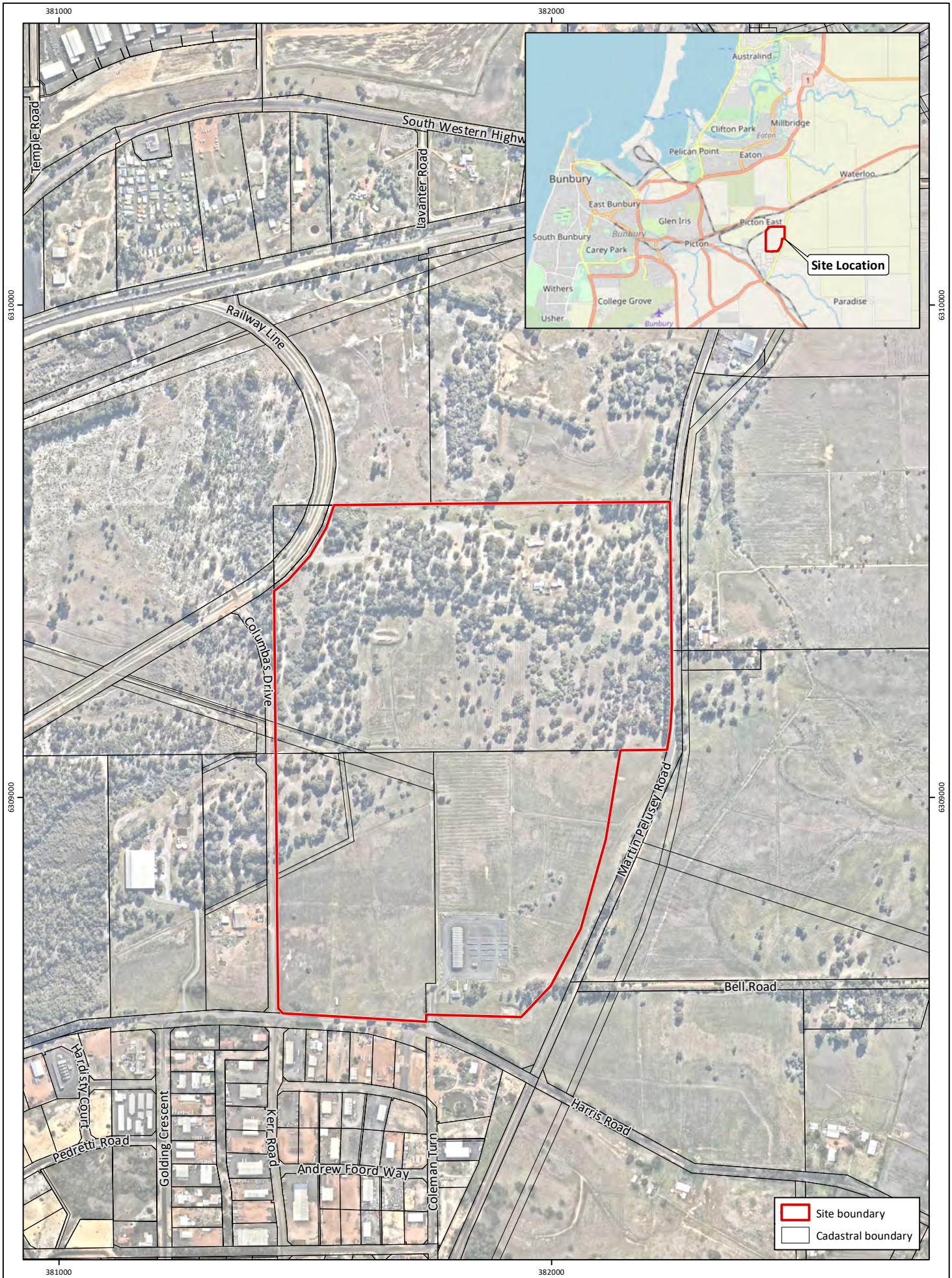

Figure 1: **Location Plan**

Project:	Environmental Assessment and Management Strategy Local Structure Plan, Lots 103, 110 and 603 Picton East
Client:	Harris Road Pty Ltd

Plan Number:
EP12-039(03)--F28

Drawn:	GAR
Date:	07/11/2019
Checked:	HPB
Approved:	KK
Date:	08/11/2019

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Metres

Scale: 1:10,000@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

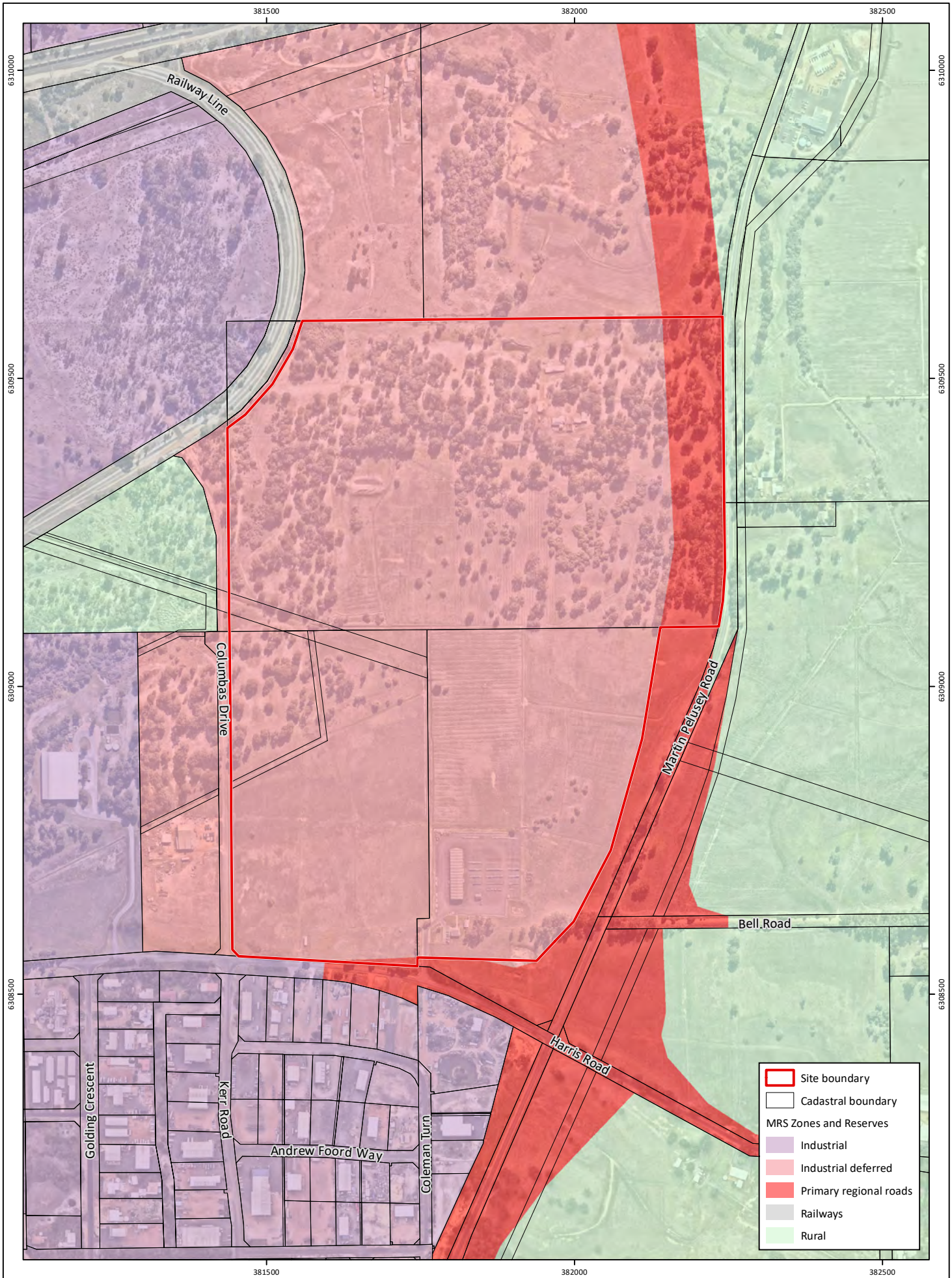

Figure 2: **Greater Bunbury Region Scheme Zoning**

Project: Environmental Assessment and Management Strategy
Local Structure Plan, Lots 103, 110 and 603 Picton East

Client: Harris Road Pty Ltd

Plan Number:
EP12-039(03)--F29

Drawn:	GAR
Date:	07/11/2019
Checked:	HPB
Approved:	KK
Date:	08/11/2019

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emerge ASSOCIATES

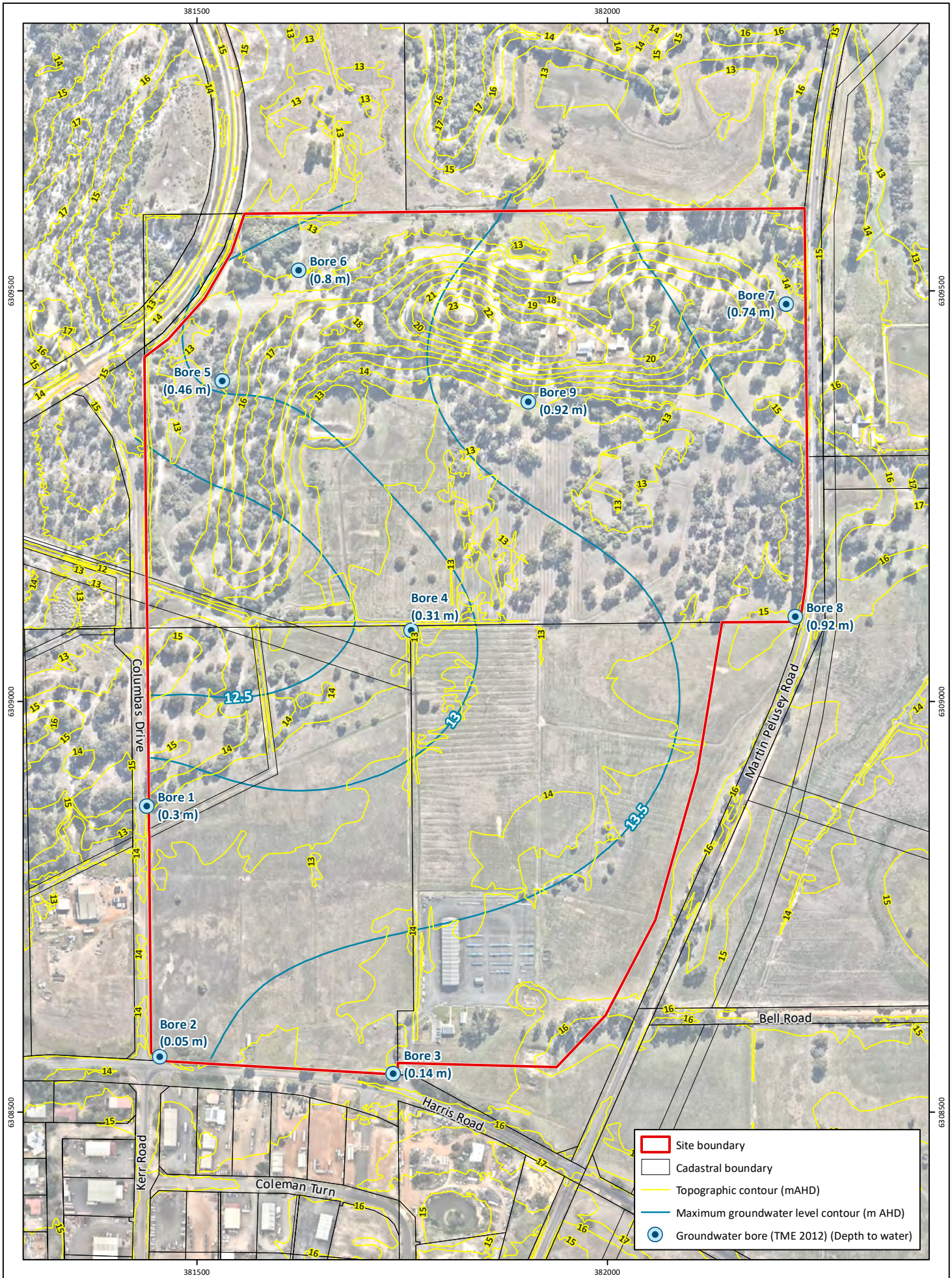

Figure 3: **Topographic and Maximum Groundwater Contours**

Project: Environmental Assessment and Management Strategy
Local Structure Plan, Lots 103, 110 and 603 Picton East

Client: Harris Road Pty Ltd

Plan Number: EP12-039(03)--F30

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Checked:	HPB
Approved:	KK
Date:	08/11/2019

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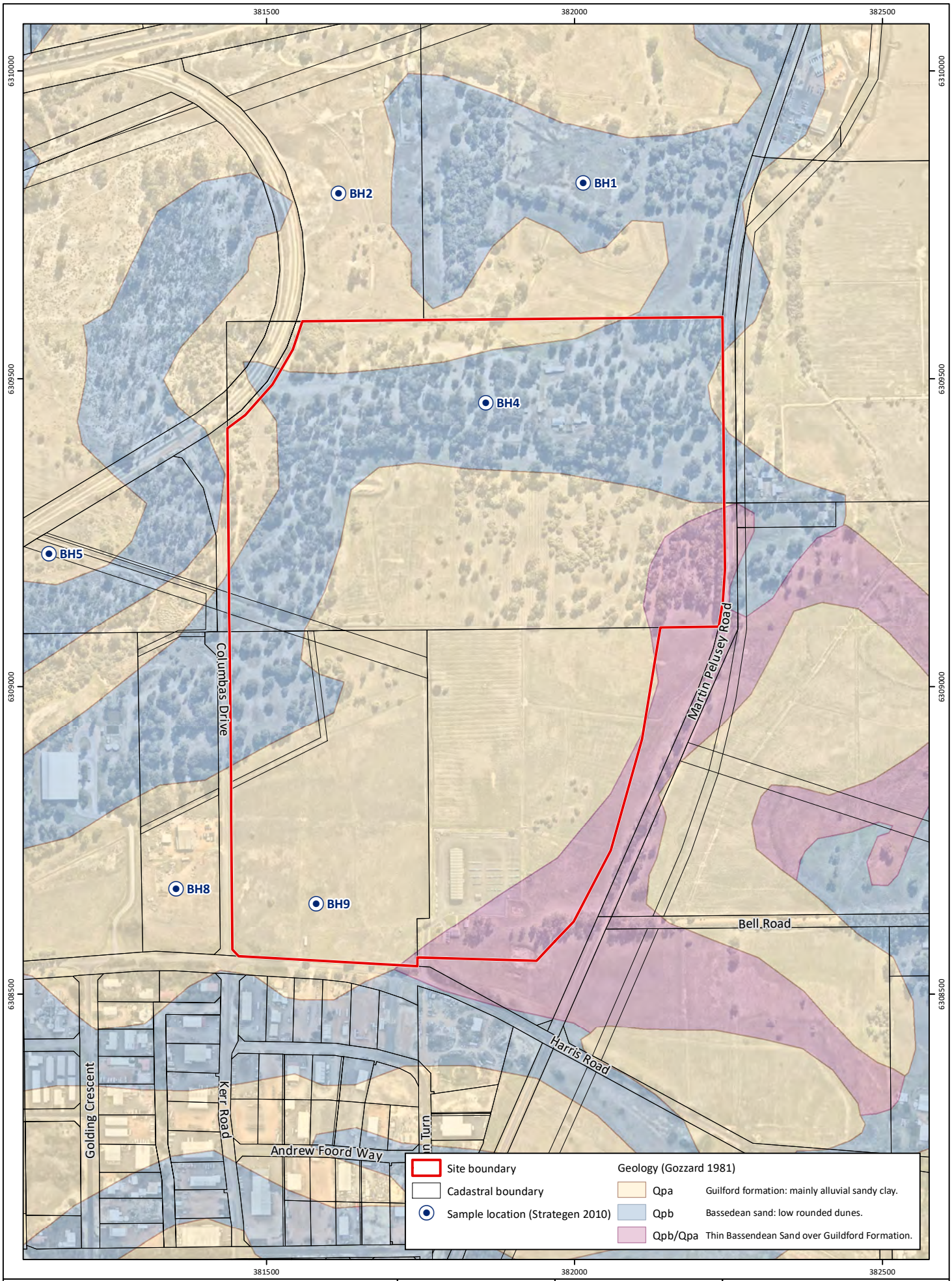

Figure 4: Geological Mapping

Project: Environmental Assessment and Management Strategy
Local Structure Plan, Lots 103, 110 and 603 Picton East

Client: Harris Road Pty Ltd

Plan Number:
EP12-039(03)--F31

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Approved:	KK
Date:	08/11/2019

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emerge ASSOCIATES

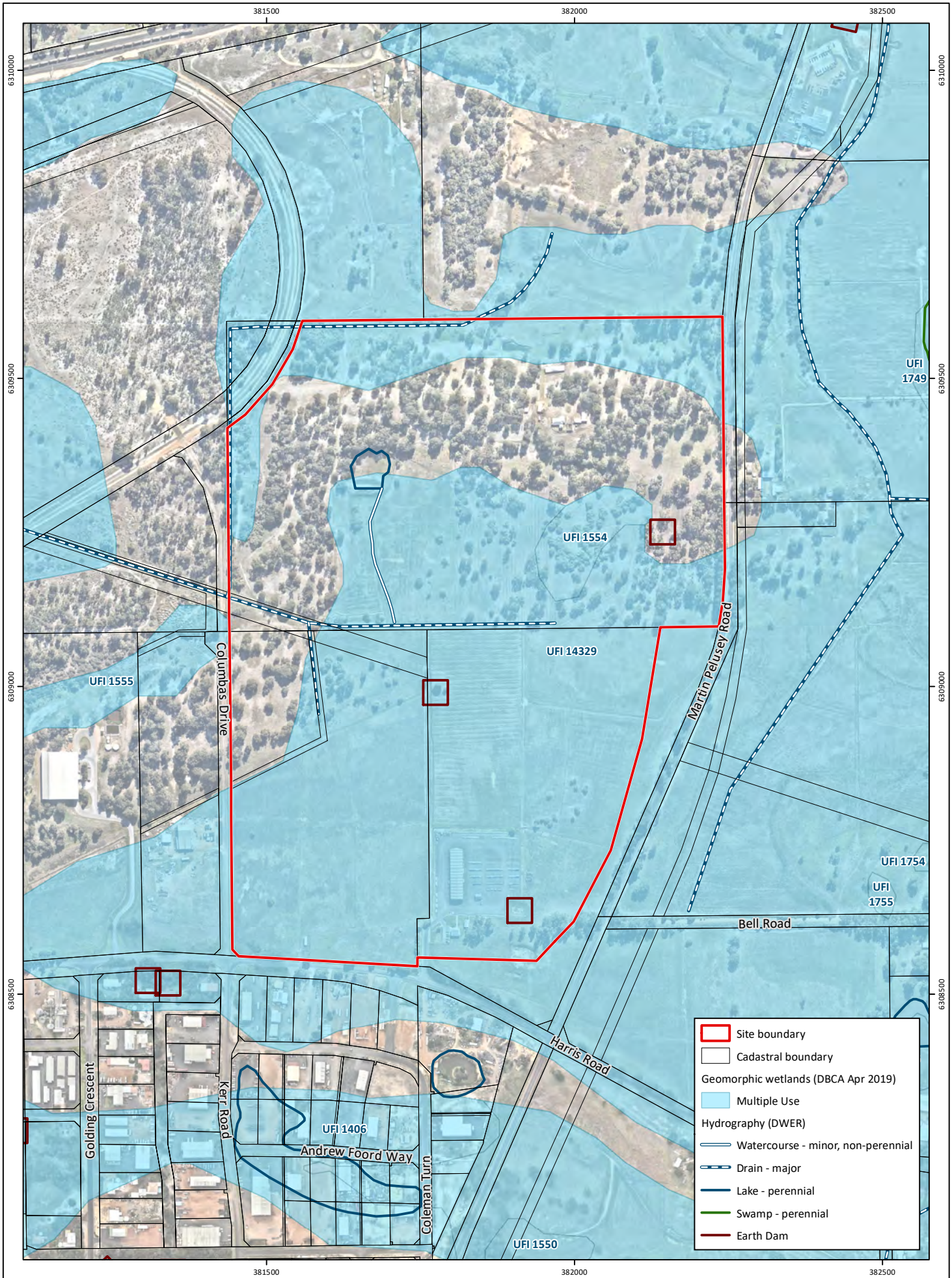

Figure 5: Geomorphic Wetlands and Hydrological Features

Project: Environmental Assessment and Management Strategy
Local Structure Plan, Lots 103, 110 and 603 Picton East

Client: Harris Road Pty Ltd

Plan Number: EP12-039(03)--F32

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Approved:	KK
Date:	08/11/2019

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emerge ASSOCIATES

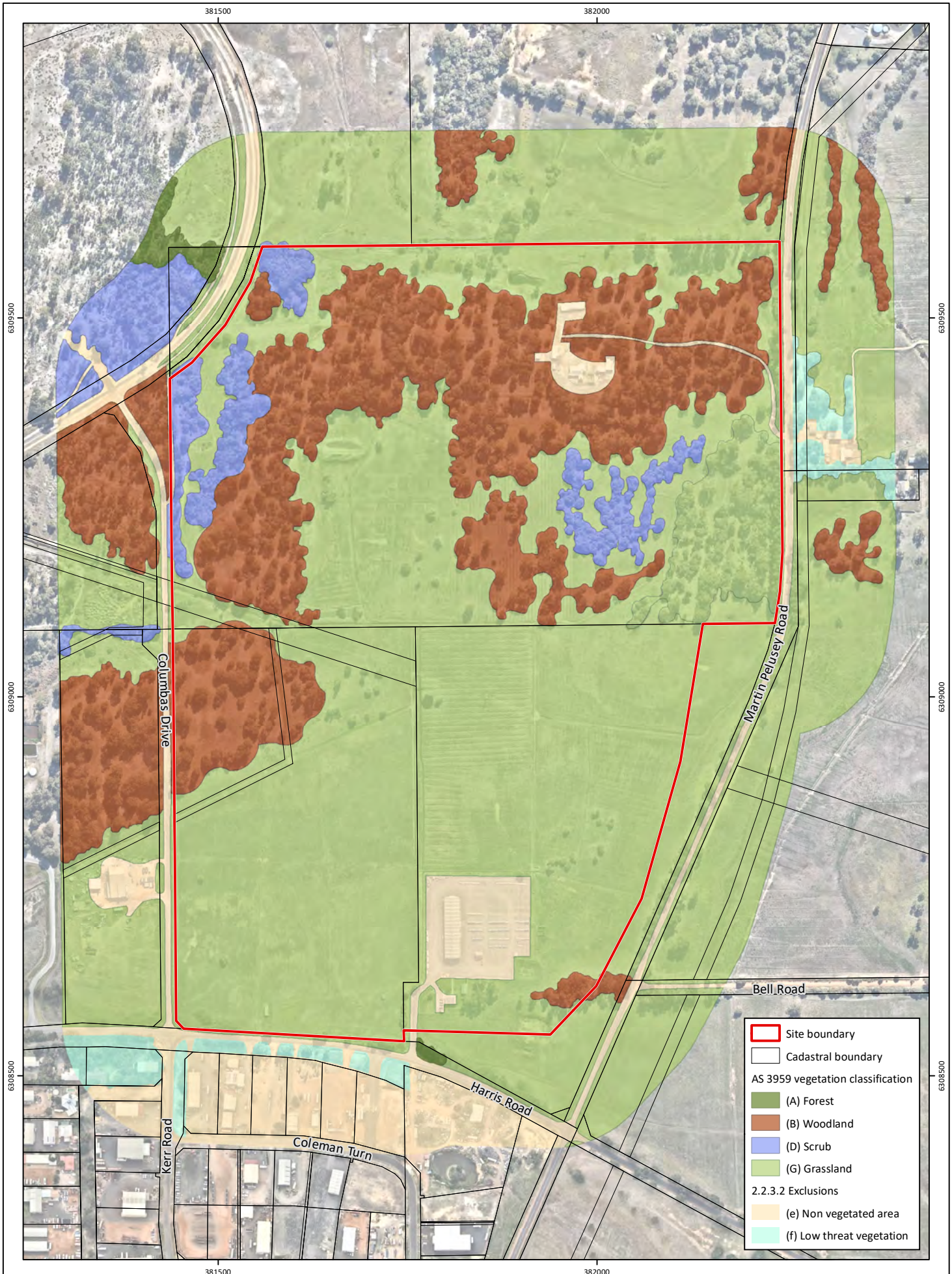

Figure 6: **Existing Site Conditions – AS 3959 Vegetation Classifications**

Project: Environmental Assessment and Management Strategy
Local Structure Plan, Lots 103, 110 and 603 Picton East

Client: Harris Road Pty Ltd

Plan Number: EP12-039(03)--F33

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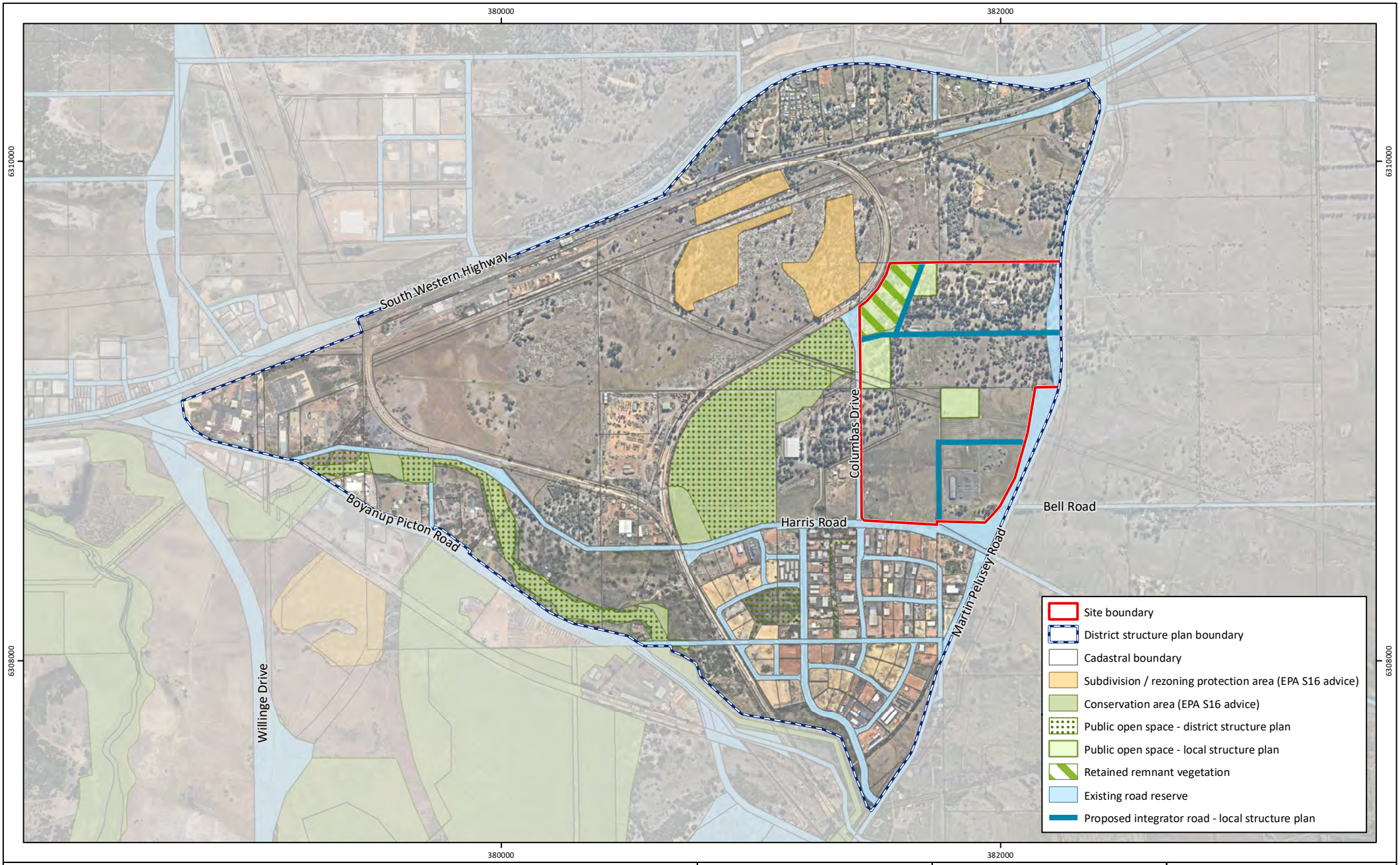

Figure 7: Areas of Retained Remnant Vegetation

Project: Environmental Assessment and Management Strategy
Local Structure Plan, Lots 103, 110 and 604 Picton East

Client: Harris Road Pty Ltd

Plan Number:
EP12-039(03)--F40

Drawn:	GAR
Date:	16/01/2020
Checked:	KK
Approved:	KK
Date:	17/01/2020

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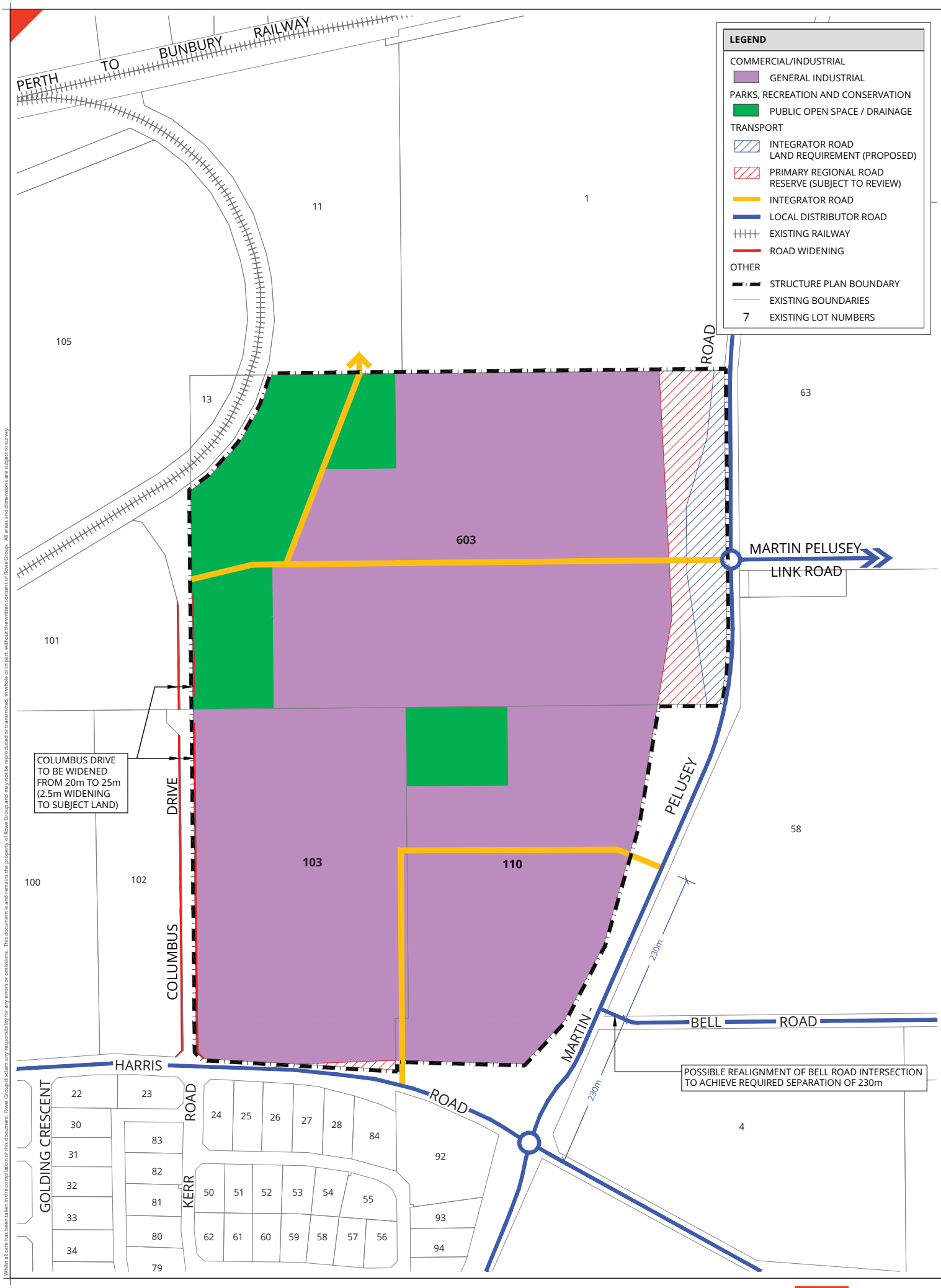
GDA 1994 MGA Zone 50

emerge ASSOCIATES

Appendix A

Lots 103, 110 and 603 Picton East Local Structure Plan (Rowe Group 2019)



LOCAL STRUCTURE PLAN

LOTS 103, 110 AND 603

PICTON EAST

NORTH

0 125 m

SCALE @ A3: 1:5000

9013-LSP-01-G

ROWE GROUP

9013_LSP01G_20191112 Picton East (LSP) | DRAWN: A. GLASKIN | DATE CREATED: 2019.11.12 | PROJECTION: MGA50 GDA94 | CADASTE: LANDGATE
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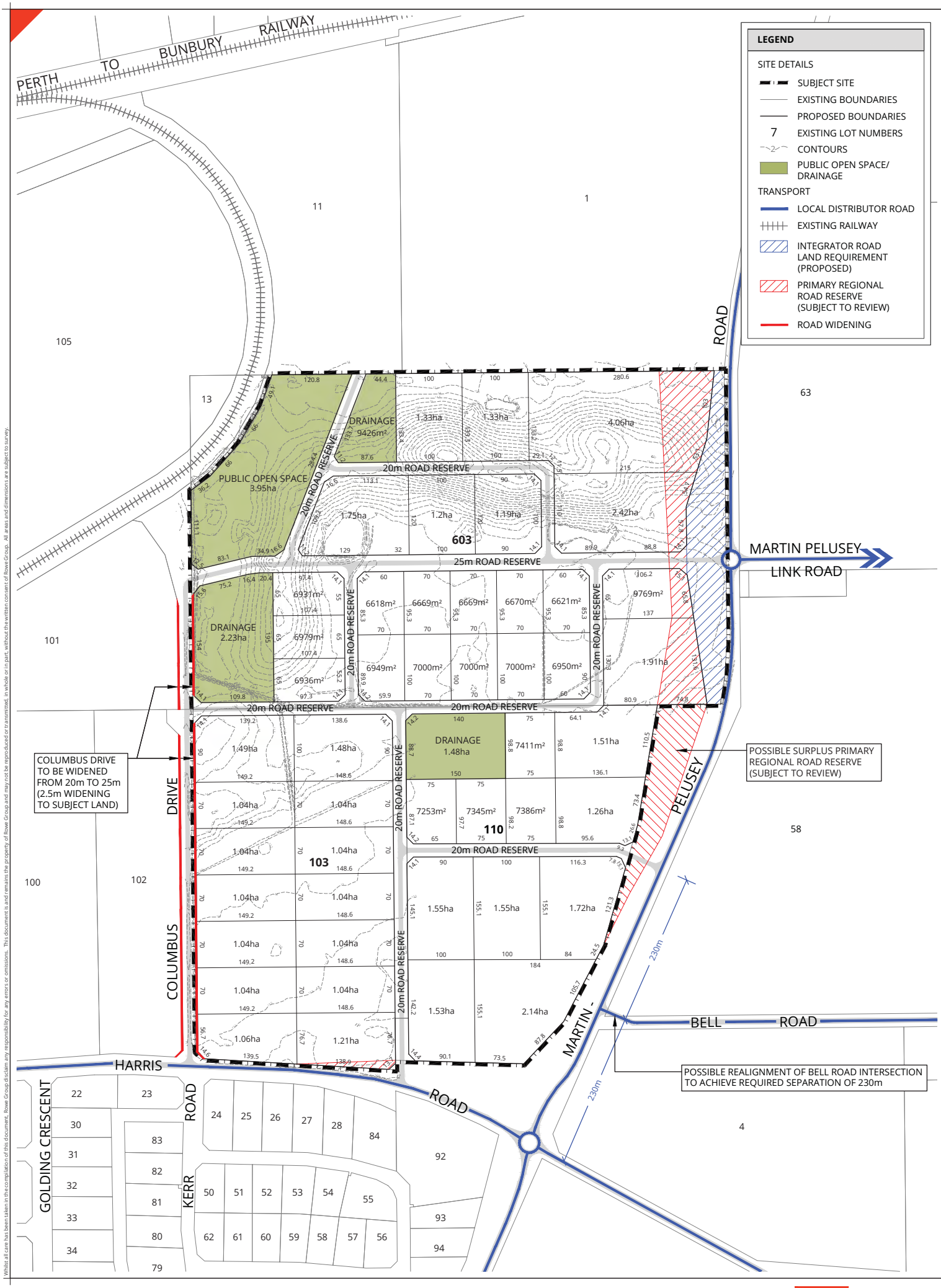

CONCEPT PLAN

LOTS 103, 110 AND 603

PICTON EAST

9013-CON-01-E

ROWE GROUP

9013_CON01E_20191111 Picton East (Concept 1) DRAWN: A. GLASKIN DATE CREATED: 2019.11.11 PROJECTION: MGA50 GDA94 CADASTRE: LANDGATE
N:\TOWN PLANNING\9000-9999\9013\DRAFTING\A-CAD - WILLIAM CLEMENTS - 2019.11.12

Appendix B

Preliminary Acid Sulphate Soil Investigation (Strategen 2010)

Preliminary Acid Sulphate Soil Investigation

Picton East, Shire of Dardanup, WA

Prepared for
TME Group
by Strategen

May 2010

Preliminary Acid Sulphate Soil Investigation

Picton South – Eastern Sector – Shire of Dardanup, WA

Strategen is a trading name of
Strategen Environmental Consultants Pty Ltd
Suite 7, 643 Newcastle Street Leederville WA
ACN: 056 190 419

May 2010

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Strategen has not attempted to verify the accuracy or completeness of the information supplied by the Client.

Client: TME Group

Report	Version	Prepared by	Reviewed by	Submitted to Client	
				Copies	Date
Draft Report	V1	ZC/DD	AP	1	19/5/2010
Final Report	Final	ZC/DD	AP	1	31/5/2010

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1. INTRODUCTION

The following report is a Preliminary Acid Sulphate Soil (ASS) Investigation undertaken for a land parcel (the study area) known as the Picton South site (eastern sector), which is bordered by Martin Pelusey Road, Harris Road, Columbas Drive, a section of disused railway line to the south west and the Perth to Bunbury railway line, and is located in the Shire of Dardanup, WA. The study area is proposed to be developed for light commercial use and will incorporate access roads and other services. Strategen was appointed by TME Group to undertake the investigation in order to develop an understanding of any potential ASS issues associated with excavations that may be undertaken within the study area, particularly in association with the provision of power and deep sewage services and stormwater management.

South West Chemical Services (SWCS) was sub-contracted by Strategen to carry out the Preliminary ASS field work, which was conducted on 12 May 2010. Previous investigations carried out to the south west of the study area, opposite Lot 200 Harris Road, showed some evidence of Potential Acid Sulphate Soils (PASS[1]) in a low lying area. In addition, some evidence of Actual Acid Sulphate Soils (AASS[2]) was observed in the upper soil layers and towards the Ferguson River at Lot 51 Martin Pelusey Rd, located to the south of the study area.

1.1 OVERVIEW OF STUDY AREA

The study area, as illustrated in Figure 2, comprises approximately 140 ha of low lying land split into seven lots, the majority of which has been cleared for grazing and industrial purposes. Some small pockets of lightly treed, native vegetation have been retained in slightly elevated areas associated with sandy soils. The surface levels range from 12 to 25 m Australian Height Datum (AHD).

1.1.1 Geology and soils

Geological maps for the study area show the site to be underlain by the Guildford Formation, consisting of clay, silt, sand and gravels, with the Bassendean Sands outcropping in some areas. Both the Pinjarra and Bassendean soil systems dominate the study area (Figure 1 – Department of Agriculture 2003). The Pinjarra P2 phase consists of flat to very gently undulating plains with poor to imperfectly drained, deep alkaline mottled, yellow duplex soil, which generally consist of shallow pale sand to sandy loam over clay (Department of Agriculture 2003). The Bassendean B1a phase consists of extremely low to very low relief dunes, undulating sandplain and discrete sand rises where soils are deep bleached grey sands with an intensely coloured yellow B horizon occurring within 1 m of the surface with marri and jarrah vegetation dominating the system (Department of Agriculture 2003).

[1] Potential acid sulphate soils (PASS) are soils or sediments which contain iron sulphides and/or other sulphidic minerals that have not been oxidised or exposed to air (DoE 2006).

[2] Actual acid sulphate soils (AASS) are soils or sediments which contain iron sulphides and/or other sulphidic minerals that have previously undergone some oxidation to produce sulphuric acid (DoE 2006).

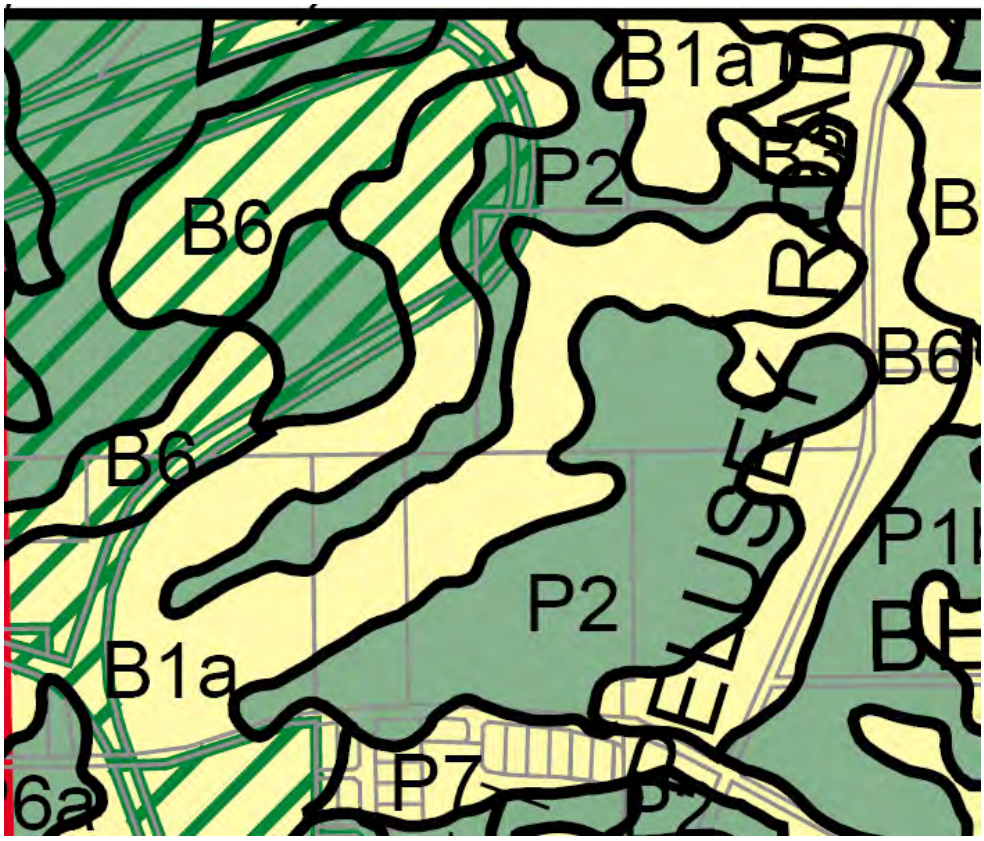


Figure 1 Soil map units within the study area

According to Western Australian Planning Commission (WAPC) Planning Bulletin 64, the site is in an area with a moderate to low risk of AASS and PASS occurring generally at depths greater than 3 m (Appendix 1).

1.1.2 Lot descriptions

The study area consists of 7 lots, comprising of:

Lot 1 – 31.6 ha of low-lying, predominantly cleared land used for horse breeding, with some moderate sized pockets of native vegetation. Part of the Lot appears to be an old sand extraction site and it has a highly modified upper soil layer consisting of predominantly fill material and builder's rubble.

Lot 11 – 11.9 ha of low-lying, predominantly cleared land used for horse breeding and training.

Lot 603 – 39.2 ha consisting of a small, cleared, low-lying area, as well as a large, slightly elevated ridge of remnant native vegetation on sandy soil.

Lot 103 – 17.1 ha of predominantly cleared, low-lying land with a small pocket of native vegetation to the north-west.

Lot 2 – 21.2 ha of almost entirely cleared, low-lying land, occupied in part by a shed used for industrial purposes.

Lot 102 – 6.3 ha of predominantly low-lying land with a slight ridge containing small amounts of vegetation.

Lot 104 – 8.6 ha of predominantly vegetated, low-lying land with areas containing piles of construction rubble.

1.2 SCOPE OF INVESTIGATION

Strategen commissioned South West Chemical Services to undertake the field work component of the Preliminary ASS Assessment of the study area. The intent of the preliminary assessment was to undertake the boring of 10 holes at pre-determined locations on the Lots using a hand auger to the depth of 2.5 m (Figure 2). Bore hole locations were considered representative of the varying elevations, soils and land types within the study area, as well as focussing on areas with a potentially higher risk of ASS. At each of the bored holes, samples were to be collected for analyses at 0.25 m vertical intervals in accordance with the Department of Environment and Conservation (DEC) *Identification and Investigation of acid sulphate soils and acidic landscapes* Guidelines (DEC 2009.

As the study area comprises approximately 140 ha, the Preliminary ASS Assessment does not constitute a full assessment in accordance with DEC Guidelines, but is intended to give an indication as to whether ASS may exist on the site. A full site assessment would entail a total of 280 holes across the full site (i.e. two holes per hectare).

Figure 2 Lot numbers and location of auger holes within the study area

2. SOIL SAMPLING

A site visit to undertake the Preliminary ASS investigation was conducted on 12 May 2010. During the initial work it became obvious that it would not be possible to complete 10 sample holes using a hand auger due to the nature of the soils at the study site. A total of six auger holes were sampled to varying depths and soil observations were made (Table 1).

Table 1 Soil observations during hand augering

Hole No.	Lot No.	Observations
8	102	Significant groundwater observed at just less than 1 m below ground level followed by a hard hand auger impenetrable layer at 1 m. The soils generally were light brown or yellow brown of fine to medium grained sands.
9	103	Gave similar results to hole 8 with water observed at 1 m. While no refusal was encountered, the large quantity of groundwater made sample collection at greater than 1.5 m impossible. The soils were generally light brown to grey/brown of fine to medium grained sands to 1 m with clayey sands at lower depths.
5	104	Located near the disused railway line, refusal was experienced at 1 m. No groundwater was encountered but the soil and gravel was damp. The soils were generally brown to yellow /brown sands and gravel.
4	603	Attempted near the maximum elevation of the sand hill that runs across the site roughly from east to west. Samples were collected to a depth of 2.25 m as the dry sand around that depth kept collapsing into the hole and were difficult to retrieve. The soil was very dry yellow sand to the depth of 2.25 m.
2	11	Samples were yielded to a depth of 2.25 m, with groundwater encountered at 1.25 m. Samples could not be collected below 2.25 m as it became increasingly difficult to remove the hand auger. The soils consisted of light brown sand to 0.5 m followed by blue/green/grey sands to 2 m. The sample collected at 2.25 m was grey clay.
1	1	The area appeared to be an old sand extraction site consisting of fill material and builder's rubble. Sampling could not be achieved at 0.25 m due to the presence of coarse builder's rubble. A further sample site was selected but samples could only be achieved to 0.5 m. The sampled soil appeared to be a dark brown sandy top soil.

It was determined that sampling the remaining four auger holes (hole numbers 3, 6, 7 and 10) would not yield sufficiently different results to those already encountered. This was because the location of holes 7 and 10 appeared to be similar in elevation and appearance to the areas sampled at holes 8 and 9, and it was likely that groundwater would be encountered. Similarly the locations of holes 3 and 6 appeared to be similar in elevation and appearance to the areas sampled at holes 4 and 5.

Samples from each of the six auger holes were collected at 0.25 m vertical intervals and immediately placed in sealed bags on ice. The samples were then transported to the SWCS laboratory and were immediately tested for field pH (pH_f) and oxidised field pH (pH_{fox}). The samples were then dried for 48 hours at 85°C for preservation and storage. The generally negative results from the field test conducted on the six completed holes confirmed the decision not to proceed with further sampling of the remaining four holes.

3. SOIL TEST RESULTS

3.1 FIELD TESTING

Details of the field test results are presented in Appendix 2. The field test results were assessed using the following criteria:

(a) pH_f less than 4

(b) pH_{fox} less than 4 and/or

(c) the change in pH was greater than 2 (where the resultant pH_{fox} was less than 4) and/or

(d) there was a strong reaction following addition of hydrogen peroxide.

The key findings from the field test results were:

- of the 36 samples tested, there were no samples where the pH_f was 4.0 or less
- of the 36 samples there were two (2) samples where the pH_{fox} was 4 or less
- of the 36 samples there were no samples that gave a change in pH > 2 units with the pH_{fox} <4.0
- 1 sample gave a High reaction with the addition of Hydrogen Peroxide
- 3 samples gave an Extreme reaction with gas evolution and heat with the addition of Hydrogen Peroxide
- There appears to be no indication of the presence of PASS at all levels in the samples processed
- There may be an indication of Actual Acid Sulphate soils in samples collected from hole 2, hole 5 and hole 8.

3.2 DETAILED LABORATORY TESTING AND ASSESSMENT

No full laboratory assessment has been carried out at this stage.

4. CONCLUSIONS

Results of the field tests indicate a potential for AASS, particularly in the vicinity of holes 2 and 8 (Lots 11 and 102). Samples exposed to gas evolution and heat with the addition of hydrogen peroxide produced an extreme reaction in three samples at depths of 1.75 – 2.25 m for hole 2, and a high reaction in one sample at a depth of 0.75 m for hole 8. In addition, potential for AASS may also occur in the vicinity of hole 5 (Lot 104), where two surface samples (0.25 – 0.5 m) experienced a pH_{fox} of 4 or less. However, there appears to be no indication of the presence of PASS at all levels in the samples processed from these holes.

The overall results of the Preliminary ASS Investigation are limited due to the low number of samples collected using a hand auger. This outcome is the result of the soil types encountered within the study area and the presence of groundwater close to the surface in some locations. In the event that any future studies are undertaken, more accurate results at depth may be obtained using equipment such as Geoprobe boring or an excavator.

For a thorough indication of the potential for ASS within the study area, a more detailed investigation that follows full DEC guidelines is recommended for areas where field tests indicated a potential for ASS (in the vicinity of holes 2, 8 and 5), as well as areas of similar soil characteristics that weren't sampled during the site investigation. To obtain a detailed assessment of ASS potential within the entire study area, a full investigation aligning with DEC requirements (i.e. two holes per hectare across the entire site) would need to be undertaken.

5. REFERENCES

Department of Agriculture WA (2003), *AgMaps Land Profiler*, Sheet 1 – Shire of Capel, CD-ROM, Government of Western Australia.

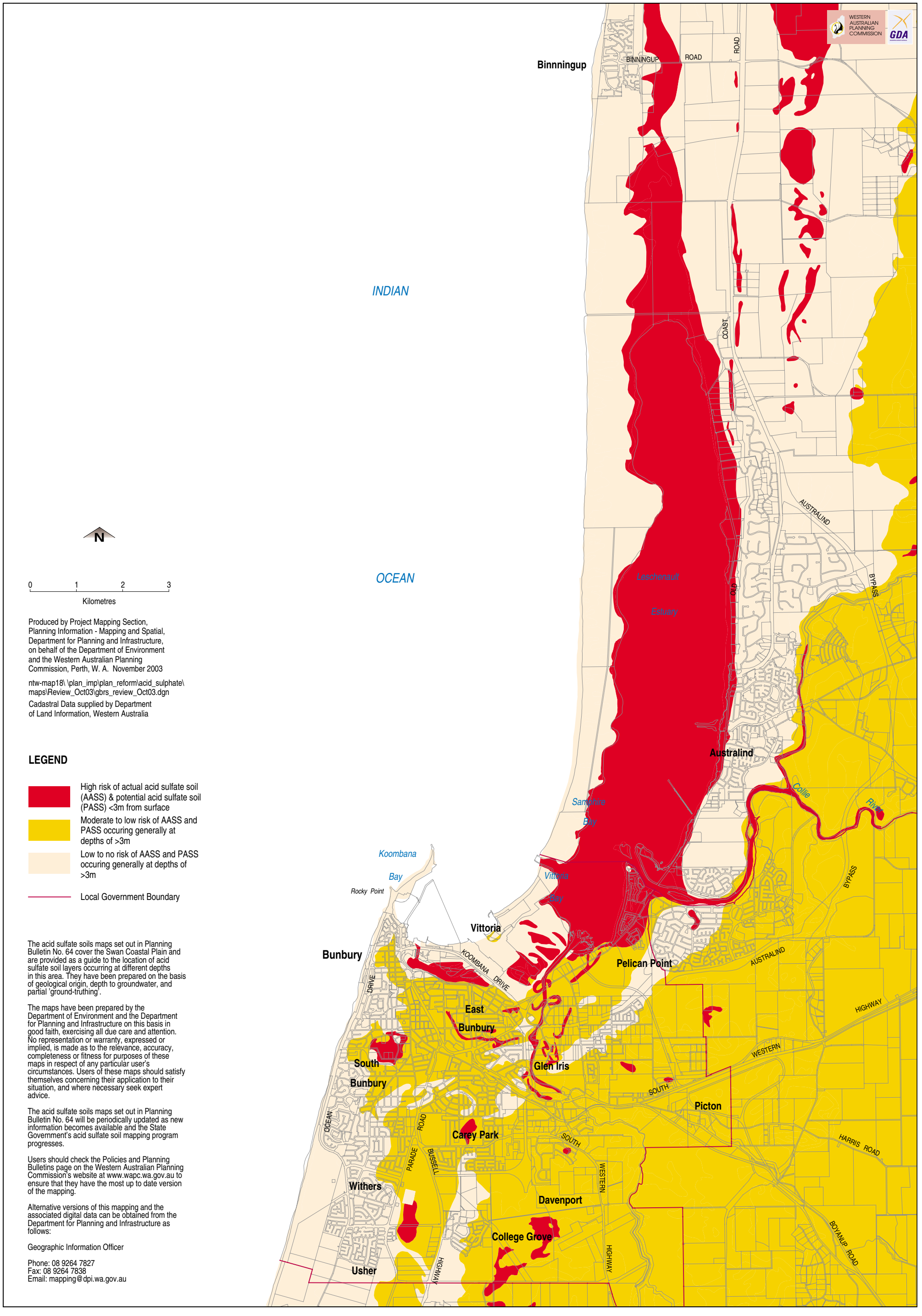
Department of Environment and Conservation (January 2009), *DRAFT Treatment and management of soils and water in acid sulphate soil landscapes*, Acid Sulphate Soils Guideline Series, Government of Western Australia.

Department of Environment and Conservation (May 2009), *Identification and Investigation of acid sulphate soils and acidic landscapes*, Acid Sulphate Soils Guideline Series, Government of Western Australia.

Queensland Department of Natural Resources, Mines and Energy (Qld NRM&E) (June 2004), *Acid Sulphate Soils, Laboratory Methods Guidelines*, Version 2.1 – Joint project of Queensland Acid Sulphate Soils Investigation Team (QASSIT), Southern Cross University (SCU), National Committee for Acid Sulphate Soils (NatCASS), Queensland Acid Sulphate Soils Management Advisory Committee (QASSMAC) and New South Wales Acid Sulphate Soils Management Advisory Committee (ASSMAC).

Western Australian Planning Commission (November 2003), *Acid Sulfate Soils*, Planning Bulletin Number 64, Figure 8: Australind – Bunbury Acid Sulfate Soils, Western Australia.

Appendix 1
Planning Bulletin Number 64: Australind – Bunbury Acid Sulphate Soils



Produced by Project Mapping Section, Planning Information - Mapping and Spatial, Department for Planning and Infrastructure, on behalf of the Department of Environment and the Western Australian Planning Commission, Perth, W. A. November 2003

ntw-map18\ \plan_imp\plan_reform\acid_sulphate\ maps\Review_Oct03\gbrs_review_Oct03.dgn

Cadastral Data supplied by Department of Land Information, Western Australia

LEGEND

- High risk of actual acid sulfate soil (AASS) & potential acid sulfate soil (PASS) <3m from surface
- Moderate to low risk of AASS and PASS occuring generally at depths of >3m
- Low to no risk of AASS and PASS occuring generally at depths of >3m
- Local Government Boundary

The acid sulfate soils maps set out in Planning Bulletin No. 64 cover the Swan Coastal Plain and are provided as a guide to the location of acid sulfate soil layers occurring at different depths in this area. They have been prepared on the basis of geological origin, depth to groundwater, and partial 'ground-truthing'.

The maps have been prepared by the Department of Environment and the Department for Planning and Infrastructure on this basis in good faith, exercising all due care and attention. No representation or warranty, expressed or implied, is made as to the relevance, accuracy, completeness or fitness for purposes of these maps in respect of any particular user's circumstances. Users of these maps should satisfy themselves concerning their application to their situation, and where necessary seek expert advice.

The acid sulfate soils maps set out in Planning Bulletin No. 64 will be periodically updated as new information becomes available and the State Government's acid sulfate soil mapping program progresses.

Users should check the Policies and Planning Bulletins page on the Western Australian Planning Commission's website at www.wapc.wa.gov.au to ensure that they have the most up to date version of the mapping.

Alternative versions of this mapping and the associated digital data can be obtained from the Department for Planning and Infrastructure as follows:

Geographic Information Officer

Phone: 08 9264 7827
Fax: 08 9264 7838
Email: mapping@dpi.wa.gov.au

Planning Bulletin Number 64

Figure 8: Australind - Bunbury Acid Sulfate Soils

Appendix 2
South West Chemical Services – Field Test Results

South West Chemical Services
Unit 5, 4 Mummery Cres.,
Bunbury, WA, 6230
ABN 71 111 052 218
Phone/Fax 08 9721 7170
Mobile 0417 149 645
Email admin@swchemservices.com.au

Certificate of Analysis

Client Name:	Strategen Attn: Roger Banks		
Address:	PO Box 287, Bunbury, WA 6231		
Phone No:	9792 4797	Fax:	9792 4708
Lab No:	4918	Email:	r.banks@strategen.com.au
Date samples received:	12/05/10	Report date:	14/05/10

Sample details: 36 Soil samples collected David Dodds and Zac Cockerill from 6 bore holes drilled using a hand auger at a site near the corner Harris Rd and Martin Pelusey Rd Dardanup, WA
The site is in an area of Moderate to Low risk of ASS occurring within 3 m of the natural soil surface.
Hole 1 Location GPS coordinates 50H 0382014 6309818 depth to 0.5 m
Hole 2 Location GPS coordinates 50H 0381617 6309801 depth to 2.25 m
Hole 4 Location GPS coordinates 50H 0381856 6309461 depth to 2.25 m
Hole 5 Location GPS coordinates 50H 0381146 6309216 depth to 1.0 m
Hole 8 Location GPS coordinates 50H 0381353 6308671 depth to 1.5 m
Hole 9 Location GPS coordinates 50H 0381580 6308647 depth to 1.5 m
Samples were immediately placed on ice and transferred to refrigerated storage.
A portion of the sample was removed for Field pH (pH_f) and oxidised Field pH (pH_{fox}), the remainder has been preserved by drying for 48 hours at 85°C

Scope of Work: Acid Sulphate Soils Field Tests pH_F, pH_{FOX}, Reaction rating, Fizz test
Preservation of retained samples, Interpretation of results.

Test Methods: Acid Sulphate Soils Laboratory Methods Guidelines Version 2.1 Section H:Field Tests June 2004, Queensland Government, Natural Resources, Mines and Energy.
Draft Identification & Investigation of Acid Sulphate Soils, prepared by Land & Water Quality Branch, DoE, WA May 2006
pH tested using Eutech WP pHScan BNC with Ionode Intermediate Junction pH combination electrode IJ48F calibrated according to manufacturer's instructions.

Test Results:

The field test results were assessed using the following criteria

a) pH_f less than 4
b) pH_{fox} less than 4 and /or
c) the change in pH was greater than 2 (where the resultant pH_{fox} was less than 4) and/or
d) there was a strong reaction following addition of hydrogen peroxide

Results meeting these criteria have been highlighted.

Of the 36 samples tested, there were no samples where the pHf was 4.0 or less

Of the 36 samples there were 2 sample where the pHfox was 4 or less

Of the 36 samples there were no samples that gave a change in pH > 2 units with the pHfox <4.0

1 sample gave a High reaction with the addition of Hydrogen Peroxide, 3 samples gave an Extreme reaction with gas evolution and heat with the addition of Hydrogen Peroxide.

'Actual acid sulphate soils (AASS) are soils or sediments which contain iron sulphides and/or other sulphidic minerals that have previously undergone some oxidation to produce sulphuric acid.' (DoE 2006)

'Potential acid sulphate soils (PASS) are soils or sediments which contain iron sulphides and/or other sulphidic minerals that have not been oxidised or exposed to air.' (DoE 2006)

There appears to be a no indication of the presence Potential Acid Sulphate soils at all levels in the samples processed.
There may be an indication of Actual Acid Sulphate soils in the samples collected from Hole 2 at 250 mm depth, Hole 5 at 250 mm and 500 mm depth.

All samples are being dried at 85°C for 48 hours.

If you have any further questions relating to this report and its interpretation please telephone South West Chemical Services on 08 9721 7170

David Dodds
Dip.App.Chem. A.G.Inst.Tech
.

Lab No: 4918
Hole No: Bore Hole 1
Hole Depth: 0.50 metre

Date Sampled: 12/05/10
Location: 0382014E
6309818N

Hole ID	Depth m	Soil Texture	pHf	pHfox	pHf - pHfox	Reaction	Fizz Test
				pH_{H2O2}=4.95			
1	0.25	fine dark brown sandy top soil	7.45	5.85	1.60	L	N
	0.50	orange brown fine to med grained sand	7.95	6.15	1.80	M	XX

Reaction Rating N = none L = low M = medium H = high X = extreme V = volcanic
N - no visible or audible reaction, X – slight reaction, XX – moderate reaction, XXX – high reaction, XXXX – Vigorous reaction, gas evolution, heat generation

Lab No: 4918
Hole No: Bore Hole 2
Hole Depth: 2.25 metre

Date Sampled: 12/05/10
Location: 0381617E
6309801N

Hole ID	Depth m	Soil Texture	pHf	pHfox	pHf - pHfox	Reaction	Fizz Test
				pH_{H2O2}=4.95			
2	0.25	light brown fine to medium grained sand	4.95	4.40	0.55	L	N
	0.50	light brown fine to medium grained sand	5.85	4.90	0.95	L	N
	0.75	blue/grey/green and brown sand - damp	6.75	5.05	1.70	N	N
	1.00	blue/grey/green and brown sand + gravel - damp	6.75	4.75	2.00	N	N
	1.25	blue/grey/green sand - wet	6.95	6.05	0.90	L	N
	1.50	blue/green/yellow sand - wet	7.55	6.80	0.75	L	N
	1.75	blue/green/grey sand - wet	7.65	7.95	-0.30	X	N
	2.00	blue/green/grey sand - wet	7.65	7.90	-0.25	X	N
	2.25	grey clay	6.90	7.50	-0.60	X	N

Reaction Rating N = none L = low M = medium H = high X = extreme V = volcanic
N - no visible or audible reaction, X – slight reaction, XX – moderate reaction, XXX – high reaction, XXXX – Vigorous reaction, gas evolution, heat generation

Lab No: 4918
Hole No: Bore Hole 4
Hole Depth: 2.25 metre

Date Sampled: 12/05/10
Location: 0381856E
6309461N

Hole ID	Depth m	Soil Texture	pHf	pHfox	pHf - pHfox	Reaction	Fizz Test
				pH_{H2O2}=4.95			
4	0.25	brown/yellow fine sand	7.00	5.40	1.60	L	N
	0.50	yellow fine to med grained sand	7.20	5.35	1.85	L	N
	0.75	yellow fine to med grained sand	7.30	5.30	2.00	L	N
	1.00	yellow fine to med grained sand	7.25	5.25	2.00	L	N
	1,25	yellow fine to med grained sand	7.20	5.30	1.90	N	N
	1.50	yellow fine to med grained sand	7.30	5.25	2.05	L	N
	1.75	yellow fine to med grained sand	7.40	5.25	2.15	L	N
	2.00	yellow fine to med grained sand	7.35	5.25	2.10	L	N
	2.25	yellow fine to med grained sand	7.40	5.25	2.15	L	N

Reaction Rating N = none L = low M = medium H = high X = extreme V = volcanic
N - no visible or audible reaction, X – slight reaction, XX – moderate reaction, XXX – high reaction, XXXX – Vigorous reaction, gas evolution, heat generation

Lab No: 4918
Hole No: Bore Hole 5
Hole Depth: 1.00 metre

Date Sampled: 12/05/10
Location: 0381146E
6309216N

Hole ID	Depth m	Soil Texture	pHf	pHfox	pHf - pHfox	Reaction	Fizz Test
				pH_{H2O2}=4.95			
5	0.25	dark brown silty sand	4.60	**4.00**	0.60	L	N
	0.50	brown fine to med grained sand + gravel	4.95	**3.90**	1.05	N	N
	0.75	yellow/brown fine to med grained sand + gravel - damp	5.95	5.05	0.90	L	N
	1.00	yellow/brown fine to med grained sand + gravel - damp	6.30	5.15	1.15	N	N

Reaction Rating N = none L = low M = medium H = high X = extreme V = volcanic
N - no visible or audible reaction, X – slight reaction, XX – moderate reaction, XXX – high reaction, XXXX – Vigorous reaction, gas evolution, heat generation

Lab No: 4918
Hole No: Bore Hole 8
Hole Depth: 1.50 metre

Date Sampled: 12/05/10
Location: 0381353E
6308671N

Hole ID	Depth m	Soil Texture	pHf	pHfox	pHf - pHfox	Reaction	Fizz Test
				pH_{H2O2}=4.95			
8	0.25	light brown fine – medium grained sand	5.70	4.25	1.45	L	N
	0.50	light brown fine to medium grained sand	6.55	5.50	1.05	N	N
	0.75	light brown/yellow fine to medium grained sand - damp	7.10	6.60	0.50	H	N
	1.00	brown/yellow fine – medium grained clayey sand - wet	7.40	6.95	0.45	M	N
	1.25	brown/yellow fine – medium grained clayey sand - wet	7.40	6.35	1.05	L	N
	1.50	brown/yellow/grey sand - wet	7.20	6.30	0.90	L	N

Reaction Rating N = none L = low M = medium H = high X = extreme V = volcanic
N - no visible or audible reaction, X – slight reaction, XX – moderate reaction, XXX – high reaction, XXXX – Vigorous reaction, gas evolution, heat generation

Lab No: 4918
Hole No: Bore Hole 9
Hole Depth: 1.50 metre

Date Sampled: 12/05/10
Location: 0381580E
6308647N

Hole ID	Depth m	Soil Texture	pHf	pHfox	pHf - pHfox	Reaction	Fizz Test
				pH_{H2O2}=4.95			
9	0.25	light brown/grey fine – medium grained sand	6.20	4.75	1.75	N	N
	0.50	grey/brown fine to medium grained sand	7.00	5.30	1.70	L	N
	0.75	brown fine to medium grained sand - damp	6.95	5.50	1.45	L	N
	1.00	grey/brown fine – medium grained sand - damp	6.65	5.35	1.30	N	N
	1.25	orange/brown fine – medium grained clayey sand - wet	5.70	4.50	1.20	L	X
	1.50	grey clayey sand - wet	6.50	4.75	1.75	L	N

Reaction Rating N = none L = low M = medium H = high X = extreme V = volcanic
N - no visible or audible reaction, X – slight reaction, XX – moderate reaction, XXX – high reaction, XXXX – Vigorous reaction, gas evolution, heat generation

Appendix C

Flora, vegetation and fauna assessment methodology
(Emerge Associates 2020)

TECHNICAL MEMORANDUM

Flora, Vegetation and Fauna Assessment Methodology

PROJECT NUMBER	EP12-039(03)	**DOC. NUMBER**	EP12-039(03)—017a KK
PROJECT	Local Structure Plan Lot 103, 110 and 603 Picton East	**CLIENT**	Harris Road Pty Ltd
AUTHOR	KK	**REVIEWER**	KK
VERSION	A	**DATE**	January 2020

1 OVERVIEW

This technical memorandum has been prepared to document the assessment of environmental values (particularly with regard to conservation significant flora, vegetation and fauna values) that has informed the preparation of the Local Structure Plan (LSP) for Lot 103, 110 and 603 Picton East (herein referred to as 'the site').

2 INFORMATION USED TO ASSESS VALUES

As part of determining the environmental values relevant to the site, Emerge Associates have considered a range of investigations undertaken for the site and surrounds, and also completed a reconnaissance site visit in November 2019 to understand whether the observed values reflected the documented environmental values and determine if additional investigations were required to support the LSP. This review and site visit were particularly relevant given that a number of new conservation significant values (such as '*Banksia woodlands of the Swan Coastal Plain*' threatened ecological community (TEC) and '*tuart woodland and forest of the Swan Coastal Plain*' TEC) have been identified since some of the investigations were completed.

This is discussed in the following sections.

2.1 Review of existing information

Over the last 10 to 15 years, a number of investigations have been undertaken specific to the site, but also the broader Preston Industrial Area (which the site forms part of) that have considered the flora, vegetation and fauna values that may require protection and/or management as part of the industrial development within the region. These investigations and the associated outcomes were reviewed in detail as part of undertaking the environmental assessment for the site and include:

- *Advice on areas of conservation significance in the Preston Industrial Park* (EPA 2008)
- *Report on a Level 1 flora and vegetation survey at various lots at Picton East* (Ekologica Pty Ltd 2009)
- *Terrestrial Fauna Survey (Level 1) of Lots 1, 2, 11, 102-104 and 603 Picton (East)* (Harewood 2009)
- *Shire of Dardanup Local Biodiversity Strategy Discussion Paper (draft)* (Ironbark Environmental & Eco Logical Australia 2009)
- *Report for Preston South, Eastern Precinct – Environmental Assessment for Potential Land Development* (GHD 2011)
- *Picton Industrial Park Southern Precinct District Structure Plan* (DPLH 2018)

In addition to the above, recent environmental investigations associated with the assessment of the Bunbury Outer Ring Road pursuant to the state *Environmental Protection Act 1986* and federal *Environment Protection and Biodiversity Conservation Act 1999* (released in 2019) were reviewed for context and information on conservation significant environmental values that may be relevant for the site.

2.2 Review of federal and state databases

To determine if current conservation significant values relevant to the site and surrounds had been considered as part of the existing detailed investigations, a review of the following datasets was undertaken:

- *Weed and native flora dataset* (Keighery *et al.* 2012)
- *Protected Matters Search Tool* (Department of Environment and Energy (DoEE) 2018)
- Threatened and priority ecological community lists (Department of Biodiversity Conservation Attraction (DBCA) 2018 and 2019a)
- *NatureMap* (DBCA 2019b).

This review identified that a number of conservation significant values (particularly threatened ecological communities (TECs) may not have been considered as part of the previous investigations, and therefore further work may be required. These values included:

- Banksia woodland of the Swan Coastal Plain TEC
- Tuart woodland and forest of the Swan Coastal Plain TEC
- Subtropical and temperate coastal saltmarsh TEC. This TEC is not relevant to the site as suitable habitat is not present.

2.3 Site assessment

In order to understand if the vegetation values within the site had changed compared to those previously assessed (particularly as part of the flora and vegetation survey (Ekologica Pty Ltd 2009)) and/or if values not previously considered conservation significant (and therefore would not have been assessed) were present within the site, an environmental scientist from Emerge Associates completed a reconnaissance site visit in November 2019.

The purpose of this site assessment was to confirm the findings of the previous survey(s) and understand if any additional flora, vegetation or fauna values may be relevant (based on the characteristics observed and outcomes of the database searches) and if additional investigations would be required to support preparation of the LSP.

The site visit included a detailed walkover of the site observing vegetation present, and searching for characteristics that may indicate the:

- Vegetation condition had changed compared to the Ecological Pty Ltd (2009) survey. Vegetation condition is a good indicator of level of disturbance, and where areas are highly disturbed, conservation significant flora values are typically less likely to occur.
- Presence of any *Banksia* sp., as if *Banksia* sp. were present this would indicate that the *Banksia woodlands of the Swan Coastal Plain* TEC may be present

- Presence of *Eucalyptus gomphocephala* (Tuart) individuals, as if tuart were present this would indicate that the *Tuart woodlands and forest of the Swan Coastal Plain* TEC may be present.

3 OUTCOMES OF REVIEW AND SITE VISIT

The outcomes of the database review indicated that additional conservation significant values pursuant to the federal EPBC Act and state *Biodiversity Conservation Act 2016* (BC Act) had the potential to occur in the site and that these were not assessed as part of the previous site-specific flora and vegetation survey (Ekologica Pty Ltd 2009). No new fauna species were identified compared to those previously considered as part of the fauna survey (Harewood 2009).

However, the site assessment indicated that no additional conservation significant values were likely to occur within the site and that the vegetation values had not changed compared to the flora and vegetation survey (Ekologica Pty Ltd 2009). In particular:

- Vegetation condition did not appear to have changed compared to the outcomes of the flora and vegetation survey (Ekologica Pty Ltd 2009). The vegetation within the site was composed of overstorey species over paddock grasses. No understorey species were observed.
- No Banksia sp. were present within the site. Accordingly, the *Banksia woodlands of the Swan Coastal Plain* TEC is unlikely to be present.
- No tuart trees were present within the site. Accordingly, the *Tuart woodlands and forest of the Swan Coastal Plain* TEC is unlikely to be present
- No new conservations significant fauna species were identified compared to those previously assessed.

On this basis, the environmental values relevant to the LSP (and assessment for the Environmental Assessment and Management Strategy (EAMS)) have been considered based on a review of current databases and the outcomes of the previous environmental investigations and recent reconnaissance site assessment undertaken by Emerge Associates (2019).

Additional investigations may be required to support a detailed consideration of potential obligations pursuant to the federal EPBC Act, and in particular potential impacts on habitat for the three black cockatoo species and western ringtail possum. This will be addressed prior to physical disturbance of remnant vegetation within the site, but is not required to support preparation of the LSP.

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Appendix D

Level 1 flora and vegetation survey (Ekologica Pty Ltd 2009)

Report on a Level 1 flora and vegetation survey of various lots at Picton East

Date: 22nd December 2009

Prepared for *Strategen*

By Russell Smith*, Ekologica Pty Ltd*
PO Box 207 Bunbury, WA, 6231

Contents

SUMMARY

A Level 1 flora survey (EPA, 2004) was carried out in October 2009 on approximately 33 ha of remnant vegetation in an area comprised of 7 lots (Lots 1, 2, 11, 103, 603, 102 and 104), totaling about 135 ha, in the proposed Picton East industrial park near Bunbury.

A total of 46 species of native flora was found within the remnant vegetation of the Study area, which is a very low number reflecting the long history of agriculture in the area. No Declared Rare or Priority List flora, or other flora of conservation significance was found. The remnant vegetation of the Study Area was mapped as four units, one of these consisting predominantly of planted species. The vegetation units were similar to units previously derived for the Study Area.

Vegetation condition was predominantly “Completely Degraded” (79%) with 9% (3 ha) in “Degraded” condition and only 12% (4 ha) in “Good” condition.

The remnant vegetation within the Study area has been classified as 1b or 1c by the South West Ecological Linkages project, which reflect the level of its proximity to a regional linkage axis line. The nearest edge of vegetation classed as 1b is up to 100 m from vegetation that touches or is less than 100 m from the axis line, and that classed as 1c is up to 100 m from vegetation classed as 1b.

INTRODUCTION

1.1. Background

A Level 1 Flora Survey[1] was conducted on an area of land, comprised of 7 lots (Lots 1, 2, 11, 103, 603, 102 and 104), totaling about 135 ha, of which about 33 ha consists of remnant vegetation in the proposed Picton East industrial park. The survey was carried out between 19th and **X** October 2009. The Study Area is within the area identified by the Western Australian Planning Commission (WAPC) for the future development of the Preston Industrial Park (Environmental Protection Authority, 2008).

1.2. Regional Setting and Soils

The study area lies 9 km ESE of the Bunbury CBD adjacent to the South West Highway. It lies near the junction of the Pinjarra and Bassendean soil landscape zones (Schoknecht *et al*, 2004). To the east lie the relatively fertile soils of the Pinjarra Plain System and to the west the leached, infertile soils of the Bassendean Dune System (Seddon, 1972, Bolland, 1998).

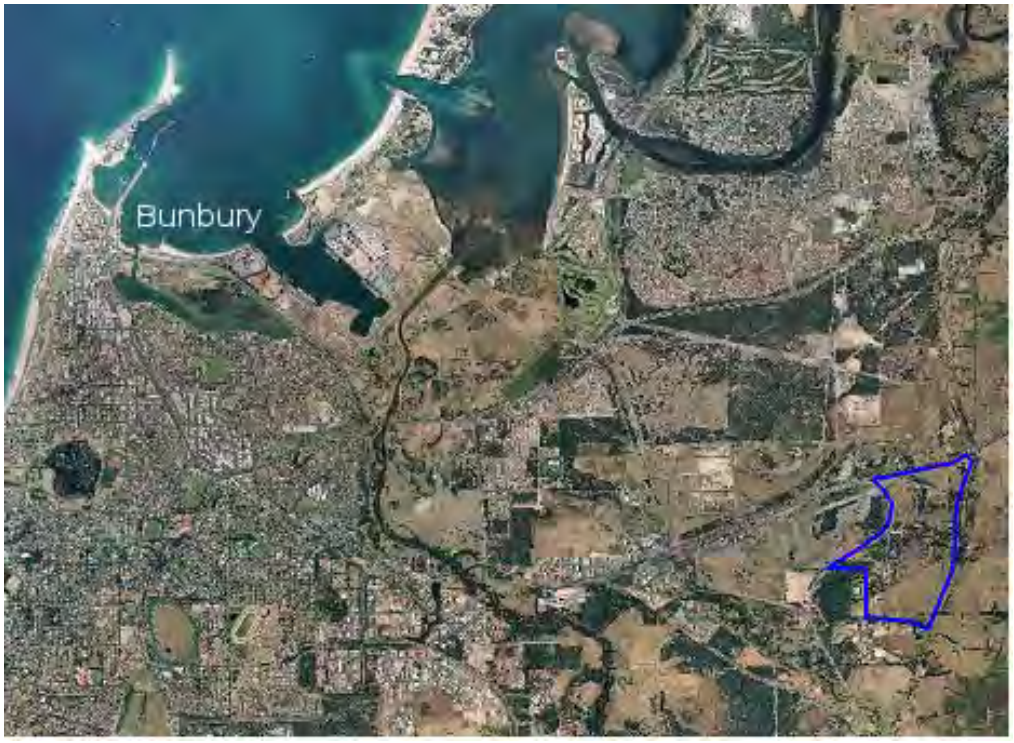


Figure 1. The Study Area in relation to the city of Bunbury.

[1] EPA (2004). Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia. Guidance for the Assessment of Environmental Factors, No. 51. Environmental Protection Authority of Western Australia.

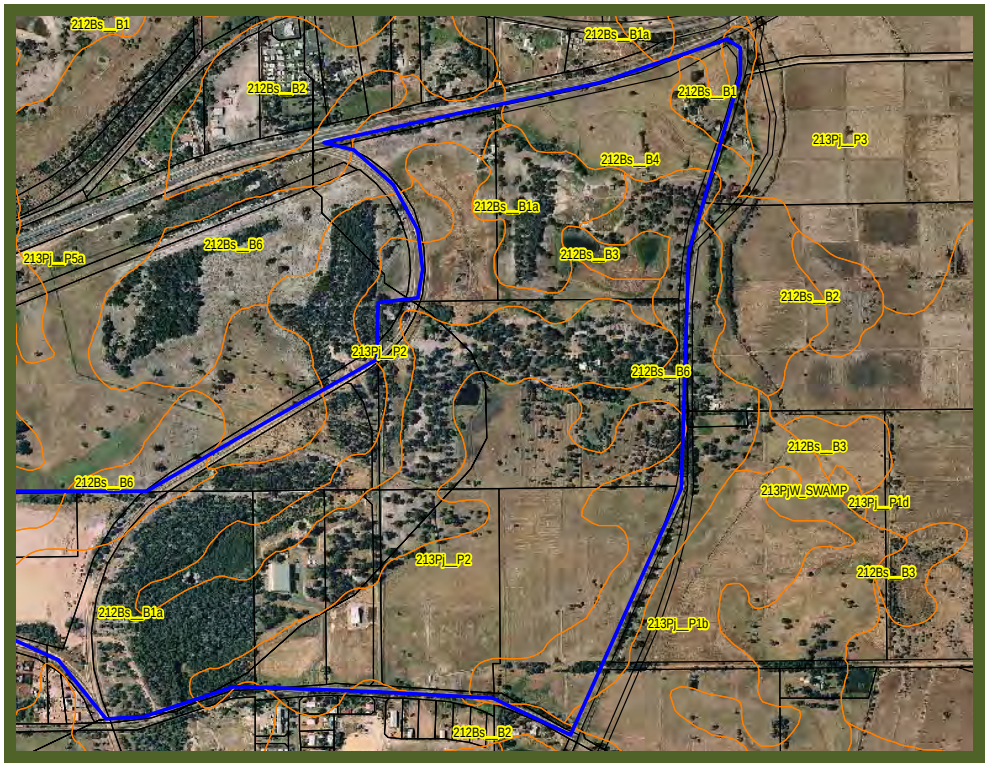


Figure 2. The soil mapping units of the Study Area.

Within the Study Area the soils are a mixture of Bassendean Dune and Pinjarra Plain soils (Fig. 2) with Bassendean soils generally occupying the low sandy ridges and the Pinjarra soils being found in the shallow depressions, or swales. The soil mapping units found within the Study Area are described in Table 1. Most of the remnant vegetation remaining within the Study Area is situated on the Bassendean soils, with the more fertile Pinjarra soils having been long ago cleared for agriculture.

1.3. Vegetation and Threatened Ecological Communities

1.3.1. Vegetation of the Study Area

The vegetation and flora of the Study Area has been investigated as part of a number of studies done as part of those carried out for the Preston Industrial Park (see references in EPA, 2008). Vegetation mapping by Smith (1974) at 1:250,000 scale shows the vegetation of the Study Area as: “Medium woodland; jarrah, marri & wandoo” occurring in the Pinjarra vegetation system of Beard (1981) and “Mosaic: Medium forest; jarrah-marri / Low woodland; *Banksia* / Low forest; teatree (*Melaleuca* spp.)” for the Bassendean System (corresponding with the Pinjarra Plain and Bassendean Dune soils respectively). Heddle *et al*. (1980) mapped the vegetation complexes of the System 6 area, which includes the Study Area. Two of these occur within the Study Area, these being:

Southern River Vegetation Complex: Open woodland of *E. calophylla - E. marginata - Banksia* species with fringing woodland of *E. rudis - M. rhaphiophylla* along creek beds.

Guildford Vegetation Complex: A mixture of open forest to tall open forest of *Corymbia calophylla – Eucalyptus wandoo – Eucalyptus marginata* and woodland of *Eucalyptus wandoo*. Minor components include *Eucalyptus rudis – Melaleuca rhaphiophylla*

Perth Bioplan mapping (unpublished) and Connell, Wagner and Ecoscape (2007) mapping of the vegetation within the Preston Industrial Park cited by EPA (2008) has not been sighted for this study.

Soil Mapping Unit	Mapping Unit Name	Description
Pj__P2	Pinjarra P2 phase	Flat to very gently undulating plain with deep alkaline mottled yellow duplex soils which generally consist of shallow pale sand to sandy loam over clay.
Bs__B1	Bassendean B1 phase	Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands sometimes with a pale yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2 m.
Bs__B1a	Bassendean B1a phase	Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands with an intensely coloured yellow B horizon occurring within 1 m of the surface.
Bs__B3	Bassendean B3 phase	Closed depressions and poorly defined stream channels with moderately deep, poorly to very poorly drained bleached sands with an iron-organic pan, or clay subsoil. Surfaces are dark grey sand or sandy loam.
Bs__B4	Bassendean B4 phase	Broad poorly drained sandplain with deep grey siliceous sands or bleached sands, underlain at depths generally greater than 1.5 m by clay or less frequently a strong iron-organic hardpan.
Bs__B6	Bassendean B6 phase	Sandplain and broad extremely low rises with imperfectly drained deep or very deep grey siliceous sands.

Table 1. The soil mapping units found within the Study Area (From Barnesby, B.A. and Proulx-Nixon, M.E., 2000).

1.3.2. Threatened Ecological Communities

An ecological community is a naturally occurring biological assemblage that occurs in a particular type of habitat. The scale at which ecological communities are defined will often depend on the level of detail in the information source, therefore no particular scale is specified (DEC, 2007a).

A threatened ecological community (TEC) is one which is found to fit into one of the following categories; "presumed totally destroyed", "critically endangered", "endangered" or "vulnerable".

Possible threatened ecological communities that do not meet survey criteria are added to DEC's Priority Ecological Community Lists under Priorities 1, 2 and 3. Ecological Communities that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. The threatened ecological communities of the Swan Coastal Plain mainly derive from the survey of Gibson *et al*. (1994).

There are several Threatened (TECs) known to occur within a 10 km radius of the study area. These are listed in Table 2.

Soil-landscape system	**Threatened Ecological Community Type and Name (from Gibson *et al*., 1994)**	**Status[2]**
Pinjarra	SCP3c "*Corymbia calophylla - Xanthorrhoea preissii* woodlands and shrublands, Swan Coastal Plain"	CR
Pinjarra	SCP08 "Herb rich shrublands in clay pans, Swan Coastal Plain"	VU
Pinjarra/Bassendean	SCP09 "Dense shrublands on clay flats, Swan Coastal Plain"	VU
Spearwood	SCP019 Shrublands on calcareous silts of the Swan Coastal Plain	CR*

Table 2. Threatened Ecological Communities occurring within 10 km of the Study Area at Picton East. (*: recommended to be upgraded from "VU").

Priority Ecological Communities that occur within 10 km of the Study area include "Low lying *Banksia attenuata* woodlands or shrublands" ('floristic community type SCP21c') and "Southern *Banksia attenuata* woodlands ('floristic community type SCP21b')", both of which are classified as Priority 3.

No Threatened Ecological Communities are known to occur within the Preston Industrial Park Area (which includes the Study Area) (EPA, 2008). However, the EPA report did acknowledge that vegetation is considered to be of regional significance at vegetation complex level. Of the four vegetation complexes within the Preston Industrial Park, the Guildford vegetation complex (Heddle *et al*., 1980) is considered of highest conservation significance because it falls below the 10% target for retention.

Vegetation of the Southern River Complex, which is characterized by being in the transition between the Pinjarra Plain and the Bassendean Dunes, and which supports communities associated with the Bassendean Dunes but contains pockets of alluvial and colluvial soils which support plant communities characteristic of the Pinjarra Plain is also below the EPA's target

[2] VU = "Vulnerable", EN = "Endangered", CR = "Critically endangered".

level of native vegetation retention of at least 30% of the pre-clearing extent of the ecological communities on the Swan Coastal Plain.

1.3.3. Declared Rare and Priority Flora

Species of flora and fauna are defined as Declared Rare or Priority conservation status where their populations are restricted geographically or threatened by local processes. The Department of Environment and Conservation recognizes these threats of extinction and consequently applies regulations towards population and species protection. Declared Rare Flora species are gazetted under subsection 2 of section 23F of the Wildlife Conservation Act (1950) and therefore it is an offence to "take" or damage rare flora without Ministerial approval. Section 23F of the Wildlife Conservation Act (1950-1980) defines "to take" as "… to gather, pick, cut, pull up, destroy, dig up, remove or injure the flora or to cause or permit the same to be done by any means.

Priority Flora are under consideration for declaration as 'rare flora', but are in urgent need of further survey (Priority One to Three) or require monitoring every 5-10 years (Priority Four). Table 3 presents the definitions of Declared Rare and the four Priority ratings under the Wildlife Conservation Act (1950) as extracted from Atkins (2008) and Department of Environment and Conservation (DEC 2009b, 2009c). Threatened or Priority flora occurring within 10 km of the Study Area are listed in Table 4.

2. OBJECTIVES

The objectives of the flora and vegetation survey for the study area were to:

- conduct an assessment of flora and vegetation values within the study area, building on existing studies in the adjacent area;
- conduct a review of other literature to summarize the values of flora and vegetation significance in the project area;
- review the documented flora and vegetation of significance, based on DEC records (databases);
- conduct a field assessment to:
    - identify the vascular flora species present;
    - determine the presence or absence of Declared Rare Flora (DRF), Priority or Significant Species;
    - define and spatially map vegetation communities;
    - define and spatially map vegetation condition;
- prepare a report that summarizes the findings of the desktop and field assessments

Conservation Code	Category
R	"Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection and have been gazetted as such.'
P1	"Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey."
P2	Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey."
P3	"Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (ie. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora', but are in need of further survey."
P4	"Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years."

Table 3. Definitions of declared rare and priority list flora

Species	Priority
Acacia flagelliformis	4
Anthotium junciforme	4
Aponogeton hexatepalus	4
Caladenia speciosa	4
Carex tereticaulis	1
Chamaescilla gibsonii	3
Diuris drummondii	DRF
Lasiopetalum membranaceum	3
Pultenaea skinneri	4
Rhodanthe pyrethrum	3
Schoenus capillifolius	3
Trichocline sp. Treeton (B.J. Keighery & N. Gibson 564)	2
Verticordia attenuata	3
Villarsia submersa	4

Table 4. Declared rare and Priority List flora occurring with the Preston Industrial Park (EPA, 2008) or known to occur with 5 km of the Study Area (DEC, 2009b)

3. METHODS

The areas of remnant vegetation within the Study Area were traversed on foot on 19th and 20th October 2009. At representative locations a listing of all native vascular flora was made within an approximately 20 m radius. Notes were also taken of surface soil type, and vegetation condition using the method of Keighery (1994) (Table 5).

SCORE	DESCRIPTION
Pristine (1)	Pristine or nearly so, no obvious signs of disturbance.
Excellent (2)	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good (3)	Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good (4)	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded (5)	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely Degraded (6)	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as "parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

Table 5. The native vegetation condition rating scale of Keighery (1994).

4. RESULTS AND DISCUSSION

4.1. Flora

Only 44 species of native flora were recorded from within the Study Area (Appendix A). Non-native species were generally not recorded, these having been comprehensively covered in previous surveys within the Preston Industrial Park Area (see references in EPA, 2008). This number of native species is far lower than would be expected in 33 ha of the original vegetation. No Declared Rare or Priority List flora, or other flora of conservation significance was found.

4.2. Vegetation units

Four vegetation units were identified within the Study Area (Table 6; Figure 3; Appendix B), however one of these, Vegetation Unit 4, is predominantly comprised of planted non-local species. There was sufficient variation in the other vegetation units to suggest that originally others may have been identifiable, however, loss of species has simplified the composition to the extent that only three are now recognizable. This accords with the survey carried out by the DEC (2007) and reported in EPA (2008), which identified three vegetation units within Investigation Area 6 (contained within the present Study Area). While they are described somewhat differently, the DEC (2007) vegetation units correspond closely with vegetation Units identified by this survey.

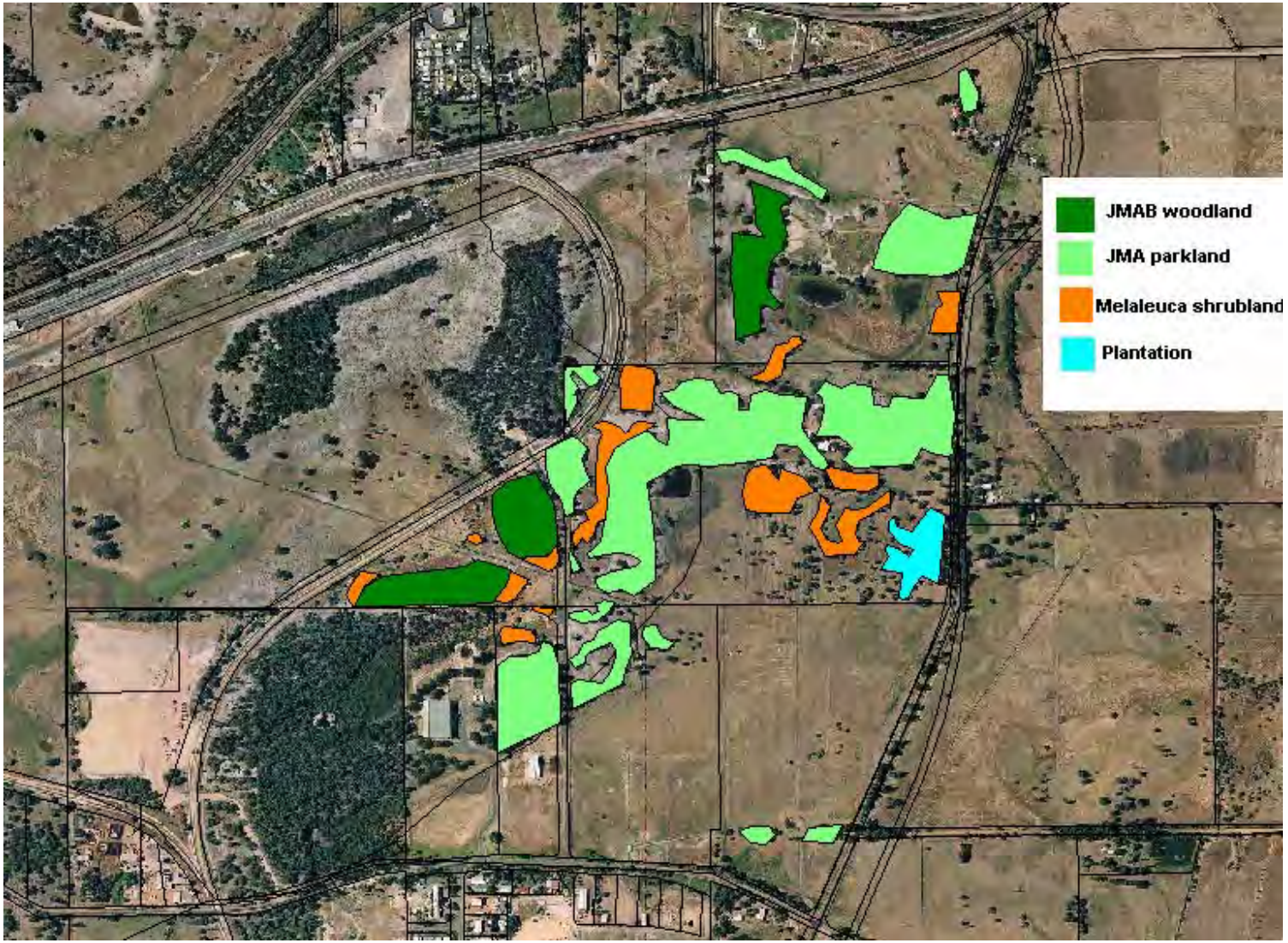
Species occurring within each of the vegetation Units are listed in Appendix 1. It is difficult because of their present paucity of native species to reliably assign the vegetation units identified in this study to the floristic community types described by Gibson *et al*. (1994) in the "Floristic Survey of the Swan Coastal Plain", except for Vegetation Unit 1, which probably belongs to the "Central *Banksia attenuata-Eucalyptus marginata* woodlands" (SCP 21a) floristic community type. None of the vegetation units corresponds with any Threatened or Priority Ecological Community.

As can be seen from Table 6 Vegetation Units 1 and 2 occur within areas mapped as "Southern River complex" by Heddle *et al*. (1980) and Vegetation Unit 2 within areas mapped as "Southern River Complex" or "Guildford Complex".

Unit Number	**Vegetation Unit**	**Description**	**Vegetation Complex** (Heddle *et al.*, 1980)
1	JMAB woodland	Woodland of Jarrah and Marri over low woodland of *Agonis flexuosa*, *Banksia attenuata* and *Banksia ilicifolia* woodland over shrubland	Southern River
2	*Melaleuca* woodland/ shrubland	Woodland or tall shrubland of *Melaleuca rhaphiophylla* or *M. preissiana* over a shrubland of *M. lateritia* and/or *M. teretifolia*	Southern River/Guildford
3	JMA parkland	Woodland to open woodland of Jarrah, Marri and *Agonis flexuosa* over pasture species and weeds	Southern River
4	Plantation	Mixed plantings of eucalypts and other species with scattered original tree species.	[Guildford]

Table 6. Vegetation Units identified within the Study Area described using the structural categories of Specht (1970).

Figure 3. Vegetation Units within the Study Area



4.3. Vegetation Condition

Because of a long history of grazing as well as partial clearing and the application of fertilizers most of the native species (particularly shrub and herbaceous species) within the remnant vegetation of the Study Area have been replaced by pasture species and annual and perennial weeds associated with agriculture. This is particularly so on the heavier and more fertile soils of the lower lying areas. Seventy nine percent (26 ha) of the remnant vegetation was judged to be in "Completely Degraded" condition, 9% (3 ha) in "Degraded" condition and only 12% (4 ha) in "Good" condition (Fig. 4).

4.4. Significance of the vegetation

Except for the area of Vegetation Unit 1 given a condition rating of "Fair to Good" the remnant vegetation of the Study Area has a low level of integrity in terms of the proportion of the original species remaining. This is particularly the case with regard to Vegetation Unit 3, which consists almost entirely of woodland or open woodland of jarrah, marri and *Agonis flexuosa* over an annual herbaceous understorey of pasture species. However, the many large trees, some with hollows, represent roosting and feeding resources for bird species. The EPA (2008) has assessed the vegetation within the Study Area as regionally significant because of the potential for used by the red-tailed Black Cockatoo, a Schedule 1 species and because the remnant vegetation represents degraded examples of the "Southern River" and "Guildford" vegetation complexes which have only 20% and 5% respectively of their original area remaining on the Swan Coastal Plain (EPA, 2008).

However, the vegetation in those areas mapped as Guildford in the Study Area (the *Melaleuca* shrubland community) has few of its original species left and has been assessed as completely degraded. Floristically it has little value as a representative of the Guildford Complex. There may be, however, opportunities to construct a partially rehabilitated linkage using remnants of this vegetation in the Study Area. This subject is addressed in Section 5, below.

4.5. Linkages

The South West Regional Linkages report (Molloy *et al*., 2009) has identified some of the vegetation in the Study Area as belonging to 1b "proximity value" (in the south west part of Lot 104) and the rest as belonging to 1c. The meanings of these proximity values are;

- 1b, the vegetation is a patch with an edge touching or <100m from a natural area selected in 1a
- 1c, a patch with an edge touching or <100m from a natural area selected in 1b.

Vegetation classified as 1a is a patch with an edge touching or <100m from a linkage, ecological linkages being;

"a series of (both contiguous and non-contiguous) patches which, by virtue of their proximity to each other, act as stepping stones of habitat which facilitate the maintenance of ecological processes and the movement of organisms within, and across, a landscape".

The report by Molloy *et al*. (2009) states that "In applying proximity analysis to land use planning it must be understood that 1b and 1c […] level patches are not part of the core linkage (1a level patches), therefore their value in maintaining a linkage's ecological function will (generally) not be as great".

5. Conclusions and recommendations

As mentioned above, there is less than 5% of the pre-European extent remaining of the Guildford vegetation complex and only 20% of the Southern River Complex. Therefore even though both of these vegetation complexes are currently in a degraded condition it is important to conserve as much as possible of these vegetation types and to take steps, where practicable, to restore areas of vegetation within both the vegetation complexes.

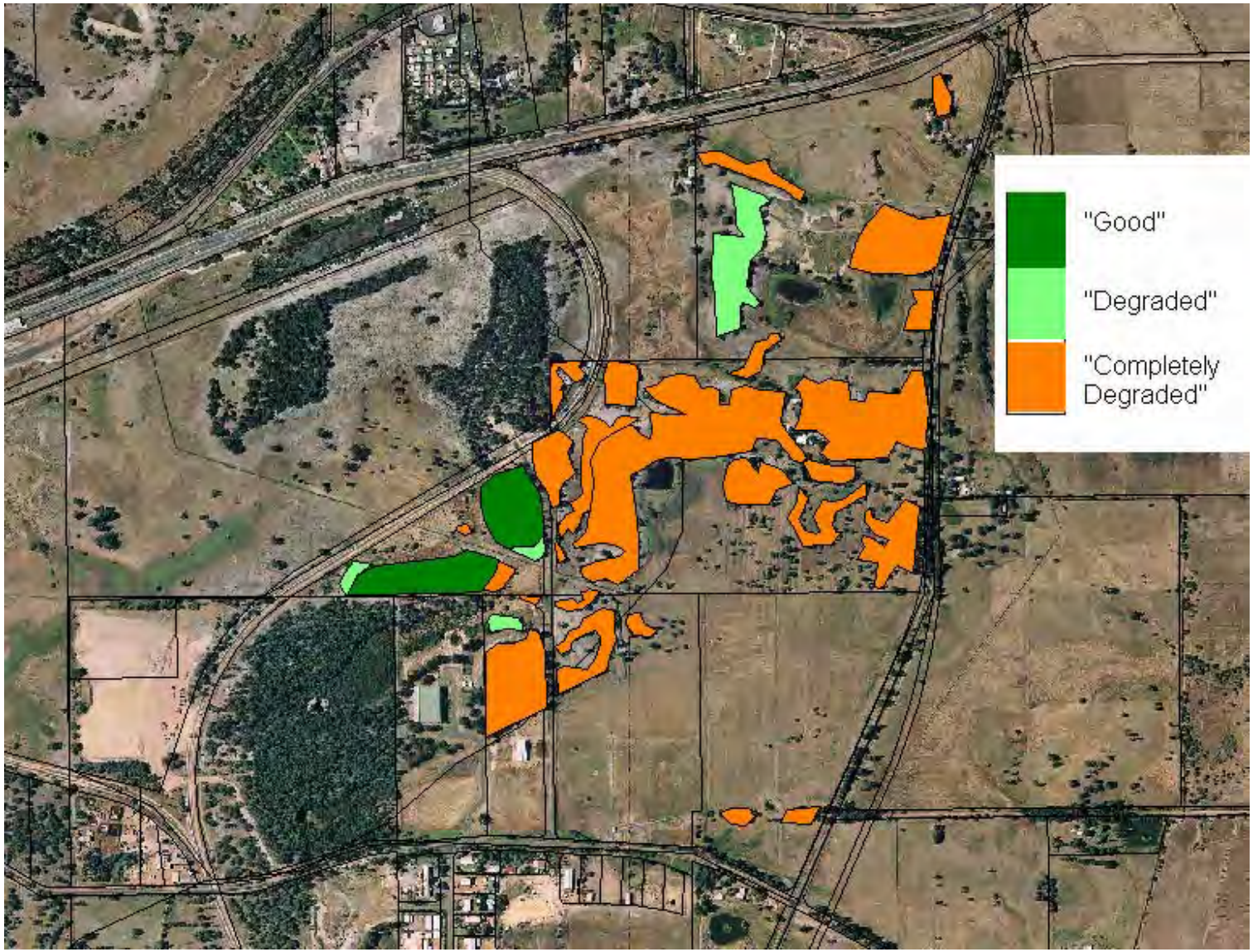
As the exact nature of any proposed development in the Study Area is unknown to the author at this juncture the following generalized recommendations are presented and should be incorporated into the planning process where possible.

Aim to reduce the impact on the existing remnant Flora much as possible. It is recommended that:

- Planning for development recognizes that some clearing of the remnant vegetation will occur however steps should be taken where possible, aim to retain and protect as much remnant vegetation on site. In particular the best quality woodland habitat as identified in EPA Bulletin 1282 (EPA 2008) should be a priority for protection (part recommendation Area E – Lot 104),
- Rehabilitated and Landscaped areas should be re-vegetated with local seed stock. The final selection of suitable species should be carried out after liaison with suitable qualified botanist with knowledge of both the Southern River and Guildford vegetation complex to ascertain which species are most suitable for the area,
- Any rehabilitation undertaken on the site should have regard to the vegetated corridors outlined in the GBRS and the recent recommendation from Malloy 2009,
- During site works areas requiring clearing should be clearly marked and access to other areas restricted to prevent accidental clearing of areas to be retained,
- All staff working on site should be made aware that native flora is highly susceptible to dieback disease caused by the soil-borne pathogen *Phytophthora cinnamomi* and

personnel working on the project should be instructed in dieback hygiene practices and a Dieback Management plan should be prepared for the site.

Figure 4. Vegetation condition within the Study Area using the method of Keighery (1994).



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Appendix A. List of locally native flora found within each vegetation unit in the Study Area at Picton East

FAMILY_NAME	LATIN NAME	1	2	3	4
Colchicaceae	*Burchardia congesta*	+			
Cyperaceae	*Gahnia trifida*		+		
	Lepidosperma leptostachyum	+			
	Lepidosperma longitudinale		+		
	Lepidosperma squamatum	+			
	Mesomelaena tetragona	+			
	Tetraria octandra	+			
Dasypogonaceae	*Dasypogon bromeliifolius*	+			
Dilleniaceae	*Hibbertia hypericoides*	+			
Droseraceae	*Drosera pallida*	+			
Epacridaceae	*Leucopogon conostephioides*	+			
	Leucopogon propinquus	+			
Haemodoraceae	*Conostylis aculeata*	+			
Hemerocallidaceae	*Thysanotus manglesianus*	+			
Iridaceae	*Patersonia occidentalis*	+			
Juncaceae	*Juncus pallidus*		+		
Lauraceae	*Cassytha racemosa*		+		
Mimosaceae	*Acacia pulchella*	+			
Myrtaceae	*Agonis flexuosa*	+	+	+	
	Corymbia calophylla	+	+	+	+
	Eucalyptus marginata	+		+	+
	Kunzea glabrescens	+	+	+	
	Melaleuca lateritia		+		
	Melaleuca preissiana		+		+
	Melaleuca rhaphiophylla		+		
	Melaleuca teretifolia		+		
Orchidaceae	*Microtis media*	+			
	Thelymitra crinita	+			
Papilionaceae	*Daviesia incrassata*	+			
	Daviesia physodes	+			
	Hardenbergia comptoniana	+			
	Jacksonia furcellata	+			
	Kennedia prostrata	+			
Proteaceae	*Banksia attenuata*	+			
	Banksia dallanneyi	+			
	Banksia ilicifolia	+			
	Banksia littoralis		+		
	Xylomelum occidentale	+		+	

FAMILY_NAME	LATIN NAME	1	2	3	4
Restionaceae	*Desmocladus fasciculatus*	+			
	Hypolaena exsulca	+			
	Loxocarya cinerea	+			
	Meeboldina scariosa		+		
Rubiaceae	*Opercularia hispidula*	+			
Xanthorrhoeaceae	*Xanthorrhoea brunonis*	+			
	Number of native species	34	13	5	3

Appendix B: Photographs taken in the Vegetation Units identified in the Study Area

	**Vegetation Unit 1.** Woodland of Jarrah and Marri over low woodland of *Agonis flexuosa*, *Banksia attenuata* and *Banksia ilicifolia* woodland over shrubland
	**Vegetation Unit 2.** Woodland or tall shrubland of *Melaleuca rhaphiophylla* or *M. preissiana* over a shrubland of *M. lateritia* and *M. teretifolia*
	**Vegetation Unit 3.** Woodland to open woodland of Jarrah, Marri and *Agonis flexuosa* over pasture species and weeds

Note: Vegetation Unit 4, which is comprised mainly of planted species is not illustrated.

Appendix E

Terrestrial Fauna Survey (Level 1) (Harewood G. 2009)

Terrestrial Fauna Survey

(Level 1)

of

Lots 1, 2, 11, 102-104 & 603

Picton (East)

December 2009
Version 1

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DISCLAIMER

This fauna assessment report ("the report") has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and Greg Harewood ("the Author"). In some circumstances the scope of services may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints. In accordance with the scope of services, the Author has relied upon the data and has conducted environmental field monitoring and/or testing in the preparation of the report. The nature and extent of monitoring and/or testing conducted is described in the report.

The conclusions are based upon field data and the environmental monitoring and/or testing carried out over a limited period of time and are therefore merely indicative of the environmental condition of the site at the time of preparing the report. Also it should be recognised that site conditions, can change with time.

Within the limitations imposed by the scope of services, the field assessment and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care ordinarily exercised by reputable environmental consultants under similar circumstances. No other warranty, expressed or implied, is made.

In preparing the report, the Author has relied upon data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations, most of which are referred to in the report ("the data"). Except as otherwise stated in the report, the Author has not verified the accuracy of completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report ("conclusions") are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. The Author will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to the Author.

The report has been prepared for the benefit of the Client and no other party. The Author assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of the Author or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own enquiries and obtain independent advice in relation to such matters.

The Author will not be liable to update or revise the report to take into account any events or emergent circumstances or facts occurring or becoming apparent after the date of the report.

EXECUTIVE SUMMARY

This report details the results of a fauna assessment of Lots 1, 2, 11, 102-104 & 603 located in East Picton (the study area). The site is located about 9 km south east of the Bunbury CBD and has an area of approximately 145 ha, most of which is cleared/partly cleared farmland (Figures 1 & 2).

It is understood that the information obtained as part of the fauna assessment reported on here will be used, in conjunction with the other studies, to facilitate the controlled and guided development of the subject site with the principal aim of minimising environmental impacts.

The extent of the broadly defined fauna habitats within the study area are shown in Figure 3 with a description of each given below.

1. **Cleared pasture with widely scattered trees:** Totally cleared or partly cleared with significant areas of bare sand in addition to sparse groundcover dominated by a mixture of introduced pasture grasses, clovers, weeds. There are scattered small groves and individual emergent trees including Peppermint *Agonis flexuosa,* Jarrah *Eucalyptus marginata,* Marri *Corymbia calophylla* and Paperbark *Melaleuca* sp.

2. **Open Woodland to Low Open Woodland of Jarrah, Marri, Banksia and Peppermint over grassland, open shrubland and shrubland**. Variable densities of Jarrah, Marri, Banksia and Peppermint along with associated species such as *Nuytsia floribunda* and *Xylomelum occidentale.* Considerable variation in ground cover and understory density with some areas having little or no native groundcover due to grazing/fire and others have a relatively dense low shrubland to shrubland of native species.

3. **Open Woodland to Low Open Woodland of Jarrah, Marri, and Peppermint over grassland**. Variable densities of Jarrah, Marri, and Peppermint along with associated species such as *Nuytsia floribunda* and *Xylomelum occidentale.* Little or no native groundcover due to clearing and ongoing grazing.

4. **Low Open Woodland to tall shrubland of Melaleuca:** Associated with the low lying areas most of which are seasonally inundated/waterlogged during wetter months of the year. Dominant species include *Melaleuca rhaphiophylla, M preissiana* and *M. teretifolia.*

5. **Planted Non-endemic Eucalypts:** Some areas have been planted with various non-endemic eucalypts.

6. **Dams/areas of seasonal inundation:** Several manmade dams have been dug to provide water for livestock. Considerable sections of the cleared pasture areas are also inundated during the wetter months of the year.

Plates 1 to 6 illustrate the nature of fauna habitats existing within the study area.

During the course of the opportunistic fauna assessment the location of "habitat" trees were noted. In total 34 habitat trees were observed. The location of each tree observed is show in Figure 4. Seven of the trees recorded contained large hollows with entrances that appeared from ground level to be possibly of a size suitable for black cockatoos to enter.

The results of the opportunistic fauna survey are summarised in Table 1 and listed in Appendix C. A total of 45 native fauna species were observed (or positively identified from foraging evidence, scats, tracks, skeletons or calls) within the study area during the reconnaissance surveys carried out on the 19th of October 2009.

In summary, six vertebrate fauna species of conservation significance (listed on state or federal threatened species lists or DEC priority species) were positively identified as utilising the study area for some purpose during the Level 1 reconnaissance survey, these being:

- *Calyptorhynchus baudinii* Baudin`s Cockatoo - S1 (*WAWC Act*), Vulnerable (*EPBC Act*)
  Foraging evidence observed during the survey period (chewed Marri nuts and Banksia cones, grubbing on marri tree trunks). A number of hollow trees present in the study area are possibly suitable for nesting though no evidence of actual breeding observed.

- *Calyptorhynchus latirostris* Carnaby`s Cockatoo – S1 *(WAWC Act),* Endangered *(EPBC Act)*
  Foraging evidence observed during survey period (chewed Marri nuts and Banksia cones). A number of hollow trees present in the study area are possibly suitable for nesting though no evidence of actual breeding observed.

- *Calyptorhynchus banksii naso* Forest Red-tailed Black Cockatoo – S1 (*WAWC Act*), Vulnerable (*EPBC Act*)
  Three individuals were observed foraging during survey period. Other foraging evidence also observed (chewed Marri nuts). A number of hollow trees present in the study area are possibly suitable for nesting though no evidence of actual breeding observed.

- *Ardea alba* Great Egret – Migratory (*EPBC Act*)
  Observed within a section of the flooded pasture during the survey period. Unlikely to breed on site. .

- *Merops ornatus* Rainbow Bee-eater – Migratory (*EPBC Act*)
  Common seasonal visitor to south west. Observed foraging and roosting in the study area during the survey period. Possibly breeds in some sections of the study area.

- *Pseudocheirus occidentalis Western Ringtail Possum* - S1 (*WAWC Act*), Vulnerable (*EPBC Act*)
  Appears to be present in low numbers in some sections of the study area. Evidence observed (dreys and scats) is possibly the result of transient

individuals temporality residing in the area as opposed to a viable resident population.

Four species of conservation significance may possibly utilise the study area for some purpose at times but their current status on site and/or in the general area is difficult to determine because they were not sighted during the survey period or evidence of use of the study area was not found. Note: Habitat for some species onsite, while considered possibly suitable, may be marginal in extent/quality and species listed below may only visit the area for short periods or as rare/uncommon vagrants:

- *Ardea ibis* Cattle Egret – Migratory (*EPBC Act*)
  May visit flooded pasture areas during wetter months of year. Unlikely to breed on site.

- *Apus pacificus* Fork-tailed Swift – Migratory (*EPBC Act*)
  Rare seasonal visitor. May forage in area but very unlikely to roost.

- *Falco peregrinus* Peregrine Falcon - S4
  Study site may form part of larger home range.

- *Falsistrellus mackenziei* Western False Pipistrelle - P4 (DEC Priority Species)
  Status in the area difficult to determine. May at least forage on site.

Of most significance is the presence on site of black cockatoo and Western Ringtail Possum habitat. Potential impacts on these species and/or their habitat will need to be addressed during the planning process and where reasonable and practical planning should aim to retain/protect and enhance habitat so that they can persist and/or continue to utilise the site. The conservation of as much vegetation as possible will simplify any referral or assessment process required under the *EPBC Act*. Where impacts cannot be avoided, every attempt to minimise impacts should be made. The recommendations made in section 7.2 are provided to facilitate this.

If the clearing of vegetation (including black cockatoo and WRP habitat) is unavoidable the DEWHA will typically request onsite mitigation through revegetation and retention of key habitat as part of the approval process. Currently a ratio of 4:1 is seen as a minimum requirement for offsetting cockatoo foraging habitat loss by way of plantings (i.e. 4ha for every 1ha lost). For WRPs the ratio is 3:1. Offsetting the loss of cockatoo breeding habitat by plantings is generally viewed by DEWHA as needing to be higher (in the region of 10:1).

The actual impact on fauna and fauna habitat and likely obligations under the *EPBC Act* should be re-assessed when development plans are finalised.

1. INTRODUCTION

This report details the results of a fauna assessment of Lots 1, 2, 11, 102-104 & 603 located in East Picton (the study area). The site is located about 9 km south east of the Bunbury CBD in south west Western Australia and is centred at approximately 33.347702°S and 115.729507°E (Figures 1 & 2). The study site has an area of approximately 145 ha most of which is cleared/partly cleared farmland.

2. DEVELOPMENT PROPOSAL

No final development proposal currently exists for the site. The fauna survey forms part of a series of investigations which will be used to assess environmental opportunities and constraints for that will be used for future planning and development at the site. It is understood that the information obtained as part of the fauna assessment reported on here will be used, in conjunction with the other studies, to facilitate the controlled and guided development of the subject site with the principal aim of minimising environmental impacts.

3. SCOPE OF WORKS

The scope of works is to conduct a "fauna survey". To achieve this, the following will be carried out:

1. Level 1 Fauna Survey (to EPA standard) including targeted searches for evidence of Western Ringtail Possums (WRP) and Black Cockatoo foraging/nesting/roosting;

2. Significant Tree Survey (including potential black cockatoo nest hollows); and

3. Report summarising results with management/planning recommendations

This survey report has been prepared for use in the EPA's (Environmental Protection Authority's) Environmental Impact Assessment (EIA) process (if required) and is considered suitable for this purpose.

4. METHODOLOGY

4.1 FAUNA INVENTORY

4.1.1 Potential Fauna

A list of all vertebrate fauna potentially occurring within the study area was compiled from searches the Department of Environment and Conservation's (DEC's) Threatened Fauna and 'NatureMap" database (joint DEC and Western Australian Museum (WAM) data), the Department of the Environment, Water, Heritage and the Arts (DEWHA) Commonwealth Environment Protection and Biodiversity Conservation database, Birds Australia's 'Birdata" database, published and unpublished reports and specialist books detailing fauna of the general area.

Taxonomy and nomenclature for fauna species used in this report generally follow Aplin and Smith (2001) for amphibians and reptiles, How *et al*. (2001) for mammals and Johnstone (2001) for birds. Some names, including common names recommended for national and international use by Christidis and Boles (1994) for birds, are also used. Common names for reptiles and amphibians come from a variety of sources and are not necessarily generally accepted. Sources include Van Dyk & Strahan (2008), Bush *et al* (2007), Wilson and Swan (2008), Bush *et al* (2002), Tyler *et al.* (2000) and Glauret (1961).

4.1.2 Fauna of Conservation Significance

The conservation significance of fauna species has been assessed using data from the following sources:

- *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*). Administered by the Australian Government Department of the Environment, Water, Heritage and the Arts (DEWHA);
- *Western Australian Wildlife Conservation Act 1950 (WAWC Act).* Administered by the Western Australian Department of Environment and Conservation (DEC);
- Red List produced by the Species Survival Commission (SSC) of the World Conservation Union (also known as the IUCN Red List - the acronym derived from its former name of the International Union for Conservation of Nature and Natural Resources). The Red List has no legislative power in Australia but is used as a framework for State and Commonwealth categories and criteria; and the
- DEC Priority Fauna list. A non-legislative list maintained by the DEC for management purposes.

The *EPBC Act* also requires the compilation of a list of migratory species that are recognised under international treaties including the:

- Japan Australia Migratory Bird Agreement 1981 (JAMBA);
- China Australia Migratory Bird Agreement 1998 (CAMBA);
- Republic of Korea-Australia Migratory Bird Agreement 2007 (ROKAMBA); and
- Bonn Convention 1979 (The Convention on the Conservation of Migratory Species of Wild Animals).

(Note - Species listed under JAMBA are also protected under Schedule 3 of the *WAWC Act*.)

All migratory bird species listed in the annexes to these bilateral agreements are protected in Australia as matters of national environmental significance under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

The conservation status of all the vertebrate fauna species listed as occurring or possibly occurring in the vicinity of the study area has been assessed using the most recent lists published in accordance with the above-mentioned Acts, International Agreements and DEC's priority fauna list. The status of each species as defined in the above mentioned acts is indicated in the fauna listings of this report. A full listing of conservation codes are held in Appendix A.

4.1.3 Other Species of Significance

A number of other species not listed in official lists can also be considered of regional conservation significance. These include species that have a restricted range, those that occur in breeding colonies and those at the limit of their range.

While not classified as rare, threatened or vulnerable under any State or Commonwealth legislation, a number of bird species have been listed as of significance on the Swan Coastal portion of the Perth Metropolitan Region (Bush Forever - Government of Western Australia 1998 and 2000). The bird species are often referred to as Bush Forever Decreaser Species. The three categories used for birds within the Bush Forever documents are:

- Habitat specialists with reduced distribution on the Swan Coastal Plain (code Bh)
- Wide ranging Species with reduced population's on the Swan Coastal Plain. (code Bp)
- Extinct in the Perth region (code Be)

The presence of Bush Forever species should be taken into consideration when determining an areas fauna values. Bush Forever decreaser species are indicated as such within the species list held in Appendix C.

4.2 SITE RECONNAISSANCE SURVEY

4.2.1 Opportunistic Fauna Observations

Opportunistic observations of fauna species was made during a 5 hour daytime survey of the site. This included a series of close spaced transects across the site while searching under logs, rocks, leaf litter and observations of bird species with binoculars.

As the area has the potential to be utilised by WRPs and/or black cockatoos additional effort was made to determine if these species are utilising the site and to what degree so that their potential presence can be taken into consideration for planning and management:

The targeted assessments were be carried out concurrent with the Level 1 survey and included:

- Specific observations to locate and record WRP dreys (and other potential daytime refuges), scats and individual WRPs;
- Specific observation of foraging and roosting evidence left by any of the three federally listed black cockatoos species; and
- Determination of the amount and quality of potential WRP and black cockatoo habitat on site.

No targeted WRP night time surveys were considered warranted at this stage. If the presence of the WRP is confirmed and the proposed development is likely to have some impact additional surveys may be required/requested by regulatory authorities as part of the approval process.

4.2.2 Fauna Habitat Assessment

A habitat assessment was carried out specifically targeting the likely habitats of listed (under the relevant Federal and State Acts) threatened vertebrate species potentially occurring in the study area. The aim of the habitat assessment was to determine if it was likely that any of the threatened species would be utilising the areas that will be impacted on as a consequence of the development proposal proceeding in its current form.

The initial phase of the assessment involved the review of available information on the habitats of the threatened species listed as possibly occurring in the area. During the field survey the habitat within the study area was assessed and specific elements searched for to determine the potential that any of the listed threatened species maybe utilising the area and its significance to them. In addition the habitat information obtained was used to aid in the compilation of a potential fauna list.

The vegetation communities present have been used as the basis for a classification into broad fauna habitats. In addition details on specific habitat components such as significant trees with hollows, loose bark, fallen hollow logs, and the amount of leaf litter were noted if present.

Quality of habitat with respect to WRPs and black cockatoos was specifically noted.

4.2.3 Habitat Tree Assessment

During the course of the opportunist and habitat assessment observations of "habitat" trees were recorded using a GPS. The aim of the survey was to document the presence of trees containing hollows suitable for fauna to use. For the purposes of this study a "habitat" tree "was defined as

"Generally any tree which is alive or dead that contains one or more visible hollows (cavities within the trunk or branches) suitable for the occupation of hollow-dependent fauna as nesting, roosting and/or denning sites. Hollows that had an entrance greater than about 12cm in diameter and would allow the entry of a black cockatoo were recorded as a "potential cockatoo nest hollow".

The assessment of hollows was conducted from ground level. Because it is impossible to determine all the characteristics of hollows that are favoured by fauna species, the assessment of suitability was based entirely on the size of each hollow's entrance, though other factors such as orientation and position (relative to ground level) was also taken into consideration. The main aim of the habitat tree assessment was to determine if any trees on site contained hollows suitable for black cockatoos to use as nest hollows.

4.3 LOCAL CONSERVATION SIGNIFICANCE OF THE STUDY AREA

The local (sub-regional) significance of the study area has been determined by applying site specific criteria such as:

- Fauna species and/or habitat present that is poorly represented in the general study area;
- Fauna habitat within the general study area supporting species of conservation or other significance;
- Fauna habitat in better condition than other similar locations in general study area.

4.4 VALUE OF THE STUDY AREA AS A WILDLIFE CORRIDOR

Corridors of native vegetation can be very important for the dispersal of species in otherwise cleared landscapes. Any areas of remnant vegetation making up

part of a linkage is therefore of great value by facilitating the movement of species that cannot utilise cleared/developed land. Linkage with adjacent bushland areas has been identified as a natural attribute of high priority in the assessment of an areas regional significance.

During the field survey and by examination of plans and air photos of the study area, the value of the site as a corridor/ecological linkage between any reserves, conservation areas or other significant areas of remnant bush was assessed.

5. SURVEY CONSTRAINTS

The assessment reported on here has included a desktop analysis and a site reconnaissance survey that included opportunistic fauna observations over a total of about eight hours. No seasonal sampling has been conducted.

Fauna species are indicated as potentially present within this report based on there being suitable (quality and extent) habitat within the study area. With respect to opportunistic observations, the possibility exists that certain species may not have been detected during field investigations due to:

- seasonal inactivity during field survey;
- species present within micro habitats not surveyed;
- cryptic species able to avoid detection;
- transient wide-ranging species not present during survey period.

The lack of observational data on some species should therefore not be taken as necessarily indicating that a species is absent from the site.

In recognition of survey limitations a precautionary approach has been adopted for this assessment. Any fauna species that would possibly occur within the study area as identified through ecological databases, publications, discussions with local experts/residents and the habitat knowledge of the Author has been assumed to potentially occur in the study area.

Field survey work was carried out by Greg Harewood (B.Sc. Zoology) on the 19th October, 2009.

6. RESULTS

6.1 REGIONAL BIOLOGICAL CONTEXT

The project area is situated within the south west margin of the Swan Coastal Plain. The Swan Coastal Plain Bioregion (SWA) is classified as part of the

Interim Biogeographical Regionalisation for Australia. The SWA bioregion is described as being a:

"Low lying coastal plain mainly covered with Woodlands. It is dominated by Banksia or Tuart on sandy soils, Casuarina obesa on outwash plains, and paperbark in swampy areas. In the east, the plain rises to duricrusted Mesozoic sediments dominated by Jarrah Woodland. Warm Mediterranean. Three phases of marine sand dune development provide relief.

The outwash plains, once dominated by Casuarina obesa – Marri Woodlands and Melaleuca shrublands, are extensive only in the south." (Thackway and Cresswell, 1996; IBRA, 2000).

The study area lies within a section of the Bassendean Dunes System and the Guilford Formation. In this area the Bassendean Dunes consist of extremely low to very low relief dunes with, deep, bleached grey sands. The Guilford formation, represent by low lying areas within the study area consists of poorly drained flats with shallow pale sand to sandy loam over clay (Agmap 2003).

Broadscale mapping by Beard (Beard 1991) shows the general area, prior to disturbance, to have consisted of a mosaic of medium forest (Jarrah-Marri), low woodland (Banksia and Jarrah-Banksia) and Low forest (Melaleuca spp).

Vegetation complexes were defined in relation to landform and soil units for the Swan Coastal Plain by Heddle *et al*. (1980). A total of 15 vegetation complexes were described for the Greater Bunbury Region (GBR - WAPC 2000). Of these the Southern River Complex and the Guildford Complex are mapped as originally comprising the vegetation units present within the study area.

The Southern River Complex is described as being an open woodland of Marri *Corymbia calophylla,* Jarrah *Eucalyptus marginata* and *Banksia* species with fringing woodlands of Flooded Gum *Eucalyptus rudis* and Swamp Paperbark *Melaleuca rhaphiophylla* along creek beds.

The Guildford Complex is described as a mixture of open forest to tall open forest of Marri *Corymbia calophylla* – Wandoo *Eucalyptus wandoo* – Jarrah *Eucalyptus marginata* and woodlands of Wandoo *Eucalyptus wandoo*. Minor components include Flooded Gum *Eucalyptus rudis* and Swamp Paperbark *Melaleuca rhaphiophylla* (Heddle *et al*. 1980)

6.2 FAUNA HABITAT ASSESSMENT

6.2.1 Fauna Habitats

The broad scale fauna habitats within the study area are based on vegetation structure. The study area has been subject to a significant amount of historical disturbance such as extensive clearing, construction of fire breaks and access

tracks, construction of dams and ongoing livestock grazing. These impacts have reduced the sites overall value to fauna by reducing or altering habitat quality and biodiversity values to a significant degree.

The extent of the broadly defined fauna habitats within the study area are shown in Figure 3 with a description of each given below. Additional information of the vegetation units present within the study area can be found in the botanical report (ekologica 2009).

7. **Cleared pasture with widely scattered trees:** Totally cleared or partly cleared with significant areas of bare sand in addition to sparse groundcover dominated by a mixture of introduced pasture grasses, clovers, weeds. There are scattered small groves and individual emergent trees including Peppermint *Agonis flexuosa,* Jarrah *Eucalyptus marginata,* Marri *Corymbia calophylla* and Paperbark *Melaleuca* sp.

8. **Open Woodland to Low Open Woodland of Jarrah, Marri, Banksia and Peppermint over grassland, open shrubland and shrubland**. Variable densities of Jarrah, Marri, Banksia and Peppermint along with associated species such as *Nuytsia floribunda* and *Xylomelum occidentale.* Considerable variation in ground cover and understory density with some areas having little or no native groundcover due to grazing/fire and others have a relatively dense low shrubland to shrubland of native species.

9. **Open Woodland to Low Open Woodland of Jarrah, Marri, and Peppermint over grassland**. Variable densities of Jarrah, Marri, and Peppermint along with associated species such as *Nuytsia floribunda* and *Xylomelum occidentale.* Little or no native groundcover due to clearing and ongoing grazing.

10. **Low Open Woodland to tall shrubland of Melaleuca:** Associated with the low lying areas most of which are seasonally inundated/waterlogged during wetter months of the year. Dominant species include *Melaleuca rhaphiophylla, M preissiana* and *M. teretifolia.*

11. **Planted Non-endemic Eucalypts:** Some areas have been planted with various non-endemic eucalypts.

12. **Dams/areas of seasonal inundation:** Several manmade dams have been dug to provide water for livestock. Considerable sections of the cleared pasture areas are also inundated during the wetter months of the year.

Plates 1 to 6 illustrate the nature of fauna habitats existing within the study area.

6.2.2 Habitat Tree Assessment

During the course of the opportunistic fauna assessment the location of "habitat" trees were noted. In total 34 habitat trees were observed. The location of each tree observed is show in Figure 4. Seven of the trees recorded contained large hollows with entrances that appeared from ground level to be possibly of a size suitable for black cockatoos to enter.

Hollows are an important resource as many fauna species are obligated to utilise them for day to day refuge and as breeding sites. In this area of the south west, hollows have the potential to be used by a range of fauna including, but not limited to, the three Black Cockatoo species, Common Brushtail Possums, Brush-tailed Phascogales, Galahs, Regent Parrots, Australian Ringneck Parrots, Red-capped Parrots, Western Rosellas, Elegant Parrots, Boobook Owls, Australian Owlet-nightjars, Sacred Kingfishers, Striated Pardalotes and Tree Martins.

It should be noted that if the project is referred to the federal Department of Environment, Water, Heritage and the Arts (DEWHA) additional information on the habitat trees, in particular those that represent potential breeding habitat to black cockatoos maybe required to better define potential impacts of any proposed development. Currently the DEWHA regard a woodland stand (in this area Jarrah or Marri trees) of an area greater than 0.5ha and containing more than three trees with a diameter at breast height (DBH) of greater than 500mm as significant breeding habitat, irrespective of the presence or absence of any actual hollows suitable for black cockatoos to use.

6.3 FAUNA INVENTORY

6.3.1 Opportunistic Fauna Surveys

The results of the opportunistic fauna survey are summarised in Table 1 and listed in Appendix C. A total of 45 native fauna species were observed (or positively identified from foraging evidence, scats, tracks, skeletons or calls) within the study area during the reconnaissance surveys carried out on the 19th of October 2009. Four introduce species were also observed (includes livestock).

Evidence of four listed threatened species was observed (all three species of black cockatoo – foraging evidence, Forest Red-tailed Black Cockatoo – three individuals observed, Western Ringtail Possum – scats and dreys). Two migratory species were observed (Rainbow Bee-eater and Great Egret). No evidence of DEC priority species was sighted.

6.3.2 Western Ringtail Possum Survey

Daytime observations for dreys, scats and WRPs were carried out as part of the opportunistic fauna survey conducted on the 19th October 2009.

The day time survey results are shown in Figure 4. In total fourteen dreys were found. WRPs will use hollows in preference to building dreys and therefore some of the 27 habitat trees identified also represent potential daytime refuge sites.

WRP scats were found to uncommon and difficult to find, suggesting the presence of a sparse, very low density population (Figure 5).

The results suggest that the species is present in low numbers in some sections of the study area. The evidence observed (dreys and scats) is possibly the results of transient individuals moving through the area as opposed to a viable resident population. Irrespective of current population levels substantial areas of the remnant vegetation on site must be regarded as potential habitat that may be considered important for recovery of the species in the long term by regulatory authorities.

6.3.3 Potential Fauna

Table 1 summarises the numbers of potential species based on vertebrate class considered likely to be present in the study area. A complete list of vertebrate fauna possibly inhabiting or frequenting the study area is held in Appendix C. The results of a DEC Threatened fauna database search and the *EPBC Act* database are held in Appendix D.

Details on specially protected and priority species expected and/or listed as potentially occurring in the general area are given in Table 2 and Appendix E.

Not all species listed in existing databases and publications as potentially occurring within the study area (i.e. *EPBC Act's* Threatened Fauna and Migratory species lists, DEC's Threatened Fauna Database and various publications) are shown in the expected listing in Appendix C. Some species have been excluded from this list based largely on the lack of suitable habitat at the study site (e.g. whales, offshore seabirds) and in the general area or known local extinction even if suitable habitat is present (e.g. Malleefowl).

Despite the omission of some species it should be noted that the list provided is still very likely an over estimation of the fauna species utilising the site (either on a regular of infrequent basis) as a result of the precautionary approach adopted for the assessment.

Table 1: Summary of Potential Fauna Species (As listed in Appendix C)

Group	Total number of potential species	Potential number of specially protected species	Potential number of migratory species	Potential number of priority species	Number of species observed October 09
Amphibians	7	0	0	0	1
Reptiles	20	0	0	0	2
Birds	91[5]	4	4	0	39
Non-Volant Mammals	11[8]	1	0	0	7[4]
Volant Mammals (Bats)	8	0	0	1	0
Total	137[13]	5	4	1	49[4]

Superscript = number of introduced species included in total.

6.3.4 Fauna of Conservation Significance

A review of EPBC Act's threatened fauna list, DEC's Threatened Fauna Database and Priority List and scientific publications identified about 25 specially protected, priority or migratory fauna species as potentially occurring in the general vicinity of the study area. Most of those species that have no potential whatsoever, under normal circumstances, to utilise the site for any purpose are not listed or discussed despite appearing in the DEC or *EPBC Act* database searches (Appendix D). Species have been omitted from the potential list (Appendix C) for the site principally due to lack of suitable habitat on site or known local extinction. A brief account of these species with details on their distribution and habitat preference and potential impact are shown in Table 2. Additional details on significant species that potentially utilise the study site are given in Appendix E.

In summary, six vertebrate fauna species of conservation significance (listed on state or federal threatened species lists or DEC priority species) were positively identified as utilising the study area for some purpose during the Level 1 reconnaissance survey, these being:

- *Calyptorhynchus baudinii* Baudin`s Cockatoo - S1 (*WAWC Act*), Vulnerable (*EPBC Act*)
  Foraging evidence observed during the survey period (chewed Marri nuts and Banksia cones, grubbing on marri tree trunks). A number of hollow trees present in the study area are possibly suitable for nesting though no evidence of actual breeding observed.

- *Calyptorhynchus latirostris* Carnaby`s Cockatoo – S1 (*WAWC Act*), Endangered (*EPBC Act*)
  Foraging evidence observed during survey period (chewed Marri nuts and Banksia cones). A number of hollow trees present in the study area are possibly suitable for nesting though no evidence of actual breeding observed.

- *Calyptorhynchus banksii naso* Forest Red-tailed Black Cockatoo – S1 (*WAWC Act*), Vulnerable (*EPBC Act*)
  Three individuals were observed foraging during survey period. Other foraging evidence also observed (chewed Marri nuts). A number of hollow trees present in the study area are possibly suitable for nesting though no evidence of actual breeding observed.

- *Ardea alba* Great Egret – Migratory (*EPBC Act*)
  Observed within a section of the flooded pasture during the survey period. Unlikely to breed on site. .

- *Merops ornatus* Rainbow Bee-eater – Migratory (*EPBC Act*)
  Common seasonal visitor to south west. Observed foraging and roosting in the study area during the survey period. Possibly breeds in some sections of the study area.

- *Pseudocheirus occidentalis Western Ringtail Possum* - S1 (*WAWC Act*), Vulnerable (*EPBC Act*)
  Appears to be present in low numbers in some sections of the study area. Evidence observed (dreys and scats) is possibly the result of transient individuals temporality residing in the area as opposed to a viable resident population.

Four species of conservation significance may possibly utilise the study area for some purpose at times but their current status on site and/or in the general area is difficult to determine because they were not sighted during the survey period or evidence of use of the study area was not found. Note: Habitat for some species onsite, while considered possibly suitable, may be marginal in extent/quality and species listed below may only visit the area for short periods or as rare/uncommon vagrants:

- *Ardea ibis* Cattle Egret – Migratory (*EPBC Act*)
  May visit flooded pasture areas during wetter months of year. Unlikely to breed on site.

- *Apus pacificus* Fork-tailed Swift – Migratory (*EPBC Act*)
  Rare seasonal visitor. May forage in area but very unlikely to roost.

- *Falco peregrinus* Peregrine Falcon - S4
  Study site may form part of larger home range.

- *Falsistrellus mackenziei* Western False Pipistrelle - P4 (DEC Priority Species)
  Status in the area difficult to determine. May at least forage on site.

Species of conservation significance that, while possibly present in the general area (e.g. various lakes, estuaries, beaches or larger reserves in the general area), are not listed as potential species due to known localised extinction (and no subsequent recruitment from adjoining areas) and/or lack of suitable habitat and/or the presence of feral predators:

- *Burhinus grallarius* Bush Stone Curlew - P4 (DEC Priority Species)
  Regionally extinct. Majority of the habitat in the study area is unsuitable due to lack of daytime shelter required by this species.

- *Psophodes nigrogularis nigrogularis* Western Whipbird (western heath subsp) - S1 (*WAWC Act*), Endangered (*EPBC Act*)
  Regionally extinct. Habitat in the study area is unsuitable for this species due to lack of dense midstorey vegetation.

- *Botaurus poiciloptilus* Australasian Bittern – S1 (*WAWC Act*)
  Habitat on site is unsuitable for this species.

- *Ixobrychus flavicollis* Black Bittern – P2 (DEC Priority Species)
  Habitat on site is unsuitable for this species.

- *Ixobrychus minutus* Little Bittern – P4 (DEC Priority Species)
  Habitat on site is unsuitable for this species.

- *Haliaeetus leucogaster* White-bellied Sea-Eagle – Migratory (*EPBC Act*)
  Unsuitable habitat. May fly over occasionally.

- *Charadrius rubricollis* Hooded Plover – P4 (DEC Priority Species)
  Unsuitable habitat.

- *Ninox connivens connivens* Barking Owl – P2 (DEC Priority Species)
  Habitat appears very marginal for this species and it is unlikely to be specifically attracted to the site.

- *Tyto novaehollandae* Masked Owl – P3 (DEC Priority Species)
  Habitat appears very marginal for this species and it is unlikely to be specifically attracted to the site.

- *Phascogale tapoatafa ssp* Southern Brush-tailed Phascogale - S1 (*WAWC Act*)
  Status in the area is difficult to determine. Better quality vegetation present to the west of the study area (Lot 200) maybe suitable, though the total area of the remnant would limit the long term viability of a population. Limited suitable habitat within the study area is marginal and would be unlikely to support a population of this species.

- *Isoodon obesulus fusciventer* Southern Brown Bandicoot – P5 (DEC Priority Species)
  There is very limited areas of suitable habitat for this species to persist within the study area (dense groundcover) and it is unlikely that a population could exist on site.

- *Dasyurus geoffroii* Chuditch - S1 (*WAWC Act*), Vulnerable (*EPBC Act*)
  Locally extinct. Transient individuals may very rarely be present but the area is too small and of a quality too poor to maintain a population of this species.

- *Setonix brachyurus* Quokka – S1 (*WAWC Act*), Vulnerable (*EPBC Act*)
  Locally extinct. Only known population on the coastal plain is located just south of Bunbury.

- *Macropus irma Western Brush Wallaby* – P4 (DEC Priority Species)
  Locally extinct. Habitat within the study area is unsuitable for this species.

- *Hydromys chrysogaster* Water Rat – P4 (DEC Priority Species)
  Unsuitable/very marginal habitat. Habitat within the study area is unsuitable for this species due to a lack of permanent water.

6.3.5 Other Species of Significance

Thirteen of the bird species that potentially frequent or occur in the study area are noted as Bush Forever Decreaser Species in the Perth metropolitan region (seven species were sighted/identified as having used the site during the site survey). Decreaser species are a significant issue in biodiversity conservation in the Perth section of the Coastal Plain as there have been marked reductions in range and population levels of many sedentary bird species as a consequence of disturbance and land clearing (Dell & Hyder-Griffiths 2002).

6.4 LOCAL CONSERVATION SIGNIFICANCE OF THE STUDY AREA

Coastal areas in south west western Australia have been altered substantially since European settlement in the 1830's and a variety of environmental factors, in particular habitat fragmentation and fire, will continue to threaten many species of fauna with local extinction (How *et al* 1987). As the local development of land progresses the significance of any remnant vegetation increases.

The results of this fauna assessment shows the study site as a whole hosts (or potentially hosts) a range of fauna species some of which are of special conservation significance. Based on these findings remnant vegetation within the study area must be considered of local significance to fauna, a fact that has previously been recognised (EPA 2008). The majority of the study area however supports (or potentially supports) a significantly depleted fauna assemblage, a consequence of its very degraded state. Most of the fauna species utilising the site are common and widespread and are often found in similar degraded/very degraded habitat present in nearby areas of the Swan Coastal Plain.

Table 2: Listed Threatened, Migratory and Priority Fauna Species Potentially Occurring in Study Area.

Common Name/Species	Conservation Code				Actual Records or Listed as Potentially in General Area			Threatening Processes	Habitat Requirements	Habitat in Project Area/Quality	Potential Impact on Habitat
	EPBC Act Status	WAWC Act Status	ICUN Status	DEC Priority Status	EPBC Act Database	DEC Database	Birds Aust. Data Base				
Western Whipbird *Psophodes nigrogularis nigrogularis*	EN	S1				Yes (1898)		Habitat loss and/or modification, changing fire regimes	Dense shrubland with an open overstorey, the structure of the vegetation being more important than the floristics. Nests found have been in dense bushes in heath adjacent to thickets.	No Species Locally Extinct	None
Hooded Plover *Charadrius rubricollis*			NT	P4		Yes		Vulnerable to disturbance of foraging and breeding activities on beaches	Broad sandy ocean beaches and bays, coastal and inland salt lakes.	No	None
Great Egret *Ardea alba*	Migratory (CAMBA, JAMBA)		LC		Yes		Yes	Loss of breeding habitat and declines in water quality.	Wetlands, flooded pasture, dams, estuarine mudflats, mangroves and reefs	Yes	Loss of some degraded foraging habitat
Cattle Egret *Ardea ibis*	Migratory (CAMBA, JAMBA)		LC		Yes		Yes	Loss of breeding habitat and declines in water quality	Moist pastures with tall grasses, shallow open wetlands and margins, mudflats.	Yes	Loss of some degraded foraging habitat
White-bellied Sea Eagle *Haliaeetus leucogaster*	Migratory (CAMBA)		LC		Yes			Loss of breeding habitat and declines in water quality	Nests and forages near the coast over islands, reefs, headlands, beaches, bays, estuaries, mangroves, but will also live near seasonally flooded inland swamps, lagoons and floodplains, often far inland on large pools of major rivers. Established pairs usually sedentary, immatures dispersive. Builds a large stick nest, which is used for many seasons in succession.	No	None
Peregrine Falcon *Falco peregrinis*		S4	LC					Loss of breeding habitat	Diverse from rainforest to arid shrublands, from coastal heath to alpine. Mainly about cliffs along coasts, rivers and ranges and about wooded watercourses and lakes. The species utilises the ledges, cliff faces and large hollows/broken spouts of trees for nesting. It will also occasionally use the abandoned nests of other birds of prey.	Yes	None Likely
Bush Stone Curlew *Burhinus grallarius*			NT	P4		Yes		Land clearing	Lightly wooded country (including partly cleared forests) near daytime shelter e.g. thickets or long grass.	No Species Locally Extinct	None
Australasian Bittern *Botaurus poiciloptilus*	VU	S1	EN					Land clearing (wetlands/swamps)	Freshwater wetlands, occasionally estuarine; prefers heavy vegetation such as beds of tall dense *Typha*, *Baumea* and sedges in freshwater swamps.	No	None
Black Bittern *Ixobrychus flavicollis*			LC	P2		Yes (1931)		Land clearing (wetlands/swamps)	Freshwater pools, swamps and lagoons, well screen with trees. Shelters in dense waterside vegetation.	No	None
Little Bittern *Ixobrychus minutus*			LC	P4				Land clearing (wetlands/swamps)	Dense beds of Freshwater pools, swamps and lagoons, well screen with trees. Shelters in dense beds of *Typha*, *Baumea* and tall rushes in freshwater swamps around lakes and along rivers.	No	None
Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso*	VU	S1	LC		Yes	Yes	Yes	Land clearing and logging.	This subspecies of the Red-tailed Black Cockatoo is restricted to the forests of the south-west. It requires tree hollows to nest and breed and is totally dependent on jarrah-marri forest	Yes	Loss of foraging and breeding habitat
Baudin's Black-Cockatoo *Calyptorhynchus baudinii*	VU	S1	EN		Yes	Yes		Land clearing and illegal shooting	Heavily forested areas of the south-west, where it feeds on the seeds of' eucalypts and various proteaceous species. It is a nomadic species. Breeding on the coastal plain mostly occurs in areas south of Mandurah during spring/summer, nesting in tree hollows (primarily Marri).	Yes	Loss of foraging and breeding habitat
Carnaby's Black-Cockatoo *Calyptorhynchus latirostris*	EN	S1	EN		Yes	Yes		Land clearing and illegal shooting	This species moves around in seasonal flocks to feeding areas in proteaceous scrubs and heaths and eucalypt woodlands as well as pine plantations. Breeding occurs in winter/spring mainly in eastern forest and wheatbelt where they can find mature hollow bearing trees to nest in though it appears this species is currently expanding its breeding range westward and south into the Jarrah – Marri forest of the Darling Scarp and into the Tuart forests of the Swan Coastal Plain including the region between Mandurah and Bunbury.	Yes	Loss of foraging and breeding habitat

Common Name/Species	Conservation Code				Actual Records or Listed as Potentially in General Area			Threatening Processes	Habitat Requirements	Habitat in Project Area/Quality	Potential Impact on Habitat
	EPBC Act Status	WAWC Act Status	ICUN Status	DEC Priority Status	EPBC Act Database	DEC Database	Birds Aust. Data Base				
Masked Owl *Tyto novaehollandae*			LC	P3				Land clearing and logging	Roosts and nests in heavy forest, hunts over open woodlands and farmlands. Probably breeding in forested deep south west with some autumn–winter wanderings northwards	No Marginal	None
Barking Owl *Ninox connivens connivens*			LC	P2				Land clearing and logging	Dense vegetation, especially forest and thickets of waterside vegetation such as melaleucas. Roosts in tree hollows.	No	None
Fork-tailed Swift *Apus pacificus*	Migratory (CAMBA, JAMBA)		LC		Yes			None identified	Low to very high airspace over varied habitat from rainforest to semi desert.	Yes	None
Rainbow Bee-eater *Merops ornatus*	Migratory (JAMBA)		LC		Yes		Yes	Loss of roosting and breeding sites	Open Country, of woodlands, open forest, semi arid scrub, grasslands, clearings in heavier forest, farmlands. Common as a regular summer migrant to southern Australia (September to April) and breeds underground during this period in areas of suitable soft soil firm enough to support tunnel building.	Yes	Loss of breeding habitat
Western Ringtail Possum *Pseudocheirus occidentalis*	VU	S1	VU		Yes	Yes		Fox predation. Habitat loss and/or modification, changing fire regimes, damming	Western Ringtail Possums feed, rest and socialise in the canopy, primarily coastal peppermint woodlands and peppermint/tuart associations. Inland, the largest known populations occur in the Upper Warren area east of Manjimup. In this area the Peppermint tree is naturally absent and Jarrah and Marri foliage constitutes the species staple diet. They require tree hollows and/or dense canopy for refuge and nesting.	Yes	Loss of foraging refuge and dispersal habitat
Chuditch *Dasyurus geoffroii*	VU	S1	VU		Yes	Yes		Competition from and predation by foxes and cats, land clearing, habitat alteration through removal of suitable den logs, poisoning, illegal shooting and road traffic.	This carnivorous marsupial occupies large home ranges, is highly mobile and appears to utilise bush remnant and corridors. Requires a medium sized hollow at or near ground level or will dig burrow under log or stump. Chuditch occur in a wide range of habitats but are more commonly found in woodland, forest and riparian vegetation.	No Species Locally Extinct	None
Southern Brush-tailed Phascogale *Phascogale tapoatafa*		S1	NT			Yes		Fox and cat predation, reduction in trees with suitable hollows and possibly altered fire regimes.	This arboreal marsupial occurs in forest and woodland where suitable tree hollows are available. Requires small hollows. Prefers dense crown vegetation. Populations fluctuate dramatically in response to invertebrate prey abundance.	No Marginal	None
Quenda *Isoodon obesulus fusciventer*			LC	P5				Fox predation and land clearing	This species prefers areas with dense understorey vegetation, particular around swamps and along watercourses that provide ample protection from predators.	No	None
Western Brush Wallaby *Macropus irma*			LC	P4		Yes		Fox predation.	The western brush wallaby prefers areas of forest and woodland supporting a dense shrub layer adjacent to small open areas.	No Species Locally Extinct	None
Quokka *Setonix brachyurus*	VU	S1	VU		Yes			Fox predation, altered fire regimes	Densely vegetated wetlands and tea-tree thickets along creek systems and dense heath on valley slopes. Peppermint and *Thomasia* species being dominant vegetation items in their diet	No Species Locally Extinct	None
Western False Pipstrelle *Falsistrellus mackenziei*			NT	P4				Land clearing and logging.	This species of bat occurs in high jarrah forest and coastal woodlands. It roosts in small colonies in tree hollows and forages in the cathedral-like spaces between trees.	Yes Marginal	Loss of roosting habitat
WaterRat *Hydromys chrysogaster*			LC	P4		Yes		Fox predation and a decline in water quality.	Water rats occur along permanent watercourses where there are freshwater molluscs and crustaceans (its main prey), frogs, small mammals and water birds present. Requires healthy fresh (to brackish) water habitat containing diverse water and bank life.	No	None

6.5 VALUE OF THE STUDY AREA AS A WILDLIFE CORRIDOR

Linkage with adjacent bushland areas has been identified as a natural attribute of high priority in the assessment of a sites regional significance (EPA 2002a, Molly *et al* 2009). Two types of linked (or potentially linked) sequences of ecological communities were identified in the EPA's Strategy, vegetated sequences and river corridors. The vegetated sequences are further divided into two groups – those that link North-South predominantly along landforms and vegetation complexes; and those that link East-West across landform and vegetation complexes (EPA 2002a)

The Greater Bunbury Region (GBR) ecological linkages plan (Appendix 4, EPA 2003) shows the study area as being situated within the north south orientated McLarty/Kemerton/Twin Rivers/Preston River/Gwindinup linkage. Detailed analyses of potential ecological linkages recently completed for the south west (Molloy *et al* 2009) also shows the study area as being close to a regional ecological linkage.

Examination of air photos and observations made during the field reconnaissance survey shows the general area is largely cleared and the value of the remnant vegetation within the site relates more to its potential function as "stepping stones" rather than part of a continuous vegetated link. These "stepping stones" facilitate to a certain degree the maintenance of ecological processes and the movement of organisms within and across a landscape (Molloy *et al* 2009) and should if possible be maintained in the long term.

7. ECOLOGICAL IMPACTS AND MANAGEMENT

7.1 POTENTIAL IMPACTS

In general the most significant potential impacts to fauna of any development include:

- Loss of vegetation/fauna habitat that is used for foraging, breeding, roosting, or dispersal (includes loss of hollow bearing trees),
- Fragmentation of vegetation/fauna habitat which may restrict the movement of some fauna species,
- Modifications to surface hydrology, siltation of creek lines,
- Changes to fire regimes,
- Pollution (e.g. oil spills),

- Noise/Light,
- Spread of plant pathogens (e.g. dieback) and weeds,
- Potential increase in the number of predatory introduced species (e.g. domestic cats), and
- Death or injury of fauna during clearing and construction.

The exact nature of any development at the site is not finalised and therefore the exact magnitude of the impact of fauna and fauna habitat cannot be predicted. If any future development requires the clearing of vegetation then the loss or degradation of fauna habitat is likely to result. The impact on the significant species listed as potentially being present will vary depending on their current degree of utilisation/population densities and preferred habitat requirements (e.g. quantity and quality of potential foraging and breeding habitat that is affected).

Of most significance is the presence on site of black cockatoo and Western Ringtail Possum habitat. Potential impacts on these species and/or their habitat will need to be addressed during the planning process and where reasonable and practical planning should aim to retain/protect and enhance habitat so that they can persist and/or continue to utilise the site.

7.2 MINIMISING IMPACTS

As the exact nature of any proposed development is unknown to the author the following generalised recommendations are presented and should be incorporated into the planning process where possible. The recommendations aim to reduce the impact on fauna and fauna habitat as much as reasonable and practicable. It is recommended that:

- Planning for development should where possible aim to retain and protect as much remnant vegetation on site. In particular the best quality woodland habitat as identified in EPA Bulletin 1282 (EPA 2008) should be a priority for protection (part recommendation Area E – Lot 104).
- Landscaped areas should be revegetated with local seed stock that includes cockatoo food plants, specifically *Eucalyptus*, *Corymbia*, *Banksia, Hakea*, and *Allocasuarina*. The final selection of suitable species should be carried out after liaison with appropriate experts or local land care groups to ascertain which species are most suitable for the area.

- During site works areas requiring clearing should be clearly marked and access to other areas restricted to prevent accidental clearing of areas to be retained.

- No dead, standing or fallen timber should be removed unnecessarily. Logs (hollow or not) and other debris resulting from land clearing should be used to enhance fauna habitat in untouched and rehabilitated areas if possible.

- A Construction and Operations Fire Management Plan should be prepared to reduce the risk of unplanned fires and provide contingency measures to minimise any associated impacts. The plan will include a contingency and response plan in the event of any bushfires that commence as a result of the works on site.

- All staff working on site should be made aware that native fauna is protected. Personnel working on the project should not be allowed to bring firearms, other weapons or pets onsite.

- Native fauna injured during clearing or normal site operations should be taken to a designated veterinary clinic or a DEC nominated wildlife carer.

- Fuel storage facilities should be bunded.

- Any trenching required for services should be kept open for only as long as necessary and suitable escape ramps and bridging provided if the site is to be left unattended for extended periods. Significant sized trenches should be inspected for fauna immediately prior to filling.

Once detailed plans for the development of the study area are finalised the impact on fauna should be reviewed as site/species specific management plans may be required.

8. LEGISLATIVE OBLIGATIONS

8.1 WILDLIFE CONSERVATION ACT 1950

The objective of the *Wildlife Conservation Act 1950* is to provide for the protection of wildlife. The Act is administered by the Executive Director of the Department of Environment and Conservation, under the direction and control of the Minister for the Environment. Under section 14, “Protection of Fauna”, of this Act, all fauna is wholly protected throughout the State at all times, unless declared by the Minister by notice in the Government Gazette. Under section 14(2)(ba) of The Act, Fauna Notices are made by the Minister for the Environment listing specially protected fauna.

Disturbance or destruction of any native fauna over and above that reasonably required for construction works and access is considered an offence under the Act and the developer should take the necessary steps to inform construction personnel of this fact. The developer should also, as part of their management plan implement procedures that will reduce the chances of wildlife being injured or killed during clearing and construction on the site.

8.2 COMMONWEALTH ENVIRONMENTAL PROTECTION & BIODIVERSITY CONSERVATION ACT 1999

A number of fauna species known to or potentially present within the study area are listed under the federal *Environment Protection and Biodiversity Conservation Act* (*EPBC Act, 1999*). The objective of the *EPBC Act* is to provide for the protection of the environment, especially those aspects that are of national significance, promote ecologically sustainable development, the conservation of biodiversity and a cooperative approach to the protection and management of the environment.

If an action (e.g. clearing of vegetation) is deemed to have a potential significant impact (as detailed in "Principal Significant Impact Guidelines 1.1" - DEW 2006) on listed species, a referral to the Department of Environment, Water, Heritage and the Arts (DEWHA) is required.

The results of the fauna assessment reported on here suggest that several species listed under the *EPBC Act* potentially utilise the study site to some degree and any the project should aim to avoid having a significant impact on any one of them. The conservation of as much vegetation as possible will simplify any referral or assessment process required under the EPBC Act. Where impacts cannot be avoided, every attempt to minimise impacts should be made. The recommendations made in section 7.2 are provided to facilitate this.

If the clearing of vegetation (including black cockatoo and WRP habitat) is unavoidable the DEWHA will typically request onsite mitigation through revegetation and retention of key habitat as part of the approval process. Currently a ratio of 4:1 is seen as a minimum requirement for offsetting cockatoo foraging habitat loss by way of plantings (i.e. 4ha for every 1ha lost). For WRPs the ratio is 3:1. Offsetting the loss of cockatoo breeding habitat by plantings is generally viewed by DEWHA as needing to be higher (in the region of 10:1).

Obligations under the *EPBC Act* should be re-assessed when development plans are finalised.

9. CONCLUSION

Potentially, 11 native mammals (includes eight bat species), 86 bird, 20 reptile and seven frog species could be expected to occur in or utilise at times, the study area. Thirteen introduced species could also occur. Of the 124 native animals that are listed as potentially occurring at the site, five are considered to be endangered/vulnerable or in need of special protection under state and/or federal law. In addition four migratory species may frequent the site at times and a single DEC priority species was identified as possibly present.

Planning of the proposal should take into account the potential presence of several species of conservation significance and impact on these species will need to be minimised so as to simplify any referral or assessment process required under the federal *EPBC Act* or the state administered EP Act. The recommendations made aim to reduce the impact on fauna and should be incorporated into the sites development plan where considered reasonable and practical.

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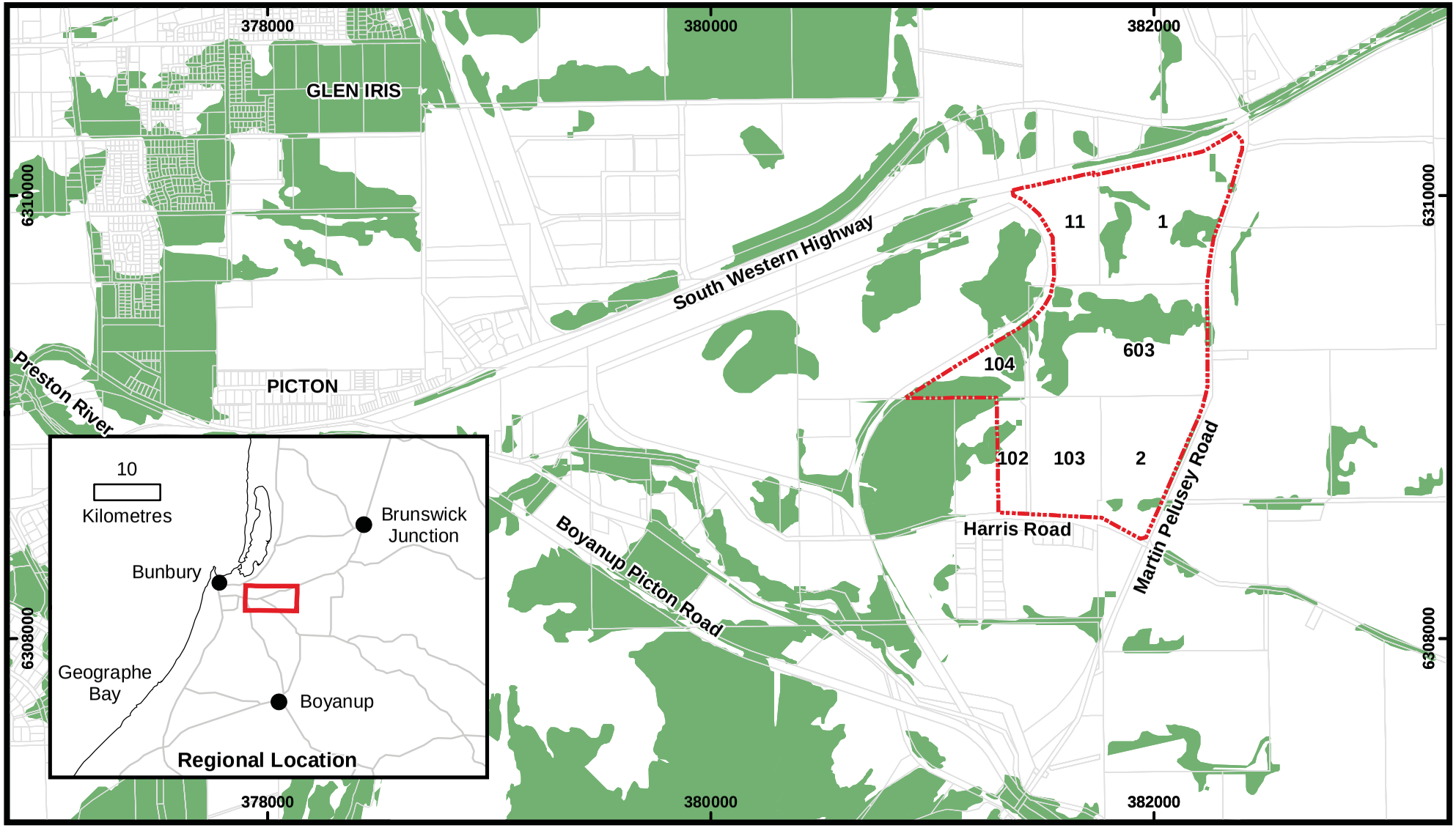
FIGURES



Legend

- Study area
- Cadastral Boundaries (Existing)
- Remnant Vegetation

N

0 0.5 1 1.5 2

Kilometres

MGA Zone 50

Fauna Survey

DRAWN:G Harewood

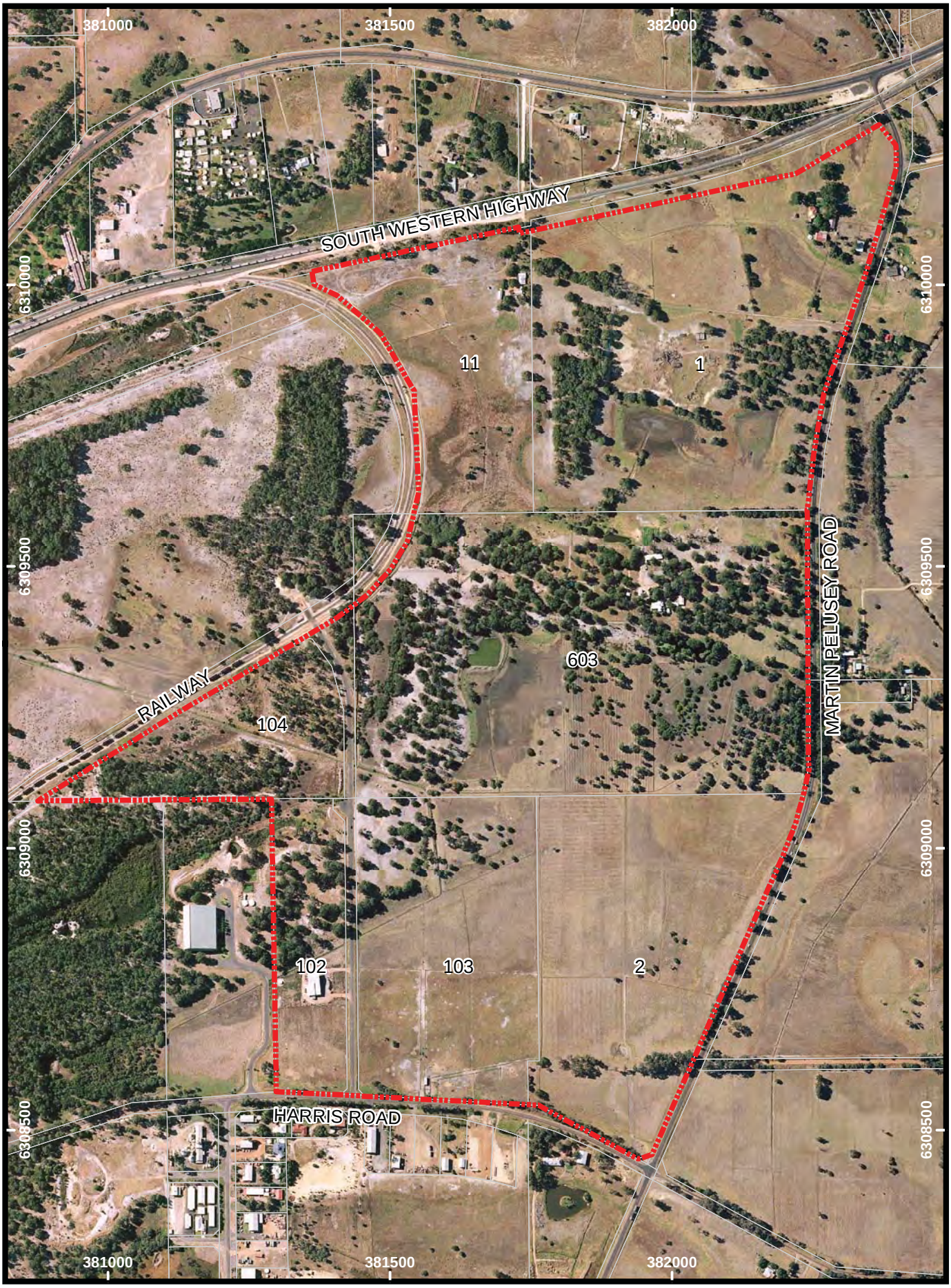
DATE : Dec 2009

SCALE: 1: 25,000

Picton East

Study Area and Surrounds

Figure: 1



Legend

- Cadastral Boundaries
- Study area

0 100 200 300 400 500

Meters

MGA Zone 50

Fauna Survey

DRAWN:G Harewood

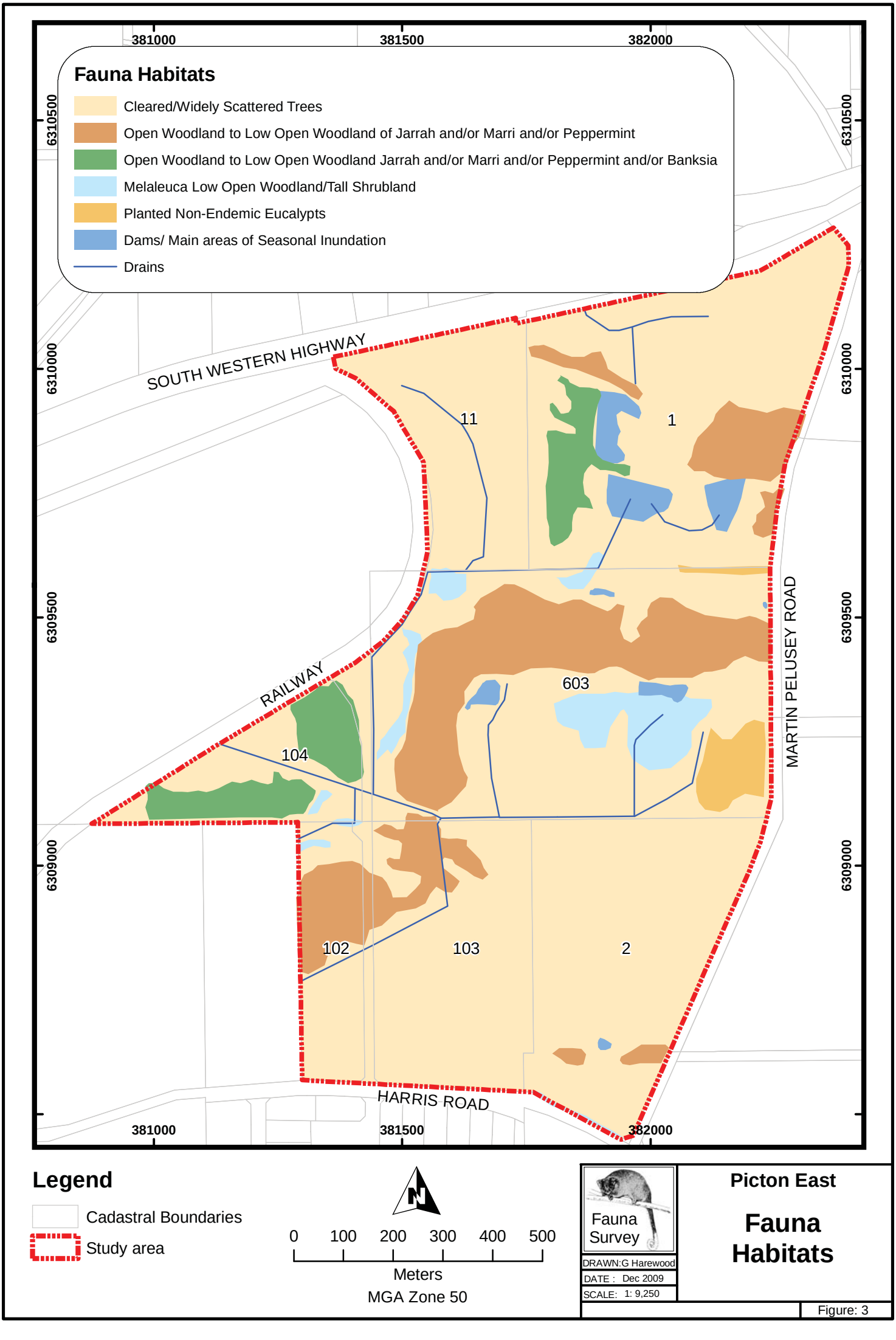
DATE : Dec 2009

SCALE: 1: 9,250

Picton East

Study Area Air Photo

Figure: 2



Legend

- Cadastral Boundaries
- Study area

0 100 200 300 400 500

Meters

MGA Zone 50

Fauna Survey

DRAWN:G Harewood

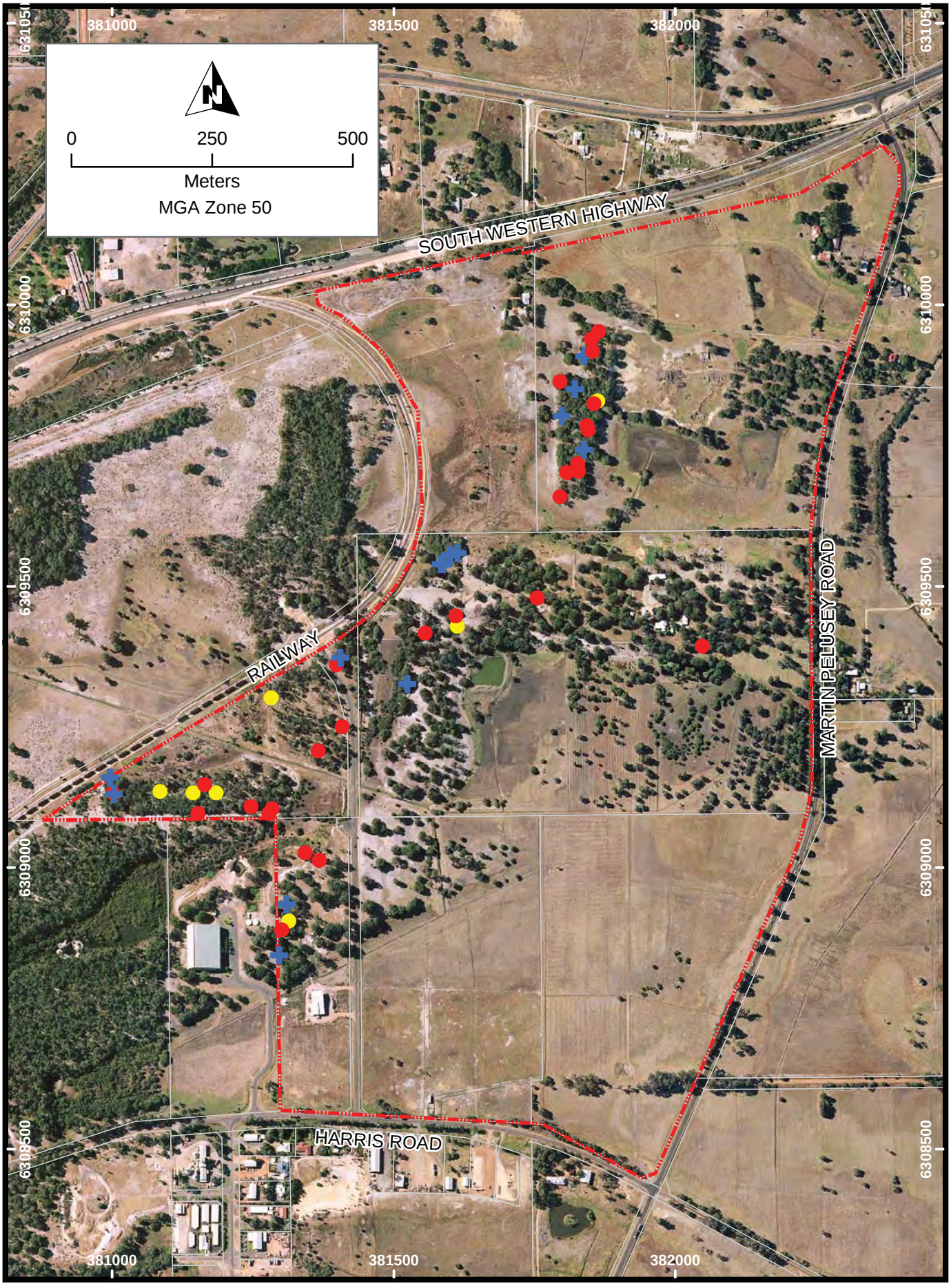
DATE : Dec 2009

SCALE: 1: 9,250

Picton East

Fauna Habitats

Figure: 3



Legend

- Cadastral Boundaries
- Study area
- Habitat Tree with Small Hollows
- Habitat Tree with Large Hollows
- WRP Drey

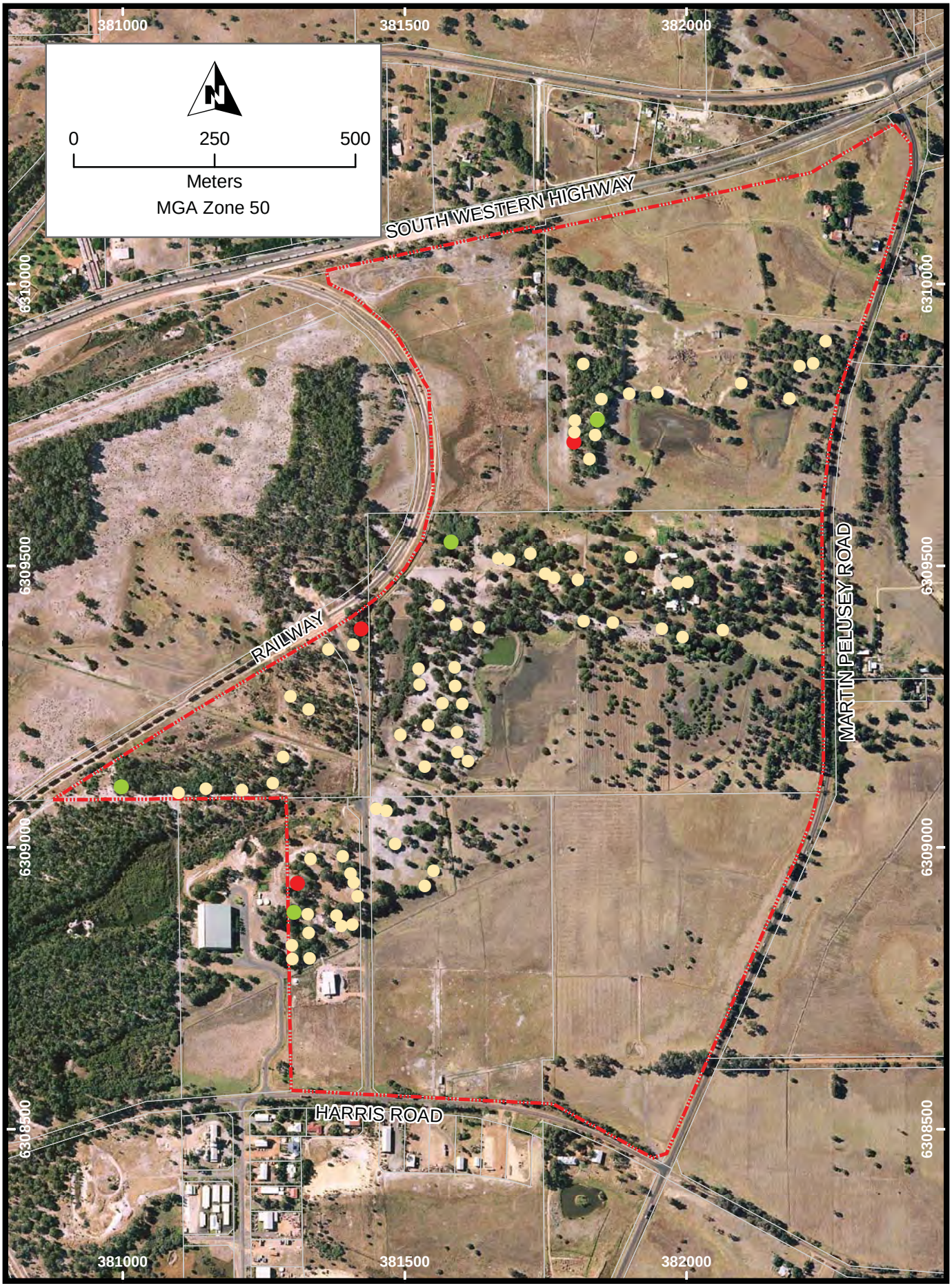
Fauna Survey

DRAWN:G Harewood
DATE : Oct 2009
SCALE: 1: 10,000

Picton East

Habitat Trees & WRP Dreys

Figure: 4



Legend

- Cadastral Boundaries
- Study area
- No WRP Scats Observed
- Small Number of WRP Scats Observed
- High Number of WRP Scats Observed

Fauna Survey

DRAWN:G Harewood

DATE : Oct 2009

SCALE: 1: 9,250

Picton East

WRP Scat Densities

Figure: 5

PLATES

Plate 1: Cleared pasture with scattered trees – Lot 2.

Plate 2: Low open woodland dominated by Banksia with various densities of Jarrah, Marri and Peppermint over very open low shrubland and grassland – Lot 104.

Plate 3: Open woodland of Jarrah and Marri over low open woodland of Peppermint over grassland – Lot 603.

Plate 4: Low open woodland of Melaleuca over seasonally inundated grassland – Lot 603.

Plate 5: Planted non-endemic Eucalypts – Lot 603.

Plate 6: Manmade Dam - Lot 603.

APPENDIX A

CONSERVATION CATEGORIES

EPBC Act (1999) Threatened Fauna Categories

Category	Code	Description
Extinct	E	There is no reasonable doubt that the last member of the species has died.
*Extinct in the wild	EW	A species (a) is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
*Critically endangered	CE	A species is facing an extremely high risk of extinction in the wild in the immediate future.
*Endangered	EN	A species: (a) is not critically endangered; and (b) is facing a very high risk of extinction in the wild in the near future.
*Vulnerable	VU	A species (a) is not critically endangered or endangered; and (b) is facing a high risk of extinction in the wild in the medium-term future.
Conservation dependent	CD	A species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered
*Migratory	Migratory	(a) all migratory species that are: (i) native species; and (ii) from time to time included in the appendices to the Bonn Convention; and (b) all migratory species from time to time included in annexes established under JAMBA, CAMBA and ROKAMBA; and (c) all native species from time to time identified in a list established under, or an instrument made under, an international agreement approved by the Minister.
Marine	Ma	Species in the list established under s248 of the EPBC Act

Note: Only species in those categories marked with an asterix are matters of national environmental significance under the EPBC Act.

Western Australian Wildlife Conservation Act (1950) Threatened Fauna Categories

Category	Code	Description
Schedule 1	S1	Fauna which is rare or likely to become extinct
Schedule 2	S2	Fauna which is presumed extinct
Schedule 3	S3	Birds which are subject to an agreement between the governments of Australia and Japan (JAMBA) relating to the protection of migratory birds and birds in danger of extinction
Schedule 4	S4	Fauna that is otherwise in need of special protection

Note: The *WAWC Act* also uses the categories defined by the *EPBC Act* to further define the status of species in the S1 category.

Western Australian DEC Priority Fauna Categories

Category	Code	Description
Priority 1	P1	Taxa with few, poorly known populations on threatened lands.
Priority 2	P2	Taxa with few, poorly known populations on conservation lands.
Priority 3	P3	Taxa with several, poorly known populations, some on conservation lands.
Priority 4	P4	Taxa in need of monitoring (Not currently threatened or in need of special protection, but could be if present circumstances change)
Priority 5	P5	Taxa in need of monitoring (Not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years)

IUCN Red List Threatened Species Categories

Category	Code	Description
Extinct	EX	Taxa for which there is no reasonable doubt that the last individual has died.
Extinct in the Wild	EW	Taxa which is known only to survive in cultivation, in captivity or and as a naturalised population well outside its past range and it has not been recorded in known or expected habitat despite exhaustive survey over a time frame appropriate to its life cycle and form.
Critically Endangered	CR	Taxa facing an extremely high risk of extinction in the wild.
Endangered	EN	Taxa facing a very high risk of extinction in the wild.
Vulnerable	VU	Taxa facing a high risk of extinction in the wild.
Near Threatened	NT	Taxa which has been evaluated but does not qualify for CR, EN or VU now but is close to qualifying or likely to qualify in the near future.
Least Concern	LC	Taxa which has been evaluated but does not qualify for CR, EN, VU, or NT but is likely to qualify for NT in the near future.
Data Deficient	DD	Taxa for which there is inadequate information to make a direct or indirect assessment of its risk of extinction based on its distribution and/or population status.

A full list of categories and their meanings are available at:

http://www.iucnredlist.org/info/categories_criteria2001#categories

APPENDIX B

HABITAT TREE COORDINATES

Habitat Trees Observed - Picton East

MGA

mN	mE	Decription	Comments
6309013.543	381368.1255	Small hollow	bees
6309027.095	381342.8316	Small hollow	bees
6308889.263	381301.8665	Small hollow	
6309095.430	381278.7093	Small hollow	
6309105.116	381284.4912	Small hollow	
6309109.089	381246.7502	Small hollow	
6309096.101	381152.4456	Small hollow	
6309133.257	381001.9924	Small hollow	
6309147.263	381164.6898	Small hollow	
6309207.586	381366.3748	Small hollow	
6309250.973	381408.4975	Small hollow	
6309360.463	381398.9402	Small hollow	
6309447.140	381610.5469	Small hollow	
6309416.531	381555.8508	Small hollow	
6309479.397	381754.8785	Small hollow	
6309394.259	382048.6222	Small hollow	
6309823.655	381855.8548	Small hollow	
6309785.800	381843.4438	Small hollow	
6309778.613	381845.2346	Small hollow	
6309718.509	381827.0451	Small hollow	
6309704.295	381828.1490	Small hollow	bees
6309658.246	381795.8183	Small hollow	
6309702.563	381807.0705	Small hollow	
6309862.837	381795.1861	Small hollow	
6309917.709	381853.6200	Small hollow	
6309939.117	381851.3488	Small hollow	
6309953.140	381864.5157	Small hollow	
6308905.682	381314.2294	Large Hollow	
6309132.901	381184.5683	Large Hollow	
6309135.197	381085.1063	Large Hollow	
6309132.784	381144.2341	Large Hollow	
6309302.394	381282.5039	Large Hollow	
6309428.134	381613.4129	Large Hollow	
6309829.472	381862.7645	Large Hollow	

APPENDIX C

FAUNA OBSERVED OR POTENTIALLY IN STUDY AREA

Fauna Observed or Potentially in Study Area

Picton East - Picton, W.A.

Compiled by Greg Harewood - October 2009

33.347505°S 115.730545°E

Recorded (Sighted/Heard/Signs) = +

Class **Family** *Species*	Common Name	Conservation Status	Recorded October 2009
Amphibia			
Myobatrachidae Ground or Burrowing Frogs			
Crinia georgiana	Quacking Frog	LC	
Crinia glauerti	Clicking Frog	LC	+
Crinia insignifera	Squelching Froglet	LC	
Heleioporus eyrei	Moaning Frog	LC	
Limnodynastes dorsalis	Western Banjo Frog	LC	
Hylidae Tree or Water-Holding Frogs			
Litoria adelaidensis	Slender Tree Frog	LC	
Litoria moorei	Motorbike Frog	LC	
Reptilia			
Gekkonidae Geckoes			
Christinus marmoratus	Marbled Gecko		
Pygopodidae Legless Lizards			
Lialis burtonis	Burtons's Legless Lizard		
Agamidae Dragon Lizards			
Pogona minor minor	Western Bearded Dragon		
Varanidae Monitor's or Goanna's			
Varanus gouldii	Bungarra or Sand Monitor		
Varanus rosenbergi	Heath Monitor		

WAWC Act Status - S1 to S4, EPBC Act Status - EN = Endangered, VU = Vulnerable, EX = Extinct, DEC Priority Status - P1 to P5, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, Bush Forever Decreaser Species - Bh = habitat specialists, Bp = wide ranging species, Be = extinct in Perth Coastal Plain Region. IUCN Red List Category Definitions see Appendix and www.iucnredlist.org/info/categories_criteria2001#categories. LR=Low Risk, LC=Least Concern, DD=Data Deficient

Class **Family** *Species*	Common Name	Conservation Status	Recorded October 2009
Scincidae Skinks			
Acritoscincus trilineatum	South-western Cool Skink		
Cryptoblepharus buchananii	Fence Skink		+
Ctenotus fallens	West Coast Ctenotus		
Ctenotus labillardieri	Red-legged Ctenotus		
Egernia kingii	King's Skink		
Egernia napoleonis	South-western Crevice Egernia		
Glaphyromorphus gracilipes			
Hemiergis peronii peronii			
Hemiergis quadrilineata	Two-toed earless Skink		
Lerista elegans	West Coast Four-toed Lerista		
Menetia greyii	Dwarf Skink		
Morethia lineoocellata	West Coast Morethia		
Tiliqua rugosa rugosa	Western Bobtail		+
Elapidae Elapid Snakes			
Notechis scutatus	Tiger Snake		
Pseudonaja affinis	Dugite		
Aves			
Casuariidae Emus, Cassowarries			
Dromaius novaehollandiae	Emu	LC	+
Phasianidae Quails, Pheasants			
Coturnix pectoralis	Stubble Quail	LC	

WAWC Act Status - S1 to S4, EPBC Act Status - EN = Endangered, VU = Vulnerable, EX = Extinct, DEC Priority Status - P1 to P5, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, Bush Forever Decreaser Species - Bh = habitat specialists, Bp = wide ranging species, Be = extinct in Perth Coastal Plain Region. IUCN Red List Category Definitions see Appendix and www.iucnredlist.org/info/categories_criteria2001#categories. LR=Low Risk, LC=Least Concern, DD=Data Deficient

Class **Family** *Species*	Common Name	Conservation Status	Recorded October 2009
Anatidae Geese, Swans, Ducks			
Anas gracilis	Grey Teal	LC	+
Anas platyrhynchos	Mallard	Introduced	
Anas superciliosa	Pacific Black Duck	LC	+
Chenonetta jubata	Australian Wood Duck	LC	+
Tadorna tadornoides	Australian Shelduck	LC	+
Podicipedidae Grebes			
Poliocephalus poliocephalus	Hoary-headed Grebe	LC	
Tachybaptus novaehollandiae	Australasian Grebe	LC	+
Ardeidae Herons, Egrets, Bitterns			
Ardea alba	Great Egret	Migratory CA JA	+
Ardea ibis	Cattle Egret	Migratory CA JA	
Ardea novaehollandiae	White-faced Heron	LC	+
Ardea pacifica	White-necked Heron	LC	+
Nycticorax caledonicus	Rufous Night Heron	LC	
Threskiornithidae Iibises, Spoonbills			
Platalea flavipes	Yellow-billed Spoonbill	LC	
Threskiornis molucca	Australian White Ibis	LC	+
Threskiornis spinicollis	Straw-necked Ibis	LC	+

WAWC Act Status - S1 to S4, EPBC Act Status - EN = Endangered, VU = Vulnerable, EX = Extinct, DEC Priority Status - P1 to P5, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, Bush Forever Decreaser Species - Bh = habitat specialists, Bp = wide ranging species, Be = extinct in Perth Coastal Plain Region. IUCN Red List Category Definitions see Appendix and www.iucnredlist.org/info/categories_criteria2001#categories. LR=Low Risk, LC=Least Concern, DD=Data Deficient

Class **Family** *Species*	Common Name	Conservation Status	Recorded October 2009
Accipitridae Kites, Goshawks, Eagles, Harriers			
Accipiter cirrocephalus	Collared Sparrowhawk	LC	
Accipiter fasciatus	Brown Goshawk	LC	
Aquila audax	Wedge-tailed Eagle	LC	
Aquila morphnoides	Little Eagle	LC	
Circus approximans	Swamp Harrier	LC	
Elanus caeruleus	Black-shouldered Kite	LC	
Haliastur sphenurus	Whistling Kite	LC	
Falconidae Falcons			
Falco berigora	Brown Falcon	LC	
Falco cenchroides	Australian Kestrel	LC	+
Falco longipennis	Australian Hobby	LC	
Falco peregrinus	Peregrine Falcon	S4 LC	
Rallidae Rails, Crakes, Swamphens, Coots			
Fulica atra	Eurasian Coot	LC	+
Columbidae Pigeons, Doves			
Columba livia	Domestic Pigeon	Introduced	
Ocyphaps lophotes	Crested Pigeon	LC	
Phaps chalcoptera	Common Bronzewing	LC	+
Streptopelia senegalensis	Laughing Turtle-Dove	Introduced	

WAWC Act Status - S1 to S4, EPBC Act Status - EN = Endangered, VU = Vulnerable, EX = Extinct, DEC Priority Status - P1 to P5, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, Bush Forever Decreaser Species - Bh = habitat specialists, Bp = wide ranging species, Be = extinct in Perth Coastal Plain Region. IUCN Red List Category Definitions see Appendix and www.iucnredlist.org/info/categories_criteria2001#categories. LR=Low Risk, LC=Least Concern, DD=Data Deficient

Class **Family** *Species*	Common Name	Conservation Status	Recorded October 2009
Psittacidae Parrots			
Cacatua roseicapilla	Galah	LC	
Cacatua sanguinea	Little Corella	Introduced	
Calyptorhynchus banksii naso	Forest Red-tailed Black-Cockatoo	S1 VU VU Be LC	+
Calyptorhynchus baudinii	Baudin's Cockatoo	S1 EN Bp VU C2a(ii)	+
Calyptorhynchus latirostris	Carnaby's Cockatoo	S1 EN Bp EN A2bcd+3bcd	+
Glossopsitta porphyrocephala	Purple-crowned Lorikeet	LC	
Neophema elegans	Elegant Parrot	LC	
Platycercus icterotis	Western Rosella		
Platycercus spurius	Red-capped Parrot	LC	+
Platycercus zonarius semitorquatus	Twenty-eight Parrot	LC	+
Polytelis anthopeplus	Regent Parrot	LC	
Cuculidae Parasitic Cuckoos			
Cacomantis flabelliformis	Fan-tailed Cuckoo	LC	
Chrysococcyx basalis	Horsfield's Bronze Cuckoo	LC	+
Chrysococcyx lucidus	Shining Bronze Cuckoo	LC	
Cuculus pallidus	Pallid Cuckoo	LC	
Strigidae Hawk Owls			
Ninox novaeseelandiae	Boobook Owl	LC	
Tytonidae Barn Owls			
Tyto alba	Barn Owl	LC	
Podargidae Frogmouths			
Podargus strigoides	Tawny Frogmouth	LC	
Aegothelidae Owlet-nightjars			
Aegotheles cristatus	Australian Owlet-nightjar	LC	

WAWC Act Status - S1 to S4, EPBC Act Status - EN = Endangered, VU = Vulnerable, EX = Extinct, DEC Priority Status - P1 to P5, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, Bush Forever Decreaser Species - Bh = habitat specialists, Bp = wide ranging species, Be = extinct in Perth Coastal Plain Region. IUCN Red List Category Definitions see Appendix and www.iucnredlist.org/info/categories_criteria2001#categories. LR=Low Risk, LC=Least Concern, DD=Data Deficient

Class **Family** *Species*	Common Name	Conservation Status	Recorded October 2009
Apodidae Swifts, Swiftlets			
Apus pacificus	Fork-tailed Swift	Migratory CA JA LC	
Halcyonidae Tree Kingfishers			
Dacelo novaeguinea	Laughing Kookaburra	Introduced	
Todiramphus sanctus	Sacred Kingfisher	LC	+
Meropidae Bee-eaters			
Merops ornatus	Rainbow Bee-eater	Migratory JA LC	+
Maluridae Fairy Wrens, GrassWrens			
Malurus splendens	Splendid Fairy-wren	Bh LC	+
Acanthizidae Thornbills, Geryones, Fieldwrens & Whitefaces			
Acanthiza apicalis	Broad-tailed Thornbill	Bh LC	
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	Bh LC	+
Acanthiza inornata	Western Thornbill	Bh LC	
Gerygone fusca	Western Gerygone	LC	+
Sericornis frontalis	White-browed Scrubwren	Bh LC	+
Smicrornis brevirostris	Weebill	LC	
Pardalotidae Pardalotes			
Pardalotus striatus	Striated Pardalote	LC	+

WAWC Act Status - S1 to S4, EPBC Act Status - EN = Endangered, VU = Vulnerable, EX = Extinct, DEC Priority Status - P1 to P5, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, Bush Forever Decreaser Species - Bh = habitat specialists, Bp = wide ranging species, Be = extinct in Perth Coastal Plain Region. IUCN Red List Category Definitions see Appendix and www.iucnredlist.org/info/categories_criteria2001#categories. LR=Low Risk, LC=Least Concern, DD=Data Deficient

Class **Family** *Species*	Common Name	Conservation Status	Recorded October 2009
Meliphagidae Honeyeaters, Chats			
Acanthorhynchus superciliosus	Western Spinebill	LC	
Anthochaera carunculata	Red Wattlebird	LC	+
Epthianura albifrons	White-fronted Chat	LC	
Lichenostomus virescens	Singing Honeyeater	LC	
Lichmera indistincta	Brown Honeyeater	LC	+
Phylidonyris nigra	White-cheeked Honeyeater	Bp LC	
Phylidonyris novaehollandiae	New Holland Honeyeater	Bp LC	
Neosittidae Sitellas			
Daphoenositta chrysoptera	Varied Sittella	Bh LC	
Pachycephalidae Crested Shrike-tit, Crested Bellbird, Shrike Thrushes, Whistlers			
Colluricincla harmonica	Grey Shrike-thrush	LC	
Pachycephala pectoralis	Golden Whistler	Bh LC	+
Pachycephala rufiventris	Rufous Whistler	LC	+
Dicruridae Monarchs, Magpie Lark, Flycatchers, Fantails, Drongo			
Grallina cyanoleuca	Magpie-lark	LC	+
Rhipidura fuliginosa	Grey Fantail	LC	+
Rhipidura leucophrys	Willie Wagtail	LC	+
Campephagidae Cuckoo-shrikes, Trillers			
Coracina novaehollandiae	Black-faced Cuckoo-shrike	LC	+
Lalage tricolor	White-winged Triller	LC	
Artamidae Woodswallows, Butcherbirds, Currawongs			
Artamus cinereus	Black-faced Woodswallow	LC	
Artamus cyanopterus	Dusky Woodswallow	Bp LC	

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Class **Family** *Species*	Common Name	Conservation Status	Recorded October 2009
Cracticidae Currawongs, Magpies & Butcherbirds			
Cracticus tibicen	Australian Magpie	LC	+
Cracticus torquatus	Grey Butcherbird	LC	+
Corvidae Ravens, Crows			
Corvus coronoides	Australian Raven	LC	+
Motacillidae Old World Pipits, Wagtails			
Motacilla alba	White Wagtail	Migratory CA LC	+
Dicaeidae Flowerpeckers			
Dicaeum hirundinaceum	Mistletoebird	LC	
Hirundinidae Swallows, Martins			
Hirundo neoxena	Welcome Swallow	LC	+
Hirundo nigricans	Tree Martin	LC	
Sylviidae Old World Warblers			
Cincloramphus cruralis	Brown Songlark	LC	
Cincloramphus mathewsi	Rufous Songlark	LC	
Zosteropidae White-eyes			
Zosterops lateralis	Grey-breasted White-eye	LC	+
Mammalia			
Phalangeridae Brushtail Possums, Cuscuses			
Trichosurus vulpecula	Common Brushtail Possum	LR/LC	+
Pseudocheiridae Ringtail Posssums			
Pseudocheirus occidentalis	Western Ringtail Possum	S1 VU VU C2a	+
Macropodidae Kangaroos, Wallabies			
Macropus fuliginosus	Western Grey Kangaroo	LR/LC	+

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Class **Family** *Species*	Common Name	Conservation Status	Recorded October 2009
Molossidae Freetail Bats			
Mormopterus planiceps	Southern Freetail-bat	LR/LC	
Tadarida australis	White-striped Freetail-bat	LR/LC	
Vespertilionidae Ordinary Bats			
Chalinolobus gouldii	Gould's Wattled Bat	LR/LC	
Chalinolobus morio	Chocolate Wattled Bat	LR/LC	
Falsistrellus mackenziei	Western False Pipistrelle	P4 VU A2c	
Nyctophilus geoffroyi	Lesser Long-eared Bat	LR/LC	
Nyctophilus gouldi	Gould's Long-eared Bat	LR/LC	
Vespadelus regulus	Southern Forest Bat	LR/LC	
Muridae Rats, Mice			
Mus musculus	House Mouse	Introduced	
Rattus rattus	Black Rat	Introduced	
Canidae Dogs, Foxes			
Vulpes vulpes	Red Fox	Introduced	
Felidae Cats			
Felis catus	Cat	Introduced	
Equidae Horses			
Equus caballus	Horse	Introduced	+
Bovidae Horned Ruminants			
Bos taurus	European Cattle	Introduced	+
Ovis aries	Domestic Sheep	Introduced	+
Leporidae Rabbits, Hares			
Oryctolagus cuniculus	Rabbit	Introduced	+

WAWC Act Status - S1 to S4, EPBC Act Status - EN = Endangered, VU = Vulnerable, EX = Extinct, DEC Priority Status - P1 to P5, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, Bush Forever Decreaser Species - Bh = habitat specialists, Bp = wide ranging species, Be = extinct in Perth Coastal Plain Region. IUCN Red List Category Definitions see Appendix and www.iucnredlist.org/info/categories_criteria2001#categories. LR=Low Risk, LC=Least Concern, DD=Data Deficient

APPENDIX D

DEC DATABASE SEARCH RESULTS & EPBC DATABASE SEARCH RESULTS

33.2637 °S 115.6131 °E / 33.4432 °S 115.8262 °E Picton area (plus ~10km buffer) #2857

Schedule 1 - Fauna that is rare or is likely to become extinct

Dasyurus geoffroii — Chuditch — *1 records*

This carnivorous marsupial occupies large home ranges, is highly mobile and appears able to utilise bush remnants and corridors.

* Date	Certainty	Seen	Location Name	Method
2000	1	1	Eaton/Pelican Point	Dead

Phascogale tapoatafa ssp. (WAM M434) — Brush-tailed Phascogale, Wambenger — *5 records*

This arboreal marsupial occurs in forest and woodland where suitable tree hollows are available. Populations fluctuate dramatically in response to invertebrate prey abundance.

* Date	Certainty	Seen	Location Name	Method
1999	1	2	North Boyanup	Caught or trapped
2003	1	1	Glen Iris	Night sighting
2008	1	1	Bunbury	Dead
2008	1	1	College Grove	Night sighting
2008	1	1	Australind	Dead

Pseudocheirus occidentalis — Western Ringtail Possum — *22 records*

This species occurs in areas of forest and dense woodlands and requires tree hollows and/or dense canopy for refuge and nesting.

* Date	Certainty	Seen	Location Name	Method
1998	1	1	Dalyellup	Night sighting
2003	1	1	Davenport	Day sighting
2005	1	1	Glen Iris/Vittoria	Dead
2006	1	1	Eaton	Day sighting
2006	1	1	Carey Park	Day sighting
2006	1	0	Millbridge/Waterloo	Dead
2006	2	1	Stratham	Dead
2006	1	2	Gelorup	Night sighting
2007	1	1	Eaton/Picton East	Dead
2007	1	2	Dardanup	Day sighting
2007	1	1	Waterloo	Day sighting
2007	1	3	Gelorup	Night sighting
2007	1	1	Eaton	Dead
2008	1	1	Bunbury	Dead
2008	1	1	Bunbury	Day sighting
2008	1	1	Gelorup	Dead
2008	1	1	Gelorup	Caught or trapped
2008	1	0	Gelorup	Definite signs
2008	1	1	Davenport	Dead
2008	1	1	Bunbury	Dead
2008	1	1	Glen Iris	Dead
2008	1	1	South Bunbury	Dead

Diomedea exulans — Wandering Albatross — *1 records*

This species is an occasional visitor to south and southwest coastal Western Australia. It breeds on subantarctic and antarctic islands.

* Date	Certainty	Seen	Location Name	Method
1939	1	1	Bunbury	Dead

33.2637 °S 115.6131 °E / 33.4432 °S 115.8262 °E Picton area (plus ~10km buffer) #2857

*	Date	Certainty	Seen	Location Name	Method
Macronectes giganteus				**Southern Giant Petrel**	*1 records*
	2008	1	1	South Bunbury	Day sighting
Thalassarche carteri				**Indian Yellow-nosed Albatross**	*1 records*
	1939	1		Bunbury	Day sighting
Thalassarche melanophrys				**Black-browed Albatross**	*1 records*
This species is an occasional visitor to south and southwest coastal Western Australia. It breeds on subantarctic and antarctic islands.					
	1939	1		Bunbury	Day sighting
Calyptorhynchus banksii naso				**Forest Red-tailed Black-Cockatoo**	*2 records*
This subspecies of the Red-tailed Black Cockatoo is restricted to the forests of the south-west. It requires tree hollows to nest and breed and is totally dependent on jarrah-marri forest.					
	1999	1	3	"Green Patch"	Day sighting
	2009	1	2	Eaton	Day sighting
Calyptorhynchus baudinii				**Baudin's Black-Cockatoo**	*3 records*
This species is a seasonal visitor to the northern forests and adjacent eastern edge of the coastal plain, feeding on the seeds of eucalypts and various proteaceous species. It breeds in spring/summer in the southern forests, nesting in tree hollows (primarily in Marri).					
	1939	2		Bunbury	Day sighting
	1999	1	3	Bunbury	Day sighting
	2008	1	6	Bunbury	Day sighting
Calyptorhynchus latirostris				**Carnaby's Black-Cockatoo**	*2 records*
This species moves around seasonally in flocks to feeding areas in proteaceous scrubs and heaths and eucalypt woodlands as well as pine plantations. Breeding occurs in winter/spring, mainly in the eastern forests and wheatbelt where they can find mature hollow-bearing trees to nest in.					
	1999	2	7	Bunbury	Day sighting
	2003	1	1	Bunbury	Dead
Psophodes nigrogularis nigrogularis				**Western Whipbird (western heath subsp)**	*1 records*
This subspecies is restricted to a small area east of Albany and inhabits areas of dense shrubland and coastal heath that is long unburnt.					
	1898	1	0	Bunbury	Eggs
Priority Three: Taxa with several, poorly known populations, some on conservation lands					
Ixobrychus flavicollis australis				**Black Bittern**	*1 records*
This species inhabits freshwater pools, swamps and lagoons, well screened with trees.					
	1931	1		Picton	
Priority Four: Taxa in need of monitoring					
Macropus irma				**Western Brush Wallaby**	*3 records*
This species occurs in areas of forest and woodland supporting a dense shrub layer.					
	1986	1	1	Gelorup	
	1999	1	1	Bunbury	Day sighting

33.2637 °S 115.6131 °E / 33.4432 °S 115.8262 °E Picton area (plus ~10km buffer) #2857

*	Date	Certainty	Seen	Location Name	Method
	2008	1	1	Gelorup	Day sighting

Hydromys chrysogaster **Water-rat, Rakali** *2 records*

This species occurs in waterways and wetlands that support its main prey items such as molluscs and crustaceans.

1957	1	1	Bunbury	
1964	1	1	Bunbury	

Burhinus grallarius **Bush Stonecurlew** *1 records*

A well camouflaged, ground nesting bird which prefers to 'freeze' rather than fly when disturbed. It inhabits lightly timbered open woodlands.

1939	1		Bunbury	

Charadrius rubricollis **Hooded Plover** *1 records*

This species frequents the margins and shallows of salt lakes, also along coastal beaches, where it forages for invertebrates along the water's edge.

1998	1	85	Leschenault	Day sighting

Numenius madagascariensis **Eastern Curlew** *4 records*

This species is a migratory visitor and has been observed on reef flats and sandy beaches along the West Australian coast and in coastal estuaries.

1998	1	15	Leschenault	Day sighting
2000	1	7	Leschenault	
2001	1	7	Leschenault	
2004	1		Pelican Point	Day sighting

Priority Five: Taxa in need of monitoring (conservation dependent)

Isoodon obesulus fusciventer **Quenda** *3 records*

This species prefers areas with dense understorey vegetation, particularly around swamps and along watercourses, that provides ample protection from predators.

1999	1	1	Bunbury	Dead
1999	2	0	Bunbury	Definite signs
2008	1	1	Gelorup	Day sighting

***** Information relating to any records provided for listed species:-
Date: date of recorded observation
Certainty (of correct species identification): 1=Very certain; 2=Moderately certain; and 3=Not sure.
Seen: Number of individuals observed.
Location Name: Name of reserve or nearest locality where observation was made
Method: Method or type of observation

Protected Matters Search Tool

You are here: Environment Home > EPBC Act > Search

16 December 2009 19:29

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.

You may wish to print this report for reference before moving to other pages or websites.

The Australian Natural Resources Atlas at http://www.environment.gov.au/atlas may provide further environmental information relevant to your selected area. Information about the EPBC Act including significance guidelines, forms and application process details can be found at http://www.environment.gov.au/epbc/assessmentsapprovals/index.html

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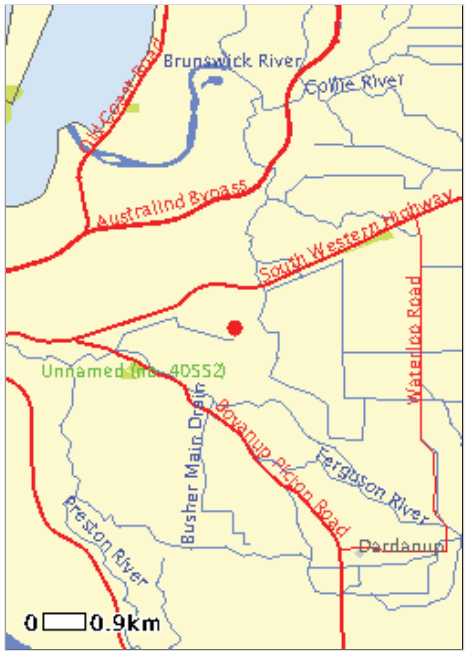
Search Type: Point

Buffer: 5 km

Coordinates: -33.348528,115.729706

Report Contents:



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 - see http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Significance: (Ramsar Sites)	None

Commonwealth Marine Areas:	None
Threatened Ecological Communities:	1
Threatened Species:	9
Migratory Species:	7

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 and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage/index.html.

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

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. Information on EPBC Act permit requirements and application forms can be found at http://www.environment.gov.au/epbc/permits/index.html.

Commonwealth Lands:	1
Commonwealth Heritage Places:	None
Places on the RNE:	None
Listed Marine Species:	5
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	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:	1
Other Commonwealth Reserves:	None
Regional Forest Agreements:	None

Details

Matters of National Environmental Significance

Threatened Ecological Communities [Dataset Information]	Status	Type of Presence
Corymbia calophylla - Xanthorrhoea preissii woodlands and shrublands of the Swan Coastal Plain	Endangered	Community known to occur within area
Threatened Species [Dataset Information]	Status	Type of Presence

Birds

Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo	Vulnerable	Species or species habitat may occur within area
Calyptorhynchus baudinii Baudin's Black-Cockatoo, Long-billed Black-Cockatoo	Vulnerable	Breeding known to occur within area
Calyptorhynchus latirostris Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo	Endangered	Breeding likely to occur within area

Mammals

Dasyurus geoffroii Chuditch, Western Quoll	Vulnerable	Species or species habitat likely to occur within area
Pseudocheirus occidentalis Western Ringtail Possum	Vulnerable	Species or species habitat likely to occur within area
Setonix brachyurus Quokka	Vulnerable	Species or species habitat may occur within area

Ray-finned fishes

Nannatherina balstoni Balston's Pygmy Perch	Vulnerable	Species or species habitat may occur within area

Plants

Darwinia sp. Muchea (B.J.Keighery 2458) Muchea Bell	Critically Endangered	Species or species habitat likely to occur within area
Drakaea micrantha Hopper & A.P.Brown nom. inval. Dwarf Hammer-orchid	Vulnerable	Species or species habitat likely to occur within area

Migratory Species [Dataset Information]	Status	Type of Presence

Migratory Terrestrial Species

Birds

Haliaeetus leucogaster White-bellied Sea-Eagle	Migratory	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater	Migratory	Species or species habitat may occur within area

Migratory Wetland Species

Birds

Ardea alba Great Egret, White Egret	Migratory	Breeding likely to occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area

Migratory Marine Birds

Apus pacificus Fork-tailed Swift	Migratory	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Migratory	Breeding likely to occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Dataset Information]	Status	Type of Presence

Birds

Apus pacificus Fork-tailed Swift	Listed - overfly marine area	Species or species habitat may occur within area

Ardea alba Great Egret, White Egret	Listed - overfly marine area	Breeding likely to occur within area
Ardea ibis Cattle Egret	Listed - overfly marine area	Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle	Listed	Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater	Listed - overfly marine area	Species or species habitat may occur within area

Commonwealth Lands [Dataset Information]

Unknown

Extra Information

State and Territory Reserves [Dataset Information]

Un-named (No. 46108) Nature Reserve, 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 Heritage and Register of National Estate properties, Wetlands of International 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 migratory and marine provisions of the Act have been mapped.

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.

Acknowledgments

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

- New South Wales National Parks and Wildlife Service
- Department of Sustainability and Environment, Victoria
- Department of Primary Industries, Water and Environment, Tasmania
- Department of Environment and Heritage, South Australia Planning SA
- Parks and Wildlife Commission of the Northern Territory
- Environmental Protection Agency, Queensland
- Birds Australia
- Australian Bird and Bat Banding Scheme
- Australian National Wildlife Collection
- Natural history museums of Australia
- 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
- Other groups and individuals

ANUCliM Version 1.8, Centre for Resource and Environmental Studies, Australian National University was used extensively for the production of draft maps of species distribution. Environment Australia is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

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Last updated: Thursday, 20-Nov-2008 14:17:56 EST

APPENDIX E

DETAILS OF SIGNIFICANT SPECIES

Western Whipbird *Psophodes nigrogularis nigrogularis*

Status and Distribution: This subspecies of the Western Whipbird is classified as Schedule 1 under the *WAWC Act (1950*) and as Endangered under the *EPBC Act (1999*. Originally found in South-west Western Australia along the west coast from Perth to Augusta and on the south coast from King Georges Sound east to at least Two People's Bay. Now restricted to a small area east of Albany between Mt Taylor and Cheyne Beach/Waychinicup R., notably Two People's Bay Nature Reserve and Mt Manypeaks.

Habitat: At Two Peoples Bay, the Western Whipbird occurs in dense shrubland with an open overstorey, the structure of the vegetation being more important than the floristics. All of the domed nests found have been in dense bushes in heath adjacent to thickets. On Mt Manypeaks, the subspecies also occurs in dense low mallee and shrubland. The birds feed mostly on or near the ground.

Likely presence in study area: Regionally extinct.

Potential impact of development: No impact on this species will occur as the result of development within the study area.

Hooded Plover *Charadrius rubricollis*

Status and Distribution: Listed as Priority 4 by DEC. In WA coastally west from Israelite Bay north to Jurien Bay and inland salt lakes more than 100km from the coast. In eastern Australia confined to suitable habitat from Jervis Bay (NSW) through Bass Strait and Tasmanian and west to Great Australian Bight in South Australia.

Habitat: Broad sandy ocean beaches and bays, coastal and inland salt lakes (Pizzey & Knight 2006).

Likely presence in study area: No suitable habitat.

Potential impact of development: No impact on this species will occur as the result of development within the study area.

Great Egret *Ardea alba*

Status and Distribution: This species of egret is listed as migratory under the *EPBC Act (1999)* and under international agreements to which Australia is a signatory. The Great Egret is common and very widespread in any suitable permanent or temporary habitat (Morcombe, 2003).

Species or species habitat listed as likely to occur in general area within EPBC database search.

Habitat: Wetlands, flooded pasture, dams, estuarine mudflats, mangroves and reefs (Morcombe 2003).

Likely presence in study area: Observed in flooded paster areas during the survey period. Likely to be a frequent visitor, in low numbers during wetter months of the year. Unlikely to breed onsite.

Potential impact of proposed development: Potential for the loss of some poor quality foraging habitat, however substantial areas of similar habitat are present in surrounding farmland and no significant impact on this species is anticipated.

Cattle Egret *Ardea ibis*

Status and Distribution: This species of egret is listed as migratory under the *EPBC Act 1999* and under international agreements to which Australia is a signatory. The Cattle Egret is common in the north sections of its range but is an irregular visitor to the better watered parts of the state (Johnstone and Storr 1998). The population is expanding (Morcombe 2003).

Species or species habitat listed as likely to occur in general area within EPBC database search.

Habitat: Moist pastures with tall grasses, shallow open wetlands and margins, mudflats (Morcombe 2003).

Likely presence in study area: Likely to be an infrequent visitor, in low numbers during wetter months of the year. Unlikely to breed onsite.

Potential impact of proposed development: Potential for the loss of some poor quality foraging habitat, however substantial areas of similar habitat are present in surrounding farmland and no significant impact on this species is anticipated.

White-bellied Sea Eagle *Haliaeetus leucogaster*

Status and Distribution: This species is listed as migratory under the *EPBC Act (1999)* and under international agreements to which Australia is a signatory. White-bellied sea eagles are moderately common to common on Kimberley and Pilbara islands, coasts and estuaries, on Bernier, Dorre and Dirk Hartog Is., in Houtman Abrolhos and in the Archipelago of the Recherche; rare to uncommon elsewhere (Johnstone and Storr 1998). Also found in New Guinea, Indonesia,

China, southeast Asia and India. Scarce near major coastal cities (Morcombe 2003).

Species or species habitat listed as likely to occur in general area within EPBC database search.

Habitat: They nest and forage usually near the coast over islands, reefs, headlands, beaches, bays, estuaries, mangroves, but will also live near seasonally flooded inland swamps, lagoons and floodplains, often far inland on large pools of major rivers. Established pairs usually sedentary, immatures dispersive (Morcombe 2003). White-bellied Sea-Eagles build a large stick nest, which is used for many seasons in succession.

Likely presence in study area: May fly over the site occasionally due to proximity to ocean and estuaries. Would however not be specifically attracted to the site as habitat unsuitable and is therefore not listed as a potential species.

Potential impact of proposed development: No impact on this species is anticipated.

Peregrine Falcon *Falco perigrinus*

Status and Distribution: This species is listed as Schedule 4 under the *WAWC Act 1950*. Individuals of this species are uncommon/rare but wide ranging across Australia. Moderately common at higher levels of the Stirling Range, uncommon in hilly, north west Kimberley, Hamersley and Darling Ranges; rare or scarce elsewhere (Johnstone and Storr 1998).

Habitat: Diverse from rainforest to arid shrublands, from coastal heath to alpine (Morcombe 2003). Mainly about cliffs along coasts, rivers and ranges and about wooded watercourses and lakes (Johnstone and Storr 1998). The species utilises the ledges, cliff faces and large hollows/broken spouts of trees for nesting. It will also occasionally use the abandoned nests of other birds of prey.

Likely presence in study area: The species potentially utilises some sections of the study area as part of a much larger home range. No potential nest sites observed.

Potential impact of proposed development: No impact anticipated.

Australasian Bittern *Botaurus poiciloptilus*

Status and Distribution: Classified as Schedule 1 under the *WAWC Act (1950*) and as Vulnerable under the *EPBC Act (1999*. The species is uncommon to rare

(Morcombe, 2003), but locally common in wetter parts of south west (Johnstone and Storr 1998). Occurs north to Moora and east to Mt Arid (Johnstone and Storr 1998).

Habitat: Freshwater wetlands, occasionally estuarine; prefers heavy vegetation (Morcombe 2003) such as beds of tall dense *Typha*, *Baumea* and sedges in freshwater swamps (Johnstone and Storr 1998).

Likely presence in study area: No suitable habitat.

Potential impact of development: No impact on this species will occur as the result of development within the study area.

Black Bittern *Ixobrychus flavicollis*

Status and Distribution: Listed as Priority 2 by DEC. Occurs north to Yanchep and Northam and east to Albany (Johnstone and Storr 1998).

Habitat: Freshwater pools, swamps and lagoons, well screened with trees. Shelters in dense waterside vegetation (Johnstone and Storr 1998).

Likely presence in study area: No suitable habitat.

Potential impact of development: No impact on this species will occur as the result of development within the study area.

Little Bittern *Ixobrychus minutus*

Status and Distribution: Listed as Priority 4 by DEC. Occurs north to Moora and east to Two Peoples Bay; accidental or on migration further north and east and on Rottnest Island and central district (Condingup district) (Johnstone and Storr 1998).

Habitat: In south dense beds of Freshwater pools, swamps and lagoons, well screened with trees. Shelters in dense beds of *Typha*, *Baumea* and tall rushes in freshwater swamps around lakes and along rivers (Johnstone and Storr 1998).

Likely presence in study area: No suitable habitat.

Potential impact of development: No impact on this species will occur as the result of development within the study area.

Bush Stone Curlew *Burhinus grallarius*

Status and Distribution: Listed as Priority 4 by DEC. Occurs over much of the western half of the state (and Kimberley) but rare to uncommon in the south of its range due to fox predation (Johnstone and Storr 1998).

Habitat: Lightly wooded country (including partly cleared forests) near daytime shelter e.g. thickets or long grass (Johnstone and Storr 1998).

Likely presence in study area: There is a single DEC database record from Bunbury 1939. No sightings since suggest the species is extinct in the general project area.

Likely presence in study area: Regionally extinct.

Potential impact of development: No impact on this species will occur as the result of development within the study area.

Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso*

Status and Distribution: Listed as Scheduled 1 under the *WAWC Act (1950)* and as Vulnerable under the *EPBC Act (1999)*. Found in the humid and subhumid south west, mainly hilly interior, north to Gingin and east to Mt Helena, Christmas Tree Well, North Bannister, Mt Saddleback, Rock Gully and the upper King River (Johnstone and Storr 1998).

Habitat: Eucalypt forests, feeds on Marri, Jarrah, Blackbutt, Karri, Sheoak and Snottygobble. The Forest Red-tailed Black Cockatoo nests in the large hollows of Marri, Jarrah and Karri (Johnstone and Kirkby 1999). In Marri, the nest hollows of the Forest Red-tailed Black Cockatoo range from 8-14m above ground, the entrance is 12 – 41cm in diameter and the depth is one to five metres (Johnstone and Storr 1998).

Breeding commences in winter/spring. There are few records of breeding in the Forest Red-tailed Black Cockatoo (Johnstone and Storr 1998), but eggs are laid in October and November (Johnstone 1997; Johnstone and Storr 1998). Incubation period 29 – 31 days. Young fledge at 8 to 9 weeks (Simpson and Day 2004).

J	F	M	A	M	J	J	A	S	O	N	D

Period in which breeding is most likely to commence
Period in which fledging/weening could extend through

Likely presence in study area: Three individuals were observed foraging during survey period. Other foraging evidence also observed (chewed Marri nuts). A number of hollow trees present in the study area are possibly suitable for nesting though no evidence of actual breeding observed.

Potential impact of development: Potential for the loss of foraging and breeding habitat. Significance of impact will depend on areas actually affected.

Baudin's Black- Cockatoo *Calyptorhynchus baudinii*

Status and Distribution: Listed as Scheduled 1 under the *WAWC Act (1950)* and as Vulnerable under the *EPBC Act (1999)*. Confined to the south-west of Western Australia, north to Gidgegannup, east to Mt Helena, Wandering, Quindanning, Kojonup, Frankland and King River and west to the eastern strip of the Swan Coastal Plain including West Midland, Byford, Nth Dandalup, Yarloop, Wokalup and Bunbury (Johnstone and Storr 1998). On the southern Swan Coastal Plain this cockatoo is in some areas resident but mainly a migrant moving from the deep south-west to the central and northern Darling Range. Between March and September most flocks move north and are concentrated in the northern parts of the Darling Range. During this period birds forage well out onto the southern Swan Coastal Plain to areas such as Harvey, Myalup, Bunbury, Capel, Dunsborough and Meelup. While generally more common in the Darling Range this species can also be common on parts of the southern Swan Coastal Plain especially in mid-August – September when flocks begin to return to their breeding quarters (Johnstone 2008).

Habitat: Mainly eucalypt forests where it feeds primarily on the Marri seeds, (Morcombe, 2003), Banksia, Hakeas and *Erodium* sp. Also strips bark from trees in search of beetle larvae (Johnstone and Storr 1998). This species of cockatoo nests in large tree hollows, 30–40 cm in diameter and more than 30 cm deep (Saunders 1974).

Baudin's Black-Cockatoo breeds in late winter and spring, from August to November or December (Gould 1972; Johnstone 1997; Saunders 1974; Saunders *et al*. 1985). Eggs laid in October (Johnstone and Storr 1998). Incubation is 28 – 30 days. Young fledge at 8 to 9 weeks (Simpson and Day 2004).

J	F	M	A	M	J	J	A	S	O	N	D

Period in which breeding is most likely to commence
Period in which fledging/weening could extend througho

Likely presence in study area: Foraging evidence observed during the survey period (chewed Marri nuts and Banksia cones, grubbing on marri tree trunks). A number of hollow trees present in the study area are possibly suitable for nesting though no evidence of actual breeding observed.

Potential impact of development: Potential for the loss of foraging and breeding habitat. Significance of impact will depend on areas actually affected.

Carnaby's Black- Cockatoo *Calyptorhynchus latirostris*

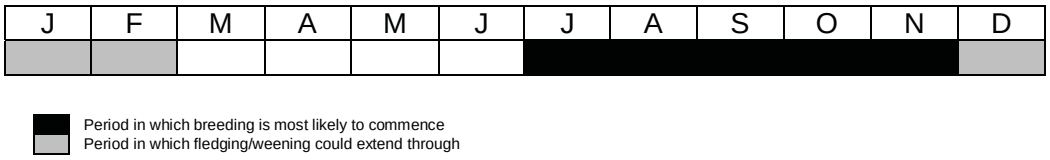
Status and Distribution: Carnaby's Black Cockatoo is listed as Scheduled 1 under the *WAWC Act (1950)* and as Endangered under the *EPBC Act (1999)*. Confined to the south-west of Western Australia, north to the lower Murchison River and east to Nabawa, Wilroy, Waddi Forest, Nugadong, Manmanning, Durokoppin, Noongar (Moorine Rock), Lake Cronin, Ravensthorpe Range, head of Oldfield River, 20 km ESE of Condingup and Cape Arid; also casual on Rottnest Island (Johnstone and Storr 1998).

Habitat: Forests, woodlands, heathlands, farms; feeds on Banksia, Hakeas and Marri. Carnaby's Cockatoo has specific nesting site requirements. Nests are mostly in smoothed-barked eucalypts with the nest hollows ranging from 2.5 to 12m above the ground, an entrance from 23-30cm diameter and a depth of 0.1-2.5m (Johnstone and Storr, 1998).

Breeding occurs in winter/spring mainly in eastern forest and wheatbelt where they can find mature hollow bearing trees to nest in (Morcombe, 2003). Judging from records in the Storr-Johnstone Bird Data Bank, this species is currently expanding its breeding range westward and south into the Jarrah – Marri forest of the Darling Scarp and into the Tuart forests of the Swan Coastal Plain including the region between Mandurah and Bunbury. Carnaby's Black Cockatoo has been known to breed close to the town of Mandurah, as well as at Dawesville, Lake Clifton and Baldivis (pers. comm., Ron Johnstone, WA Museum) and there are small resident populations on the southern Swan Coastal Plain near Mandurah, Lake Clifton and near Bunbury. At each of these sites the birds forage in remnant vegetation and adjacent pine plantations (Johnstone 2008).

Carnaby's Black-Cockatoo lays eggs from July or August to October or November, with most clutches being laid in August and September (Saunders

1986). Birds in inland regions may begin laying up to three weeks earlier than those in coastal areas (Saunders 1977). The female incubates the eggs over a period of 28-29 days. The young depart the nest 10–12 weeks after hatching (Saunders 1977; Smith & Saunders 1986).



Likely presence in study area: Foraging evidence observed during the survey period (chewed Marri nuts and Banksia cones). A number of hollow trees present in the study area are possibly suitable for nesting though no evidence of actual breeding observed.

Potential impact of development: Potential for the loss of foraging and breeding habitat. Significance of impact will depend on areas actually affected.

Barking Owl *Ninox connivens connivens*

Status and Distribution: Listed as Priority 2 by DEC. Found north to Perth (formerly) and east to Northam, Katanning and nearly to Bremer Bay. Declining in south west (Johnstone and Storr 1998).

Habitat: Dense vegetation, especially forest and thickets of waterside vegetation such as melaleucas (Johnstone and Storr 1998). Roosts in tree hollows.

Likely presence in study area: Habitat appears very marginal for this species and it is unlikely to be specifically attracted to the site. Not listed as a potential species.

Potential impact of development: No impact on this species is anticipated.

Masked Owl *Tyto novaehollandae novaehollandae*

Status and Distribution: Listed as Priority 3 by DEC. Found north to Yanchep and east to Yealering, Gnowangerup and Albany, casual further north. Locally common in south west but generally uncommon (Johnstone and Storr 1998).

Habitat: Roosts and nests in heavy forest, hunts over open woodlands and farmlands (Morcombe, 2003). Probably breeding in forested deep south west with some autumn–winter wanderings northwards (Johnstone and Storr 1998).

Likely presence in study area: Habitat appears very marginal for this species and it is unlikely to be specifically attracted to the site. Not listed as a potential species.

Potential impact of development: No impact on this species is anticipated.

Fork-tailed Swift *Apus pacificus*

Status and Distribution: The Fork-tailed Swift is listed as migratory under the *EPBC Act 1999* and under international agreements to which Australia is a signatory. It is a summer migrant (Oct-Apr) to Australia (Morcombe 2003).

Habitat: Low to very high airspace over varied habitat from rainforest to semi desert (Morcombe 2003).

Likely presence in study area: It is potentially an occasional summer visitor to the study area but is entirely aerial and largely independent of terrestrial habitats.

Potential impact of development: No impact on this species is anticipated.

Rainbow Bee-eater *Merops ornatus*

Status and Distribution: This species is listed as migratory under the *EPBC Act (1999)* and under international agreements to which Australia is a signatory. The Rainbow Bee-eater is a common summer migrant to southern Australia but in the north they are resident (Morcombe 2003).

Habitat: Open Country, of woodlands, open forest, semi arid scrub, grasslands, clearings in heavier forest, farmlands (Morcombe 2003). Breeds underground in areas of suitable soft soil firm enough to support tunnel building.

Likely presence in study area: Observed foraging and roosting onsite. Some areas suitable for breeding.

Potential impact of development: Despite the potential for breeding no significant impact on this species is anticipated as individuals onsite are unlikely to represent a substantial proportion of the population. It can be expected to continue to utilise the area, as it does now, despite any future development.

Chuditch *Dasyurus geoffroii*

Status and Distribution: Listed as Scheduled 1 under the *WC Act (1950)* and as Vulnerable under the *EPBC Act (1999).* Formerly occurred over nearly 70 per cent of Australia. The Chuditch now has a patchy distribution throughout the

Jarrah forest and mixed Karri/Marri/Jarrah forest of southwest Western Australia. Also occurs in very low numbers in the Midwest, Wheatbelt and South Coast Regions with records from Moora to the north, Yellowdine to the east and south to Hopetoun.

Habitat: Chuditch are known to have occupied a wide range of habitats from woodlands, dry sclerophyll (leafy) forests, riparian vegetation, beaches and deserts. Riparian vegetation appears to support higher densities of Chuditch, possibly because food supply is better or more reliable and better cover is offered by dense vegetation. Chuditch appear to utilise native vegetation along road sides in the wheatbelt (CALM 1994). The estimated home range of a male Chuditch is over 15 km^2 whilst that for females is 3-4 km^2 (Sorena and Soderquist 1995).

Likely presence in study area: Locally extinct. Habitat within the study area is not suitable for a population of this species to persist.

Potential impact of development: No impact on this species is anticipated.

Southern Brush-tailed Phascogale *Phascogale tapoatafa tapoatafa*

Status and Distribution: Listed as Scheduled 1 under the *WAWC Act (1950)*. Present distribution is believed to have been reduced to approximately 50 per cent of its former range. Now known from Perth and south to Albany, west of Albany Highway. Occurs at low densities in the northern Jarrah forest. Highest densities occur in the Perup/Kingston area, Collie River valley, and near Margaret River and Busselton (DEC information pamphlet). Records are less common from wetter forests.

Habitat: This subspecies has been observed in dry sclerophyll forests and open woodlands that contain hollow-bearing trees but a sparse ground cover. A nocturnal carnivore relying on tree hollows as nest sites. The home range for a female Brush-tailed Phascogale is estimated at between 20 and 70 ha, whilst that for males is given as twice that of females. In addition, they tend to utilise a large number (approximately 20) of different nest sites throughout their range (Soderquist, 1995).

Likely presence in study area: Better quality vegetation present to the west of the study area (Lot 200) maybe suitable, though the total area of the remnant would limit the long term viability of a population. Limited suitable habitat within the study area is marginal and would be unlikely to support a population of this species.

Potential impact of development: No impact on this species is anticipated.

Quenda *Isoodon obesulus fusciventer*

Status and Distribution: Listed as Priority 5 by DEC. Widely distributed in the south west from near Cervantes north of Perth to east of Esperance, patchy distribution through the Jarrah and Karri forest and on the Swan Coastal Plain, and inland as far as Hyden. Has been translocated to Julimar State Forest, Hills Forest Mundaring, Tutanning Nature Reserve, Boyagin Nature Reserve, Dongolocking Nature Reserve, Leschenault Conservation Park, and Karakamia and Paruna Sanctuaries (DEC information pamphlet) and Nambung National Park (DEC pers. coms.)

Habitat: Dense scrubby, often swampy, vegetation with dense cover up to one metre high, often feeds in adjacent forest and woodland that is burnt on a regular basis and in areas of pasture and cropland lying close to dense cover. Populations inhabiting Jarrah and Wandoo forests are usually associated with watercourses. Quendas can thrive in more open habitat subject to exotic predator control (DEC information pamphlet).

Likely presence in study area: There is very limited areas of suitable habitat for this species to persist within the study area (dense groundcover) and it is unlikely that a population could exist on site.

Potential impact of development: No impact on this species is anticipated.

Western Ringtail Possum *Pseudocheirus occidentalis*

Status and Distribution: Listed as Scheduled 1 under the *WAWC Act (1950)* and as Vulnerable under the *EPBC Act (1999).* Common in suitable habitat (de Tores 2008). The highest densities of this species are recorded in Peppermint habitat near Busselton area; relatively high densities are found in Jarrah/Marri forest at Perup (de Tores 2008).

The Western Ringtail Possum has a restricted distribution in south-western Western Australia. Most known populations (natural and translocated) are now restricted to near coastal areas of the south west from the Dawesville area to the Waychinicup National Park. Inland, it is also known to be relatively common in a small part of the lower Collie River valley, the Perup Nature Reserve and surrounding forest blocks near Manjimup. It was recently recorded in stands of Peppermint near the Harvey River and in Jarrah/Marri forest near Collie; however, the long term persistence of the species in these areas is not confirmed (de Tores et al. 2004). The Western Ringtail was formerly more widespread: in the 1970s it was known from Casuarina woodlands in the wheatbelt near Pingelly (south-east of Perth), and it is thought to have once occurred throughout much of

south-western Western Australia (but not necessarily continuously distributed) (Maxwell et al. 1996; de Tores 2008).

The species is widespread and relatively common in vegetated remnants within the Swan Coastal Plain and along the Whicher Scarp between Bunbury and Busselton (G. Harewood per. obs.). Most northern known natural population is centred on the Binningup townsite.

Habitat: The Western Ringtail Possum was once located in a variety of habitats including Coastal Peppermint, Coastal Peppermint-Tuart, Jarrah-Marri associations, Sheoak woodland, and eucalypt woodland and mallee. Coastal populations mostly inhabit Peppermint-Tuart associations with highest densities in habitats with dense, relatively lush vegetation. In these areas the main determinants of suitable habitat for WRPs appears to be the presence of *Agonis flexuosa* either as the dominant tree or as an understorey component of Eucalypt forest or woodland (Jones *et al*. 1994a). Inland, the largest known populations occur in the Upper Warren area east of Manjimup (Wayne *et al* 2005). In this area the peppermint tree is naturally absent and jarrah-marri associations constitute the species refuge and foraging habitat.

Likely presence in study area: Appears to be present in low numbers in some sections of the study area. Evidence observed (dreys and scats) is possibly the result of transient individuals temporality residing in the area as opposed to a viable resident population. Despite current population levels significant areas of remnant vegetation on site represents potential habitat that may be considered important for recovery of the species in the long term.

Potential impact of development: Potential for the loss of foraging, refuge and/or dispersal habitat. Significance of impact will depend on areas actually affected.

Quokka *Setonix brachyurus*

Status and Distribution: Listed as Scheduled 1 under the *WC Act* (1950) and as Vulnerable under the *EPBC Act* (1999). Rare and restricted in south west W.A. from south of Perth to Two Peoples Bay. The distribution of the Quokka includes Rottnest and Bald Islands, and at least 25 known sites on the mainland, including Two Peoples Bay Nature Reserve, Torndirrup National Park, Mt Manypeaks National Park, Walpole-Nornalup National Park, and various swamp areas through the south-west forests from Jarrahdale to Walpole.

Species or species habitat listed as likely to occur in general area within EPBC database search.

Habitat: Mainland populations of this species are currently restricted to densely vegetated coastal heaths, swamps, riverine habitats including tea-tree thickets on sandy soils along creek systems where they are less vulnerable to predation. The species is nocturnal

Likely presence in study area: No suitable habitat.

Potential impact of development: No impact on this species is anticipated.

Western Brush Wallaby *Macropus irma*

Status and Distribution: Listed as Priority 4 by DEC. The Western Brush Wallaby is distributed across the south-west of Western Australia from north of Kalbarri to Cape Arid (DEC information pamphlet).

Habitat: The species optimum habitat is open forest or woodland, particularly favouring open, seasonally wet flats with low grasses and open scrubby thickets. It is also found in some areas of mallee and heathland, and is uncommon in karri forest (DEC information pamphlet).

Likely presence in study area: Locally extinct. Remnants with the study area are two small and isolated to support a population or even transient individuals of this species.

Potential impact of development: No impact on this species is anticipated.

Western False Pipistrelle *Falsistrellus mackenziei*

Status and Distribution: Listed as Priority 4 by DEC. Listed as vulnerable by the ICUN. Confined to south west W.A. south of Perth and east to the wheat belt. Most records from Karri forests but also recorded in wetter stands of jarrah and tuart and woodlands on the Swan Coastal Plain (Menkhorst and Knight 2001). Range appears to be contracting southwards, presumably due to drying climate.

Habitat: This species of bat occurs in high forest and coastal woodlands. It roosts in small colonies in tree hollows and forages at canopy level and in the cathedral-like spaces between trees.

Likely presence in study area: Status in the area difficult to determine. May at least forage on site.

Potential impact of development: Potential for the loss of roosting habitat (hollow trees).

Water Rat *Hydromys chrysogaster*

Status and Distribution: Listed as Priority 4 by DEC. The water rat is widely distributed around Australia and its offshore islands, New Guinea and some adjacent islands. It occurs in fresh brackish water habitats in the south-west of Western Australia, but occurs in marine environments along the Pilbara coastline and offshore islands. Previous survey work in the south west suggested this species was relatively common and widespread though difficult to capture (Christensen *et al* 1985, How et al 1987).

Habitat: The water rat occupies habitat in the vicinity of permanent water, fresh, brackish or marine. Likely to occur in all major rivers and most of the larger streams as well as bodies of permanent water in the lower south west (Christensen *et al* 1985).

Likely presence in study area: This species is unlikely to persist onsite.

Potential impact of development: No impact on this species is anticipated.

Appendix F

Groundwater Levels and Quality Monitoring Report (TME 2012)

Town Planning Management Engineering

Groundwater Levels & Quality Monitoring Report

Lot 103 Harris Road & 96 Martin Pelusey Road, Picton East

Research, Design & Delivery of Sustainable Development

10334
March 2012

DOCUMENT QUALITY CONTROL

AUTHOR	DATE
Peter Jones	15.03.2012
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2	Revisions for Client	02.04.2012

TME Town Planning Management Engineering Pty Ltd

PO BOX 733, BUNBURY

PH: (08) 9791 4411

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EXECUTIVE SUMMARY

TME Town Planning Management Engineering Pty Ltd (TME) has prepared this report on behalf of Harris Road Pty Ltd for the proposed industrial development. The subject land consists of Lot 103 on Diagram 96575 Harris Road and Lot 603 on Plan 246179 (96) Martin Pelusey Road, Picton East (see *Figure 1*).

The subject land is located in an area that exhibits high groundwater levels, including Multiple Use wetlands. This necessitated the requirement for monitoring of the superficial groundwater level across the land as per advice provided by the Department of Water. The Department of Water also required monitoring of physical and chemical parameters of the groundwater on-site due to the risks involved with the industrial nature of the development, and the close proximity of the Ferguson River to the subject land.

TME monitored groundwater levels at 9 monitoring bore sites across the subject land with regular measurements between October 2010 and December 2011. Quarterly quality sampling was undertaken at all bores over a period of 14 months.

The rainfall from April to December 2011 was approximately within the 50th percentile or greater for the land. However May and July were lower, approximately 40th and 20th percentiles respectively. The total rainfall during this period was less than 10mm greater than the long term average total. This data suggest that 2011 was a representative year for the average rainfall at the subject land, which therefore suggests that the seasonal peak high groundwater levels measured would be close the average annual maximum groundwater level (AAMGL).

The quality sampling of the groundwater found that Total Nitrogen and Total Phosphorus levels on the subject land exceeded the ANZEEC and Department of Water Swan Coastal Plain trigger values. These results were however not unexpected given the past agricultural land uses. Iron and Aluminium also had high concentrations, however this is typical of the natural soils on the Swan Coastal Plain.

The subject land's high seasonal groundwater levels were modelled at less than 1 metre below the surface level across the majority of the subject land.

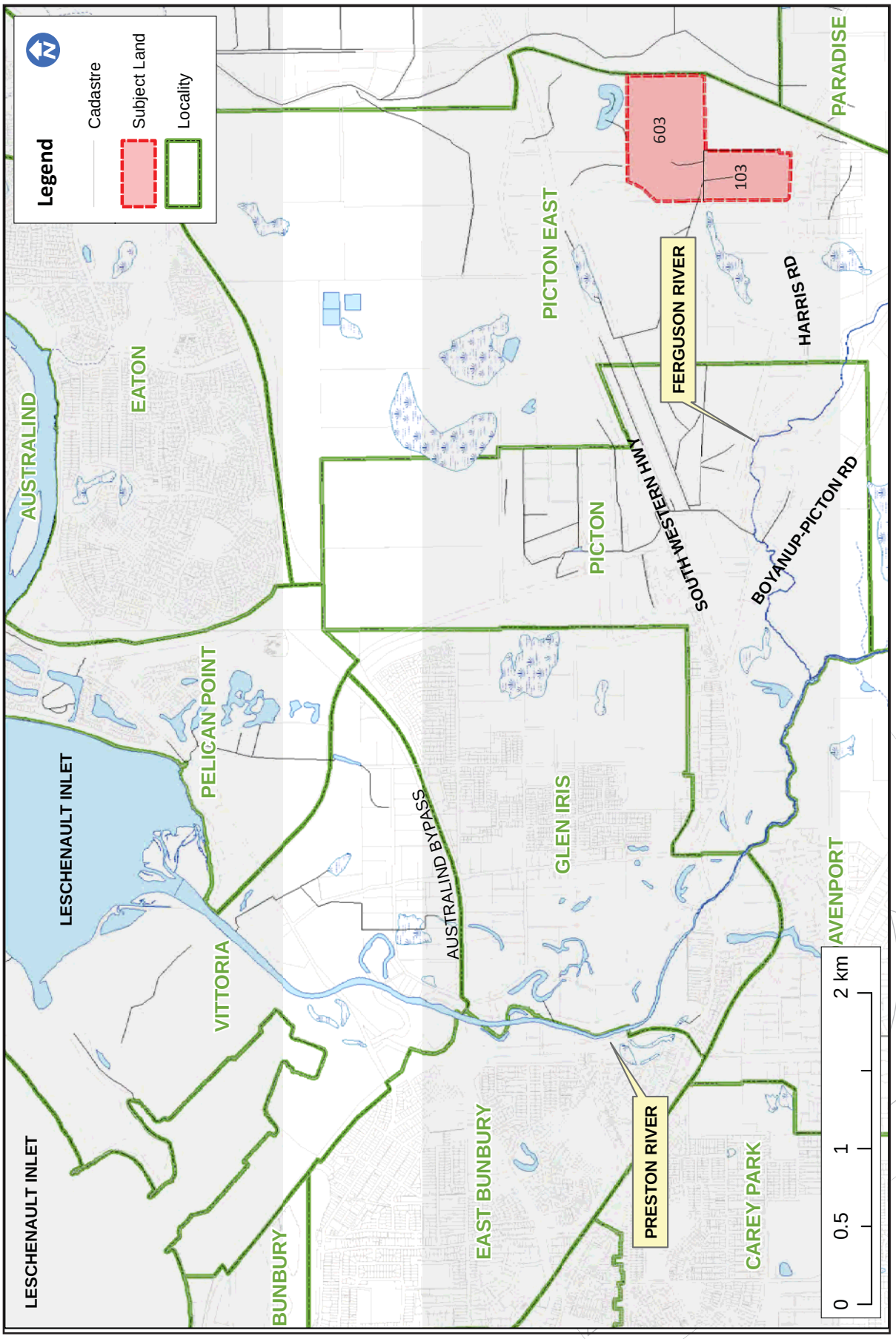

Figure 1 - Location Plan

METHODOLOGY

In September 2010 9 water table monitoring bores were installed on the subject land and TME verified their installation (see *Figure 2* for locations). Monitoring bores were constructed to an average depth of 3m below the natural surface level. PVC casing pipes with slots were placed within the holes and the bottom of the pipe was capped. The monitoring bores were finished with free draining sand backfill and a bentonite plug.

TME monitored groundwater levels from October 2010 to December 2011. A total of 12 measurements were taken for each monitoring bore site during this period of time. All measurements were undertaken on the same day for every monitoring bore.

To obtain the measurement of the groundwater's level, an electrical sounder groundwater probe was lowered into the pipe until it signalled that it had reached the water table. The depth was recorded, and in the office the pipe height above the surface level was subtracted from the recorded measurement to ascertain the depth to the groundwater from the ground's surface.

Groundwater quality samples were taken from each of monitoring bores on 4 separate occasions in October 2010, April, October and December 2011. Physical and chemical parameters of the groundwater were tested. The physical parameters were measured in the field, and samples were taken and submitted to ALS Laboratory Group (NATA Accredited) for chemical analysis.

The physical and chemical parameters sampled from each of the monitoring bores are listed below. The trigger values used for analysis are shown in *Appendix 2*.

Physical Parameters

- Temperature
- pH
- Conductivity
- Dissolved oxygen
- Oxidation reduction potential
- Salinity

Chemical Parameters

- Alkalinity
- Nitrate-N
- Nitrite-N
- Ammonia-N
- Total Kjeldahl Nitrogen (TKN)
- Total Nitrogen (TN)
- Total Phosphorus (TP)
- Reactive Phosphorus
- Metals (Aluminium, Arsenic, Cadmium, Chromium, Copper, Lead, Manganese, Zinc and Iron)

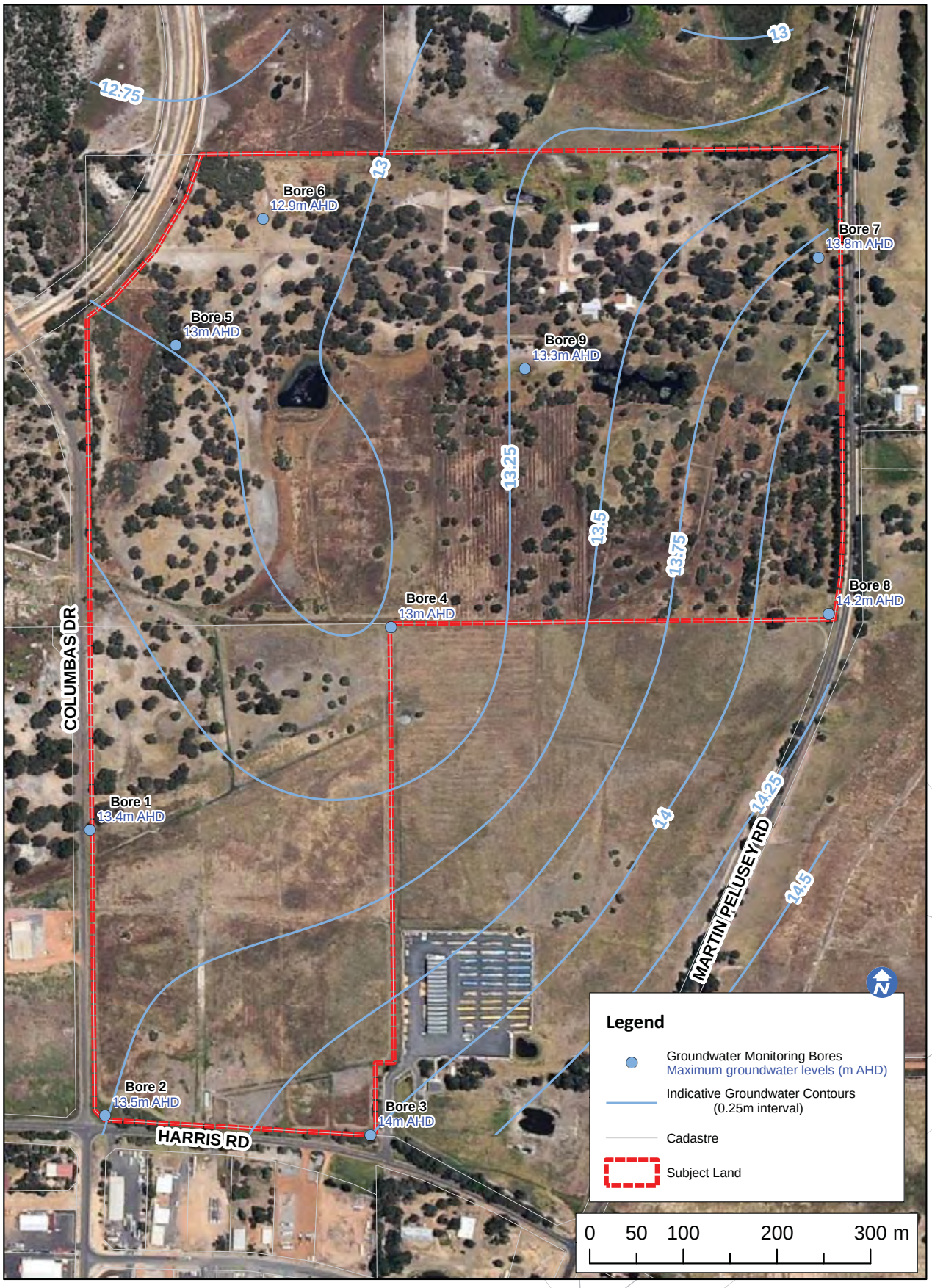

Figure 2 -Monitoring Program and Groundwater Contour Plan

RESULTS

LEVELS

The general trend observed in the groundwater records across all bores was an increase in depths to groundwater (i.e. a lower groundwater table) between September and April or May, and a decrease in depths to groundwater (i.e. a rising groundwater table) between April or May and September (see *Figure 3*).

The following table (*Table 1*) summarises the highest seasonal groundwater levels (HSGL) and lowest seasonal groundwater levels (LSGL) recorded and the months when recorded, also the seasonal range of groundwater levels is included. All records within this report's tables are relative to the distance (in millimetres) of the water below the natural surface level measured at each monitoring bore.

For full details of recordings for each monitoring bore site please refer to *Appendix 1*.

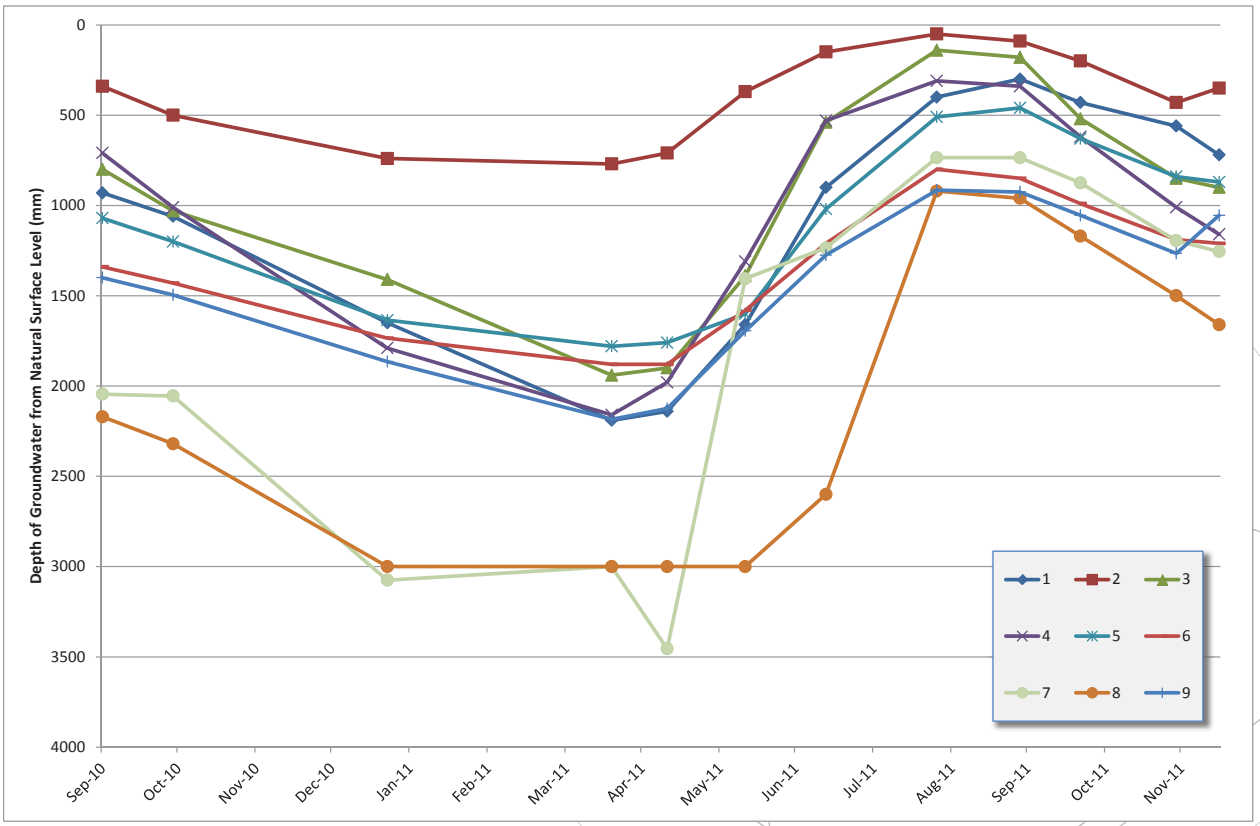

Figure 3 - Groundwater Hydrograph

Monitoring Bore No.	HSGL (mm)	Date(s) Recorded	LSGL (mm)	Date(s) Recorded	Range (mm)
1	300	Sep-11	2190	Apr-11	1890
2	50	Aug-11	770	Apr-11	720
3	140	Aug-11	1940	Apr-11	1800
4	310	Aug-11	2160	Apr-11	1850
5	460	Sep-11	1780	Apr-11	1320
6	80	Aug-11	1880	Apr to May-11	1080
7	735	Aug to Sep-11	DRY (>3000)	Apr-11	>2265
8	920	Aug-11	DRY (>3000)	Jan to Jun-11	>2080
9	915	Aug-11	2185	Apr-11	1270

Table 1 - Summary of Groundwater Levels Monitoring Results

The '>' recordings for the monitoring bores were made when no water was present within the bore's pipe when monitored. This meant that at the time of measurement, the groundwater level was lower than the base of the bore.

PHYSICAL PARAMETERS

The physical parameter results for the four sample runs for each monitoring bore are shown in *Appendix 3*. The sample records were compared to the Australian Drinking Water Guidelines (ADWG) and ANZEEC Guidelines for south Western Australia.

The pH across the site was generally low (slightly acidic) with pH results predominantly between 5.01 and 6.71, which is generally below the ANZEEC trigger value for surface waters in wetlands (7.0) and for the ADWG (aesthetic only) range of 6.5 to 8.

The dissolved oxygen saturated percentages were significantly less than the minimum value of 85%. These values however are based on surface water values, and are not an accurate in comparison to groundwater values, as there is minimal interaction to the atmosphere to oxygenate the water.

CHEMICAL PARAMETERS

Total Nitrogen (TN)

Each bore had at least one sample that exceeded the Swan Coastal Plain target value of 1.0mg/L. The concentrations ranged from 0.4 to 29.8mg/L. The majority of the nitrogen is comprised of Total Kjeldahl Nitrogen (TKN). Results are shown in *Table 2*.

Monitoring Bore	Total Nitrogen (mg/L)			
	26/10/2010	18/04/2011	21/10/2011	15/12/2011
1	0.6	1.2	8.0	4.8
2	5.0	4.4	2.4	3.0
3	6.8	4.5	3.9	2.5
4	0.8	0.4	4.2	1.3
5	6.5	1.5	3.0	1.6
6	6.3	9.2	1.4	4.9
7	1.6		7.4	3.0
8	2.2		7.2	3.3
9	4.3	29.8	11.0	3.9

Table 2 – Total Nitrogen Sample Results.

The yellow cell indicates that the value exceeds the Swan Coastal Plain trigger value (1.0mg/L), green cell indicates that the value exceeds the ANZEEC wetland river trigger value (1.5mg/L), and orange cell indicated the value exceeds the ANZEEC long-term irrigation trigger value (5.0mg/L).

Total Phosphorus (TP)

The sample results exceeded the Swan Coastal Plain target value of 0.1 mg/L for all runs at all bores, except for Bore 4's sample in April 2011. The TP ranged from 0.03 to 2.52mg/L. The results are shown in *Table 3*.

Monitoring Bore	Total Phosphorous (mg/L)			
	26/10/2010	18/04/2011	21/10/2011	15/12/2011
1	0.07	0.13	0.58	0.31
2	0.29	0.19	0.14	0.31
3	0.54	0.43	0.24	0.26
4	0.24	0.03	0.42	0.14
5	0.34	0.19	0.16	0.14
6	1.69	0.79	2.00	4.60
7	0.31		0.56	0.24
8	0.52		1.06	0.55
9	0.30	2.52	1.79	0.70

Table 3 – Total Phosphorus Sample Results.

The green cell indicates that the value exceeds the ANZEEC wetland river trigger value (0.06mg/L), and the yellow cell indicates that the value exceeds the Swan Coastal Plain trigger value (0.1mg/L).

Total Metals

From the results two metals are of note. Aluminium (Al) and Iron (Fe) regularly exceeded all trigger values (including short and long term irrigation). The maximum Aluminium recorded was at Bore 6, with a result of 146.0mg/L. This exceeds the short-term irrigation trigger value by 126mg/L. The lowest Aluminium record was 2.15mg/L at Bore 5, which is lower than the short-term (20mg/L) and long-term (5mg/L) irrigation trigger values

The other metal of note was Iron, with results regularly exceeding the short-term irrigation trigger value of 10mg/L. Bore 6 also recorded the highest Iron sample (146mg/L) in the same sampling period (18th April 2011), which is 136mg/L higher than the short-term irrigation trigger value. The lowest Iron record was 3.47mg/L at Bore 6 (6 months after recording the highest Iron value for the whole land).

The full results from the metal samples and remaining quality parameters tested are shown in *Appendix 4*.

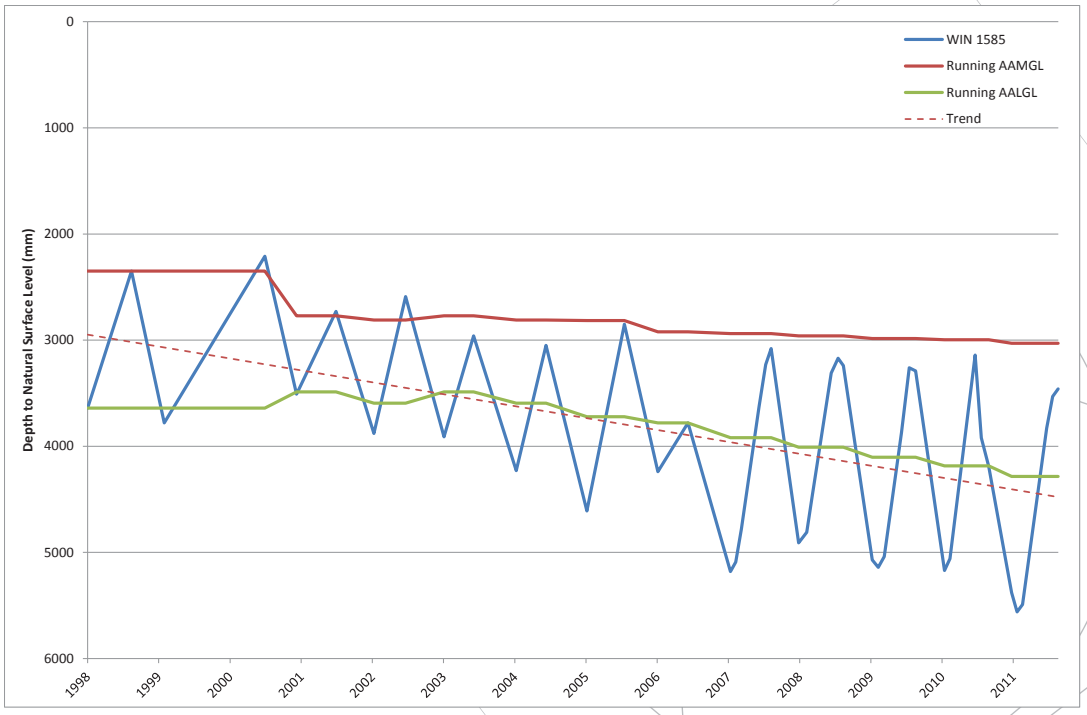

Figure 4 - DoW Bore (WIN 1585) Hydrograph

DISCUSSION

COMPARISON TO DEPARTMENT OF WATER MONITORING BORES

To ascertain the long-term water table patterns for the subject land a query of all the Department of Water (DoW) shallow groundwater monitoring bores within a 3km radius of the subject land was undertaken

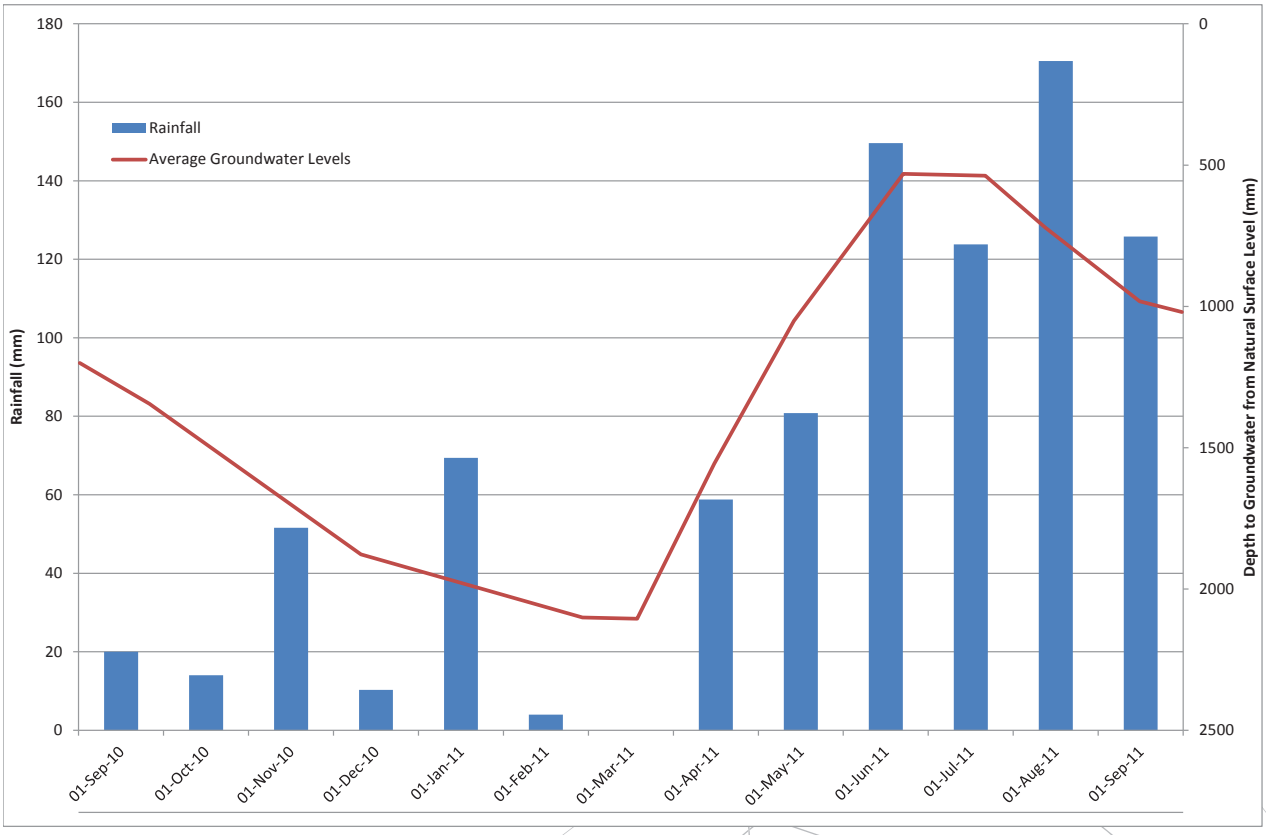

Figure 5 - Rainfall Hydrograph

by DoW on TME's behalf. Only one monitoring bores was determined to provide information considered marginally useful to compare with the subject land.

The monitoring bore shows a falling trend in the groundwater table since the commencement of records in 1998 (see *Figure 4*). The AAMGL at bore (WIN ID) 1585 has fallen over 650mm since 1998, and the 2011 highest peak level was 800mm deeper than the AAMGL in 2011. The AAMGL and average annual lowest groundwater level (AALGL) have steadily deepened since 1998.

The on-site drainage of surface water on the subject land, and the presence of groundwater at the surface across the majority suggest that comparisons with the DoW bore are not that useful. The DoW bore's AAMGL is around 3000mm below the natural ground surface, whilst the deepest seasonal high peak on the subject land was less than 1000mm below the natural surface. The majority of the bores were within 100mm of the surface. This suggests the DoW bore does not have a similar on-site drainage infrastructure or ponding of groundwater on the land as is evident at the subject land. The general trends observed in the DoW bore are the only real useful information available for comparison to the subject land.

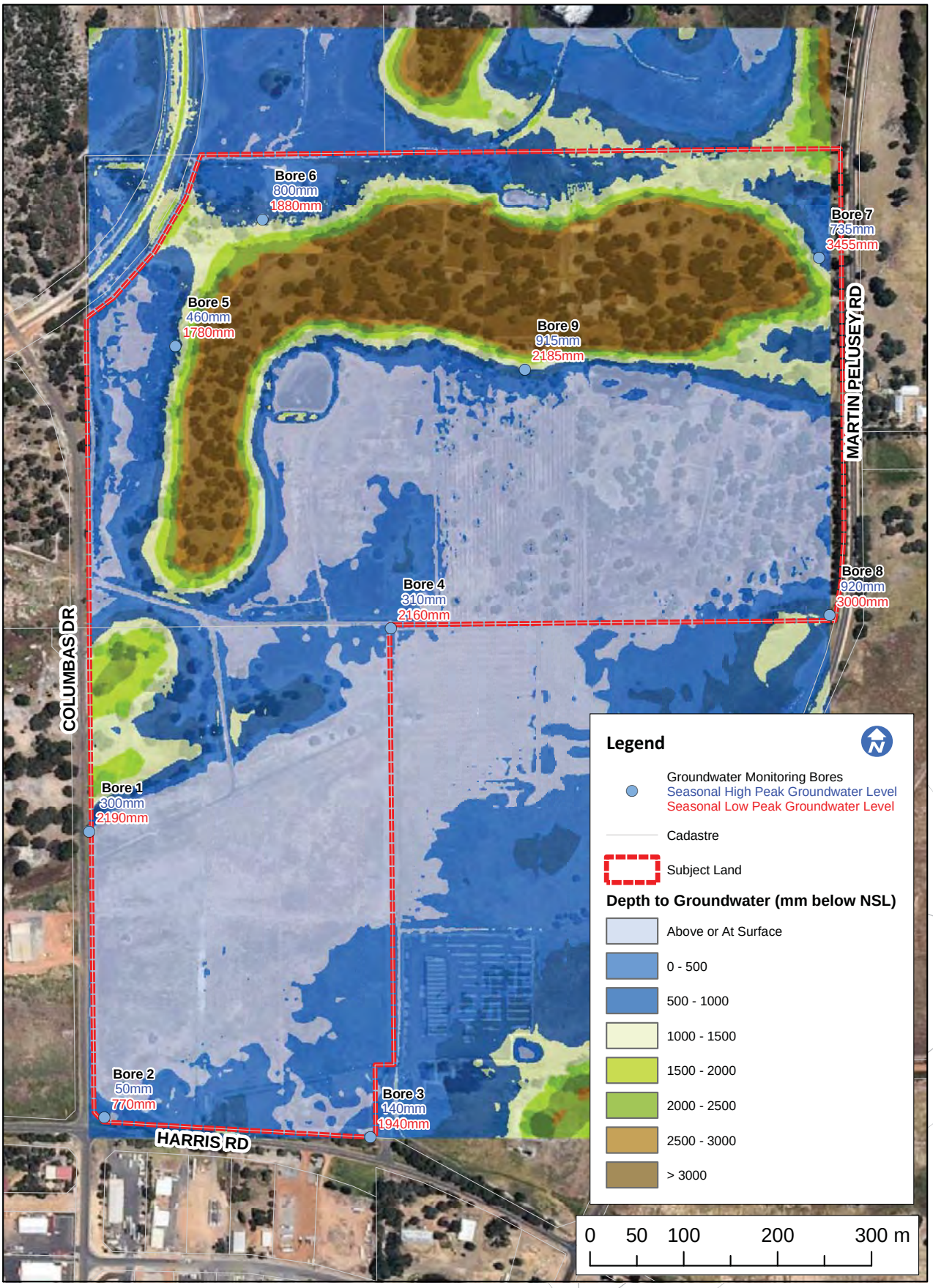

Figure 6 - Depth to Groundwater

COMPARISON TO RAINFALL PATTERNS

The graph in *Figure 5* visually depicts a relationship between rainfall events and the water table level. The groundwater levels rose closer to the surface as rainfall increased. This implies that rainfall may directly recharge the shallow groundwater table at the site, and that there is little influence on the shallow water table from flows outside of the site.

DEPTH TO AVERAGE ANNUAL MAXIMUM GROUNDWATER LEVELS (AAMGL)

The depth to the AAMGL across the subject land has been modelled in *Figure 6*. The depth to AAMGL for each bore was derived from modelling the groundwater contours for the site, and then subtracting the natural surface levels from these contours. There was no adjustment of the seasonal high peaks against the DoW bore because of the issues discussed in the last paragraph of the DoW comparison section, i.e. direct comparisons of the subject land and DoW bore were unrepresentative.

Figure 8 shows that the groundwater depth is very shallow (less than 1m below natural surface level) for the majority of the subject land (shades of blue). It would be expected that groundwater levels may be shallower than modelled for the maximum groundwater levels (MGL). The ridge in the north is clearly visible in the model by the dark brown shading. This represents areas where the groundwater is greater than 3m below the natural surface level.

QUALITY

The high values of TN and TP within the groundwater were not unexpected given the past land use and presence of wetlands on the subject land. Sources of TN would include plant decay, animal wastes (especially from previous livestock grazing) and the use of fertilisers. The TP sources would primarily be from the agricultural practices on the land. Phosphorus and nitrogen in high concentrations (as recorded on the subject land) indicate the potential for algal growth and blooms in receiving water bodies, including the surrounding wetlands. The removal of stock and reduction of fertilisers on the land could assist in reducing TN and TP concentrations.

The sands on the Swan Coastal Plain are coated with both iron and aluminium oxides, and are the reason for the high concentrations of Aluminium and Iron recorded on the site. The high Iron and Aluminium concentrations in the groundwater may also suggest that these metals are coating the sand grains, which may increase the sands capacity to retain phosphorus. The Iron and Aluminium concentrations at each bore did at one stage exceed the guidelines for short and long term irrigation uses.

CONCLUSION

The results of this monitoring program should be utilised in any future studies and/or designs that require site specific information regarding groundwater levels (especially seasonal highs) and quality data. The results from 2011 provide a representative seasonal high level to model an maximum groundwater level for the subject land, which can be used for detailed designs.

APPENDICES

Appendix 1 - Field Sheet Level Measurements
Appendix 2 - Trigger Values for Water Quality
Appendix 3 - Quality (Physical Parameters) Results
Appendix 4 - Complete Quality Results
Appendix 5 - Enclosed CD
Certificate of Analysis
Raw Results

APPENDIX 1

Field Sheet Level Measurements

TME Groundwater Monitoring Program - Field Sheets

Project Name: Harris Road Groundwater Monitoring
Client: Harris Road Pty Ltd
Job No: 10334

Bore Number: **1**
Eastings: 381439.00 *Northings:* 6308872.00
Height of TOC above Surface Level (mm): 480

Date	Depth to Water (mm)	Groundwater Level (mm)	Comments
28/09/2010	1410	930	
26/10/2010	1540	1060	
19/01/2011	2130	1650	
18/04/2011	2670	2190	
10/05/2011	2620	2140	
10/06/2011	2140	1660	
12/07/2011	1380	900	
25/08/2011	880	400	
27/09/2011	780	300	
21/10/2011	910	430	
28/11/2011	1040	560	
15/12/2011	1200	720	

Bore Number: **2**
Eastings: 381455.00 *Northings:* 6308567.00
Height of TOC above Surface Level (mm): 530

Date	Depth to Water (mm)	Groundwater Level (mm)	Comments
28/09/2010	870	340	
26/10/2010	1030	500	
19/01/2011	1270	740	
18/04/2011	1300	770	
10/05/2011	1240	710	
10/06/2011	900	370	
12/07/2011	680	150	
25/08/2011	580	50	
27/09/2011	620	90	
21/10/2011	730	200	
28/11/2011	960	430	
15/12/2011	880	350	

Project Name: Harris Road Groundwater Monitoring
Client: Harris Road Pty Ltd
Job No: 10334

Bore Number: **3**
Eastings: 381739.00 *Northings:* 6308546.00
Height of TOC above Surface Level (mm): 440

Date	Depth to Water (mm)	Groundwater Level (mm)	Comments
28/09/2010	1240	800	
26/10/2010	1470	1030	
19/01/2011	1850	1410	
18/04/2011	2380	1940	
10/05/2011	2340	1900	
10/06/2011	1830	1390	
12/07/2011	980	540	
25/08/2011	580	140	
27/09/2011	620	180	
21/10/2011	960	520	
28/11/2011	1290	850	
15/12/2011	1340	900	

Bore Number: **4**
Eastings: 381761.00 *Northings:* 6309089.00
Height of TOC above Surface Level (mm): 450

Date	Depth to Water (mm)	Groundwater Level (mm)	Comments
28/09/2010	1160	710	
26/10/2010	1460	1010	
19/01/2011	2240	1790	
18/04/2011	2610	2160	
10/05/2011	2430	1980	
10/06/2011	1760	1310	
12/07/2011	980	530	
25/08/2011	760	310	
27/09/2011	790	340	
21/10/2011	1070	620	
28/11/2011	1460	1010	
15/12/2011	1610	1160	

Project Name: Harris Road Groundwater Monitoring
Client: Harris Road Pty Ltd
Job No: 10334

Bore Number: **5**
Eastings: 381531.00 *Northings:* 6309390.00
Height of TOC above Surface Level (mm): 460

Date	Depth to Water (mm)	Groundwater Level (mm)	Comments
28/09/2010	1530	1070	
26/10/2010	1660	1200	
19/01/2011	2095	1635	
18/04/2011	2240	1780	
10/05/2011	2220	1760	
10/06/2011	2060	1600	
12/07/2011	1480	1020	
25/08/2011	970	510	
27/09/2011	920	460	
21/10/2011	1090	630	
28/11/2011	1300	840	
15/12/2011	1330	870	

Bore Number: **6**
Eastings: 381624.00 *Northings:* 6309525.00
Height of TOC above Surface Level (mm): 480

Date	Depth to Water (mm)	Groundwater Level (mm)	Comments
28/09/2010	1820	1340	
26/10/2010	1910	1430	
19/01/2011	2215	1735	
18/04/2011	2360	1880	
10/05/2011	2360	1880	
10/06/2011	2060	1580	
12/07/2011	1690	1210	
25/08/2011	1280	800	
27/09/2011	1330	850	
21/10/2011	1470	990	
28/11/2011	1670	1190	
15/12/2011	1690	1210	

Project Name: Harris Road Groundwater Monitoring
Client: Harris Road Pty Ltd
Job No: 10334

Bore Number: **7**
Eastings: 382218.00 *Northings:* 6309484.00
Height of TOC above Surface Level (mm): 495

Date	Depth to Water (mm)	Groundwater Level (mm)	Comments
28/09/2010	2540	2045	
26/10/2010	2550	2055	
19/01/2011	3570	3075	
18/04/2011	NA	DRY	No water encountered
10/05/2011	3950	3455	
10/06/2011	1900	1405	
12/07/2011	1730	1235	
25/08/2011	1230	735	
27/09/2011	1230	735	
21/10/2011	1370	875	
28/11/2011	1690	1195	
15/12/2011	1750	1255	

Bore Number: **8**
Eastings: 382229.00 *Northings:* 6309103.00
Height of TOC above Surface Level (mm): 520

Date	Depth to Water (mm)	Groundwater Level (mm)	Comments
28/09/2010	2690	2170	
26/10/2010	2840	2320	
19/01/2011	NA	DRY	No water encountered
18/04/2011	NA	DRY	No water encountered
10/05/2011	NA	DRY	No water encountered
10/06/2011	NA	DRY	No water encountered
12/07/2011	3120	2600	
25/08/2011	1440	920	
27/09/2011	1480	960	
21/10/2011	1690	1170	
28/11/2011	2020	1500	
15/12/2011	2180	1660	

Project Name: Harris Road Groundwater Monitoring
Client: Harris Road Pty Ltd
Job No: 10334

Bore Number: **9**
Eastings: 381904.00 *Northings:* 6309365.00
Height of TOC above Surface Level (mm): 525

Date	Depth to Water (mm)	Groundwater Level (mm)	Comments
28/09/2010	1925	1400	
26/10/2010	2020	1495	
19/01/2011	2390	1865	
18/04/2011	2710	2185	
10/05/2011	2650	2125	
10/06/2011	2220	1695	
12/07/2011	1800	1275	
25/08/2011	1440	915	
27/09/2011	1450	925	
21/10/2011	1580	1055	
28/11/2011	1790	1265	
15/12/2011	1580	1055	

APPENDIX 2

Trigger Values for Water Quality

	ADWG (2004)		ANZEEC (2000)	DoH (2006)	Swan Coastal Plain	ANZEEC (2000)	
	Health	Aesthetic	Wetland	Non-Pot Gwater Use	WQIP	Long Term Irrigation	Short Term Irrigation
TP	-	-	0.06	-	0.1	-	-
FRP	-	-	0.03	-	-	-	-
TN	-	-	1.5	-	1	5	-
NO_x	-	-	0.1	-	-	-	-
Amonia (NH_3)	-	*0.5*	0.9	5	-	-	-
Nitrate	50	-	0.7	500	-	-	-
Nitrite	3	-	-	30	-	-	-
Ammonium (NH_4)	-	-	0.04	5	-	-	-
DO% (Sat)	-	*85*	90 120	-	-	-	-
pH	-	*6.5 8*	7 8.5	-	-	6 8.5	-
SPC (mS/cm)	-	-	0.3 1.5	-	-	-	-
Sulfate (SO_4)	500	*250*	-	5000	-	-	-
Chloride	-	*250*	-	2500	-	-	-
Aluminium	-	*0.2*	0.055	2	-	5	20
Arsenic	0.007	-	0.024	0.07	-	0.1	2
Cadmium	0.002	-	0.00002	0.02	-	0.01	0.05
Chromium	0.05	-	-	0.5	-	0.1	1
Copper	2	*1*	0.0014	20	-	0.2	5
Iron	-	*0.3*	-	3	-	0.2	10
Lead	0.001	-	0.0014	0.1	-	2	5
Manganese	0.5	*0.1*	1.9	5	-	0.2	10
Mercury (total)	0.001	-	0.0006	0.01	-	0.002	0.002
Nickel	0.02	-	0.011	0.2	-	0.2	2
Selenium (total)	0.01	-	0.011	0.1	-	0.02	0.05
Zinc	-	*3*	0.008	30	-	2	5

APPENDIX 3

Quality (Physical Parameters) Results

	Bore 1				Bore 2				Bore 3			
	26/10/2010	18/04/2011	21/10/2011	15/12/2011	26/10/2010	18/04/2011	21/10/2011	15/12/2011	26/10/2010	18/04/2011	21/10/2011	15/12/2011
Temperature *(˚C)*	16.5	21.2	17.2	18.1	17.8	23.2	17.1	19.0	17.7	22.0	17.5	18.3
Conductivity SPC *(mS/cm)*	2.3140	2.0100	0.4200	2.1200	0.4221	0.4220	0.6700	1.5920	1.6290	3.0800	2.4000	3.3380
Dissolved Oxygen *(ppm)*	1.38	0.03	0.28	0.13	2.06	0.05	0.01	0.00	2.08	0.09	0.00	0.02
pH *(scale)*	6.07	5.86	5.42	5.94	6.71	6.41	6.30	5.90	6.64	6.00	6.22	6.24
Salinity *(ppt)*		1.11	0.20	1.09		0.21	0.33	0.81		1.71	1.24	1.76
Diss. Oxygen % *(Saturated)*	14.5	0.4	3.0	1.3	21.3	0.6	0.1	0.0	21.2	1.0	-0.2	0.2
ORP *(mV)*	24.8	-74.7	57.2	-186.5	-25.2	-156.6	-100.0	-150.5	103.2	58.0	54.0	-104.2

Table A

The green fill shown in the tables denotes the variable was outside of the ANZEEC trigger value ranges for a wetland. However both these trigger values are based on surface water in wetlands and not groundwater in particular. The light green fill denotes the variable was less than the ADWG (aesthetic only) trigger value.

	Bore 4				Bore 5				Bore 6			
	26/10/2010	18/04/2011	21/10/2011	15/12/2011	26/10/2010	18/04/2011	21/10/2011	15/12/2011	26/10/2010	18/04/2011	21/10/2011	15/12/2011
Temperature *(˚C)*	18.0	23.1	18.2	19.4	16.7	19.8	16.9	18.6	18.4	24.2	18.1	19.3
Conductivity SPC *(mS/cm)*	2.9020	1.7500	2.2200	2.5260	0.5210	0.5600	0.5700	0.6300	0.7040	0.9600	0.4200	0.9070
Dissolved Oxygen *(ppm)*	2.48	0.19	0.03	0.15	1.37	0.07	0.02	0.01	1.43	0.01	0.00	0.00
pH *(scale)*	6.52	6.03	6.46	6.00	6.17	5.95	5.88	5.78	6.52	6.18	5.31	6.18
Salinity *(ppt)*		0.92	1.14	1.31		0.30	0.29	0.31		0.49	0.20	0.45
Diss. Oxygen % *(Saturated)*	26.3	2.2	0.3	1.6	13.5	0.9	0.4	0.1	16.2	0.2	-0.4	0.0
ORP **(***mV)*	125.5	-119.1	43.8	0.9	14.2	-141.4	-25.5	-96.6	22.2	-209.7	84.7	-124.0

Table B

	Bore 7				Bore 8				Bore 9			
	26/10/2010	18/04/2011	21/10/2011	15/12/2011	26/10/2010	18/04/2011	21/10/2011	15/12/2011	26/10/2010	18/04/2011	21/10/2011	15/12/2011
Temperature *(˚C)*	17.1		18.0	18.6	18.1		18.1	19.0	17.5	20.8	17.7	18.3
Conductivity SPC *(mS/cm)*	1.5690		5.0200	1.2100	3.1210		0.1700	0.2420	1.0140	1.9000	1.2500	1.1270
Dissolved Oxygen *(ppm)*	2.60		0.08	0.12	1.60		2.24	0.42	3.34	0.68	0.09	0.01
pH *(scale)*	5.82		5.56	6.32	5.87		5.46	5.01	6.32	5.16	5.04	5.43
Salinity *(ppt)*			0.24	0.60			0.08	0.12		1.06	0.63	0.56
Diss. Oxygen % *(Saturated)*	28.0		0.9	1.3	16.2		23.8	4.3	35.1	7.7	1.0	0.1
ORP *(mV)*	148.7		55.2	-187.2	60.5		79.9	-2.1	72.7	127.3	99.6	-14.5

Table C

APPENDIX 4

Complete Quality Results

	Bore 1				Bore 2				Bore 3			
	26/10/2010	18/04/2011	21/10/2011	15/12/2011	26/10/2010	18/04/2011	21/10/2011	15/12/2011	26/10/2010	18/04/2011	21/10/2011	15/12/2011
OH^- Alkalinity *(mg/L, LOR = 1)*	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
CO_3^{2-} Alkalinity *(mg/L, LOR = 1)*	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
HCO_3^- Alkalinity *(mg/L, LOR = 1)*	34	13	7	7	87	66	151	71	151	96	<1	163
Total Alkalinity *(mg/L, LOR = 1)*	34	13	7	7	87	66	151	71	151	96	<1	163
Aluminium *(mg/L, LOR = 0.01)*	2.20	5.71	21.90	10.40	25.60	23.80	5.09	9.77	29.20	42.00	22.10	27.80
Arsenic *(mg/L, LOR = 0.001)*	<0.001	<0.001	0.001	0.001	<0.001	0.002	0.001	0.002	<0.001	0.002	0.001	<0.001
Cadmium *(mg/L, LOR = 0.0001)*	<0.0001	0.0001	0.0002	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium *(mg/L, LOR = 0.001)*	0.003	0.01	0.021	0.015	0.049	0.01	0.008	0.018	0.049	0.06	0.037	0.042
Copper *(mg/L, LOR = 0.001)*	0.008	0.033	0.042	0.038	0.056	0.060	0.009	0.019	0.026	0.037	0.022	0.025
Lead *(mg/L, LOR = 0.001)*	0.002	0.012	0.036	0.012	0.050	0.057	0.008	0.018	0.018	0.026	0.019	0.019
Manganese *(mg/L, LOR = 0.001)*	0.074	0.029	0.043	0.023	0.057	0.036	0.252	0.050	*0.132*	0.268	0.087	*0.176*
Zinc *(mg/L, LOR = 0.005)*	0.030	0.081	0.096	0.062	0.030	0.050	0.025	0.023	0.050	0.041	0.021	0.050
Iron *(mg/L, LOR = 0.05)*	6.92	6.48	19.50	8.43	43.60	42.40	15.40	20.50	16.90	20.80	14.00	15.00
Ammonia *(mg/L, LOR = 0.01)*	0.22	0.11	0.04	<0.05	1.07	2.13	0.42	1.12	0.01	0.04	0.07	<0.05
Nitrite *(mg/L, LOR = 0.01)*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	<0.01
Nitrate *(mg/L, LOR = 0.01)*	<0.01	<0.01	<0.01	0.04	0.01	0.01	<0.01	0.04	0.59	0.02	0.42	0.02
NO_x *(mg/L, LOR = 0.01)*	<0.01	<0.01	<0.01	0.04	0.01	0.01	<0.01	0.04	0.59	0.02	0.47	0.02
TKN *(mg/L, LOR = 0.1)*	0.6	1.2	8.0	4.8	5.0	4.4	2.4	3.0	6.2	4.5	3.4	2.5
Total Nitrogen *(mg/L, LOR = 0.1)*	0.6	1.2	8.0	4.8	5.0	4.4	2.4	3.0	6.8	4.5	3.9	2.5
Reactive P *(mg/L, LOR = 0.01)*	<0.01	<0.01	0.02	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01
Total P *(mg/L, LOR = 0.01)*	0.07	0.13	0.58	0.31	0.29	0.19	0.14	0.31	0.54	0.43	0.24	0.26

Table D

Refer to Quality Trigger Values Key

ADWG (2004)		ANZEEC (2000)	DoH (2006)	Swan Coastal Plain	ANZEEC (2000)	
Health	Aesthetic	Wetland	Non-Pot Gwater Use	WQIP	Long Term Irrigation	Short Term Irrigation

	Bore 4				Bore 5				Bore 6			
	26/10/2010	18/04/2011	21/10/2011	15/12/2011	26/10/2010	18/04/2011	21/10/2011	15/12/2011	26/10/2010	18/04/2011	21/10/2011	15/12/2011
OH^- Alkalinity *(mg/L, LOR = 1)*	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
CO_3^{2-} Alkalinity *(mg/L, LOR = 1)*	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
HCO_3^- Alkalinity *(mg/L, LOR = 1)*	60	61	85	68	31	37	<1	38	5	38	<1	39
Total Alkalinity *(mg/L, LOR = 1)*	60	61	85	68	31	37	<1	38	5	38	<1	39
Aluminium *(mg/L, LOR = 0.01)*	4.56	8.80	16.50	11.80	15.50	11.50	2.15	3.28	20.00	146.00	2.84	30.40
Arsenic *(mg/L, LOR = 0.001)*	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	<0.001	0.001	<0.001	0.066	0.002	0.031
Cadmium *(mg/L, LOR = 0.0001)*	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0010	<0.0001	<0.0001
Chromium *(mg/L, LOR = 0.001)*	0.013	0.02	0.032	0.024	0.017	0.01	0.002	0.003	0.017	0.09	0.002	0.023
Copper *(mg/L, LOR = 0.001)*	0.014	0.025	0.071	0.055	0.034	0.036	0.010	0.007	0.042	0.104	0.005	0.029
Lead *(mg/L, LOR = 0.001)*	0.007	0.011	0.022	0.012	0.029	0.024	0.007	0.006	0.022	0.120	0.003	0.021
Manganese *(mg/L, LOR = 0.001)*	0.086	0.043	*0.119*	0.041	0.094	0.055	0.063	0.061	0.047	0.088	0.031	0.044
Zinc *(mg/L, LOR = 0.005)*	0.028	0.051	0.067	0.038	0.049	0.044	0.016	0.012	0.058	<0.052	0.018	0.033
Iron *(mg/L, LOR = 0.05)*	10.90	17.30	23.60	19.40	25.70	17.40	30.50	37.80	21.60	114.00	3.47	31.20
Ammonia *(mg/L, LOR = 0.01)*	0.03	0.03	0.06	<0.05	0.21	0.23	0.07	0.06	0.11	0.25	0.05	0.11
Nitrite *(mg/L, LOR = 0.01)*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Nitrate *(mg/L, LOR = 0.01)*	0.17	0.03	<0.01	0.08	0.05	<0.01	<0.01	0.06	2.76	0.01	0.24	0.68
NO_x *(mg/L, LOR = 0.01)*	0.17	0.03	<0.01	0.08	0.05	<0.01	<0.01	0.06	2.77	0.01	0.24	0.68
TKN *(mg/L, LOR = 0.1)*	0.6	0.4	4.2	1.2	6.4	1.5	3.0	1.5	3.5	9.2	1.2	4.2
Total Nitrogen *(mg/L, LOR = 0.1)*	0.8	0.4	4.2	1.3	6.5	1.5	3.0	1.6	6.3	9.2	1.4	4.9
Reactive P *(mg/L, LOR = 0.01)*	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	1.64	0.05
Total P *(mg/L, LOR = 0.01)*	0.24	0.03	0.42	0.14	0.34	0.19	0.16	0.14	1.69	0.79	2.00	4.60

Table E

	Bore 7				Bore 8				Bore 9			
	26/10/2010	18/04/2011	21/10/2011	15/12/2011	26/10/2010	18/04/2011	21/10/2011	15/12/2011	26/10/2010	18/04/2011	21/10/2011	15/12/2011
OH^- Alkalinity *(mg/L, LOR = 1)*	<1		<1	<1	<1		<1	<1	<1	<1	<1	<1
CO_3^{2-} Alkalinity *(mg/L, LOR = 1)*	<1		<1	<1	<1		<1	<1	<1	<1	<1	<1
HCO_3^- Alkalinity *(mg/L, LOR = 1)*	12		28	33	59		<1	10	55	<1	<1	21
Total Alkalinity *(mg/L, LOR = 1)*	12		28	33	59		<1	10	55	<1	<1	21
Aluminium *(mg/L, LOR = 0.01)*	23.80		15.00	11.70	8.30		28.20	20.30	11.60	31.80	23.30	20.20
Arsenic *(mg/L, LOR = 0.001)*	<0.001		0.001	<0.001	<0.001		0.001	<0.001	<0.001	0.011	0.002	0.002
Cadmium *(mg/L, LOR = 0.0001)*	<0.0001		0.0001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001
Chromium *(mg/L, LOR = 0.001)*	0.041		0.018	0.018	0.019		0.052	0.040	0.018	0.06	0.022	0.021
Copper *(mg/L, LOR = 0.001)*	0.073		0.053	0.041	0.031		0.151	0.069	0.056	0.125	0.084	0.051
Lead *(mg/L, LOR = 0.001)*	0.022		0.029	0.012	0.010		0.068	0.035	0.019	0.073	0.025	0.014
Manganese *(mg/L, LOR = 0.001)*	0.075		0.074	0.032	0.205		0.075	0.044	0.084	*0.193*	*0.121*	0.094
Zinc *(mg/L, LOR = 0.005)*	0.180		0.026	0.022	0.055		0.046	0.031	0.033	0.061	0.018	0.033
Iron *(mg/L, LOR = 0.05)*	33.50		19.70	18.10	21.20		45.20	43.90	22.00	169.00	37.40	34.60
Ammonia *(mg/L, LOR = 0.01)*	0.05		0.01	0.10	0.05		0.02	<0.05	0.11	<0.10	0.07	0.06
Nitrite *(mg/L, LOR = 0.01)*	<0.01		<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate *(mg/L, LOR = 0.01)*	0.13		<0.01	0.06	0.02		<0.01	0.03	<0.01	0.03	<0.01	0.04
NO_x *(mg/L, LOR = 0.01)*	0.13		<0.01	0.06	0.02		<0.01	0.03	<0.01	0.03	<0.01	0.04
TKN *(mg/L, LOR = 0.1)*	1.5		7.4	2.9	2.2		7.2	3.3	4.3	29.8	11.0	3.9
Total Nitrogen *(mg/L, LOR = 0.1)*	1.6		7.4	3.0	2.2		7.2	3.3	4.3	29.8	11.0	3.9
Reactive P *(mg/L, LOR = 0.01)*	0.01		<0.01	<0.01	<0.01		0.03	<0.01	<0.01	<0.01	<0.01	<0.01
Total P *(mg/L, LOR = 0.01)*	0.31		0.56	0.24	0.52		1.06	0.55	0.30	2.52	1.79	0.70

Table F

APPENDIX 5

C.D OF ATTACHMENTS:
CERTIFICATE OF ANALYSIS
RAW RESULTS

APPENDIX 4

BUSHFIRE MANAGEMENT PLAN

ROWE GROUP DESIGN

Bushfire Management Plan

Local Structure Plan, Lots 103, 110 and 603, Picton East

Project No: EP12-039(02)

Prepared for Harris Road Pty Ltd
November 2019

Document Control

Doc name:	**Bushfire Management Plan Local Structure Plan, Lots 103, 110 and 603, Picton East**				
Doc no.:	**EP12-039(02)--010A HPB**				
Version	**Date**	**Author**		**Reviewer**	
1	November 2019	Heidi Becker	HPB	Kirsten Knox	KK
				Anthony Rowe	AJR
	Report issued for client review.				
A	November 2019	Heidi Becker	HPB	Kirsten Knox	KK
				Anthony Rowe	AJR
	Minor updates following client review and to accompany local structure plan submission				

Executive Summary

Harris Road Pty Ltd (the proponent) are in the process of preparing a local structure plan for Lots 103, 110 and 603, Picton East (herein referred to as 'the site') to support future industrial development within the site. The site is approximately 73 ha and is located within the Shire of Dardanup. It is bounded by Martin-Pelusey Road to the east, undeveloped industrial-zoned land to the north, a railway to the north-west, Columbas Drive to the west and Harris Road and existing land uses to the south. The site forms part of a larger area proposed for industrial land use including the broader Picton Industrial Park Southern Precinct District Structure Plan area (DPLH 2018) and Waterloo Industrial District Structure Plan (WAPC 2019) located to the east of Martin-Pelusey Road.

The site is currently identified as a 'bushfire prone area' under the state-wide *Map of Bush Fire Prone Areas* prepared by the Office of Bushfire Risk Management (OBRM 2019). The identification of the site within an area declared as bushfire prone necessitates that a further assessment of the determined bushfire risk affecting the site (in accordance with *Australian Standard 3959-2018 Construction of buildings in bushfire prone areas* (AS 3959)) and the satisfactory compliance of the proposal with the policy measures described in *State Planning Policy 3.7 Planning in Bushfire Prone Areas* (SPP 3.7) (WAPC 2015) and its associated *Guidelines for Planning in Bushfire Prone Areas Version 1.3* (the Guidelines) (WAPC and DFES 2017).

The purpose of SPP 3.7 and its policy intent is best summarised as preserving life and reducing the impact of bushfire on property and infrastructure through effective risk-based land use planning. Importantly, it is required by SPP 3.7 that the determining authority is to apply its consideration to the precautionary principle (clause 6.11 in SPP 3.7) and it must be satisfied that the intent of the policy measures have been met, before it issues an approval.

Pursuant to the policy measures outlined in SPP 3.7, this Bushfire Management Plan (BMP) examines the various responses to the identified bushfire risk (following development) that will make the ultimate use of the land suitable for its intended purpose. As part of this, a bushfire attack level (BAL) assessment has been undertaken to determine the associated bushfire risk, the applicable BAL ratings (if any), and in turn the building siting and construction response that will achieve compliance with the bushfire protection criteria and satisfy the precautionary principle.

As part of assessing the long-term bushfire risk to the site, the vegetation within 150 m of the site has been classified in accordance with AS 3959. The following bushfire hazards were identified in the post-development scenario:

- Forest (Class A) vegetation, associated with vegetation on the western side of the railway line (north-west of the site), as well as the area of public open space in the north-west of the site, which is proposed to be revegetated.
- Woodland (Class B) vegetation, associated with private landholdings surrounding the site to the east, west and north.
- Scrub (Class D) vegetation, located to the north-west and west of the site.
- Grassland (Class G) vegetation, largely associated with cleared private landholdings (largely used for agricultural purposes) to the east, south, west and north of the site.

Overall, the outcomes of this BMP demonstrate that as development progresses, it will be possible for the intent of the bushfire protection criteria outlined in the Guidelines to be satisfied through an acceptable solution approach. This includes:

- **Location:** all proposed buildings can be located in an area subject to a low or moderate bushfire hazard, given buildings will be located within areas identified as low threat in accordance with Clause 2.2.3.2(e) of AS 3959. Appendix Two of the Guidelines states that non-vegetated areas will be considered a 'low' hazard, except where within 100 m of a moderate or extreme hazard (associated with areas of classified vegetation), and in that case would be subject to a 'moderate' hazard.
- **Siting and Design:** all future built form can be sited within the proposed development so that BAL-29 or less can be achieved based on the proposed local structure plan and separation to nearby hazards through the location of public roads and/or through the use of in-lot setbacks. The development areas adjoining the northern, western and southern boundaries of the site are likely to include areas subject to a BAL rating of BAL-FZ, however the future lots can be suitably sized to accommodate built form that will not be exposed to a BAL rating exceeding BAL-29. The proposed public open space in the north-western corner of the site is intended to be revegetated and will therefore be considered a bushfire hazard. However suitable separation from this area can be provided based on the proposed road layout and use of in-lot setbacks.
- **Vehicular Access:** appropriate vehicle access can be provided, with the proposed development connecting to the existing public road network including Martin-Pelusey Road immediately east of the site, Harris Road immediately south of the site, Columbas Drive to the west of the site, and future industrial development to the north of the site. The site will have two connections to Martin-Pelusey Road which is a major regional connector road and provides egress opportunities to the north and south, including to South Western Highway and Boyanup-Picton Road.
- **Water:** the development will be provided with a permanent and reticulated water supply to support onsite firefighting requirements. It is possible that that the water pressure within the reticulated network may not be sufficient to support fire-fighting, however this can be addressed through provision of tanks and pumps in future lots as part of development.

The management/mitigation measures to be implemented through this structure plan and future requirements as part of subdivision design have been outlined as part of this BMP and can be used to support future planning and development approval processes. A revised BMP is likely to be required to support any future subdivision applications, in order to address the specific bushfire risk reduction measures applicable to future proposed lots.

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List of Abbreviations

Table A1: Abbreviations – General terms

General terms	
AHD	Australian Height Datum
AS	Australian Standard
APZ	Asset Protection Zone
BAL	Bushfire Attack Level
BMP	Bushfire Management Plan
BPAD	Bushfire Planning and Design
EEP	Emergency Evacuation Plan
ESL	Emergency Services Levy
FDI	Fire Danger Index
FZ	Flame Zone

Table A2: Abbreviations – Organisations

Organisations	
DBCA	Department of Biodiversity Conservation and Attractions
DoW	Department of Water (now known as Department of Water and Environment Regulation)
DFES	Department of Fire and Emergency Services
DPLH	Department of Planning, Lands and Heritage
DWER	Department of Water and Environmental Regulation
OBRM	Office of Bushfire Risk Management
SES	State Emergency Services
WAPC	Western Australian Planning Commission

Table A3: Abbreviations – Legislation and policies

Legislation	
Guidelines	*Guidelines for Planning in Bushfire Prone Areas version 1.3 (WAPC and DFES 2017)*
SPP 3.7	*State Planning Policy 3.7 Planning in Bushfire Prone Areas* (WAPC 2015)

Table A4: Abbreviations – Planning and building terms

Planning and building terms	
AS 3959	*Australian Standard 3959-2018 Construction of buildings in bushfire prone areas*
GBRS	Greater Bunbury Region Scheme
POS	Public Open Space
ROS	Regional Open Space
TPS	Town Planning Scheme

1 Introduction

1.1 Background

Harris Road Pty Ltd (the proponent) are in the process of preparing a local structure plan for Lots 103, 110 and 603, Picton East (herein referred to as 'the site'), to support future industrial development, as shown in the structure plan in **Appendix A**. The site is shown in **Figure 1** and consists of an area approximately 73 ha and is located within the Shire of Dardanup. It is bounded by Martin-Pelusey Road to the east, undeveloped industrial-zoned land to the north, a railway to the north-west, Columbas Drive to the west and Harris Road and existing industrial land uses to the south.

The site is currently identified as a 'bushfire prone area' under the state-wide *Map of Bush Fire Prone Areas* prepared by the Office of Bushfire Risk Management (OBRM 2019) and is shown in **Plate 1** below. The identification of an area within a declared bushfire prone area necessitates further assessment of the bushfire risk and suitability of the proposed development to be undertaken in accordance with *State Planning Policy 3.7 Planning in Bushfire Prone Areas* (SPP 3.7) (WAPC 2015) and the *Guidelines for Planning in Bushfire Prone Areas Version 1.3* (the Guidelines) (WAPC and DFES 2017).

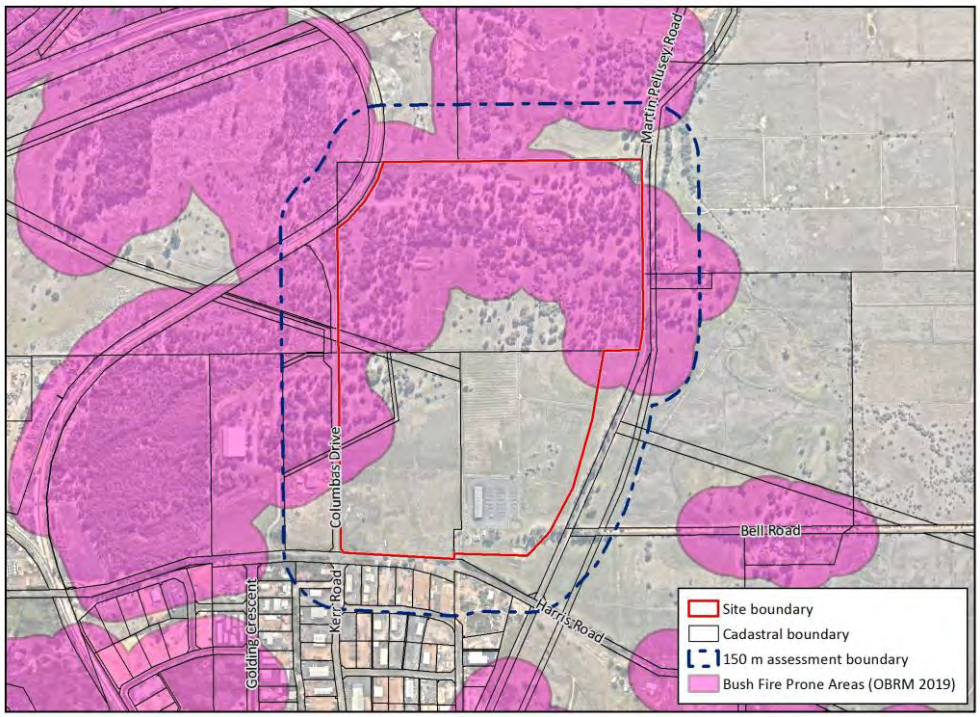

Plate 1: Areas within and surrounding the site identified as 'bushfire prone areas' (as indicated in purple) under the state-wide Map of Bush Fire Prone Areas (OBRM 2019).

1.2 Aim of this report

The aim of this BMP is to assess bushfire hazards within the site and nearby areas and ensure that the threat posed by any identified hazards can be appropriately mitigated and managed and demonstrate satisfaction of clause 6.11 of SPP 3.7 the precautionary principle. It has been prepared to support the proposed structure plan for the site and addresses the requirements of SPP 3.7 (WAPC 2015), the Guidelines (WAPC and DFES 2017) and *Australian Standard 3959-2018 Construction of buildings in bushfire prone areas* (AS 3959) (Standards Australia 2009). The document provides an assessment of the general bushfire management strategies to be considered as part of the future industrial development within the site and includes:

- An assessment of the existing classified vegetation in the vicinity of the site (within 150 m) and consideration of bushfire hazards that will exist in the post development scenario (**Section 3**).
- Commentary on how the future development can achieve the bushfire protection criteria outlined within the Guidelines (**Section 5**).
- An outline of the roles and responsibilities associated with implementing this BMP (see **Section 6**).

1.3 Statutory policy and framework

The following key legislation, policies and guidelines are relevant to the preparation of a bushfire management plan:

- *Fire and Emergency Services Act 1998*
- *Bush Fires Act 1954*
- *Planning and Development Act 2005* and associated regulations
- *Building Act 2011* and associated regulations
- *State Planning Policy 3.7 Planning in Bushfire Prone Areas* (WAPC 2015)
- *Guidelines for Planning in Bushfire Prone Areas version 1.3* (WAPC and DFES 2017)
- *Australian Standard AS 3959 – 2018 Construction of buildings in bushfire prone areas* (Standards Australia 2009)

1.4 Description of the proposed development

The proposed structure plan for the site will facilitate the future subdivision and development of the site for industrial purposes and is provided in **Appendix A**. The structure plan is intended to support:

- A number of industrial lots ranging in size from approximately 0.65 ha to 4.6 ha, with an approximate overall yield of 47 lots.
- An area of public open space 3.9 ha in size in the north-west corner of the site that will be revegetated.
- Approximately 4.7 ha of drainage reserves.
- An interconnected road network, including three 25 m integrator road reserves, and a number of 20 m wide local access roads.

The site is zoned 'Industrial deferred' under the Greater Bunbury Region Scheme (GBRS) and 'General farming' and 'Special' under the Shire of Dardanup Town Planning Scheme (TPS) No.3. The site is currently undergoing a GBRS amendment to lift the 'Industrial Deferred' zone (to move to an 'Industrial' zone) which will be supported through the approval of the local structure plan. The current GRBS zoning for the site and surrounds is shown in **Plate 2**. Under an 'Industrial' zoning, land uses will include those associated with supporting manufacturing industry, the storage and distribution of goods and associated uses, and may include service stations, storage and transport depots as an example.

More broadly, the site forms part of a larger industrial area and is located within the Picton Industrial Park Southern Precinct area and adjacent to the Waterloo Industrial District Structure Plan located to the east of Martin-Pelusey Road. A residential area, associated with the Wanju District Structure Plan area is located further north of the site.

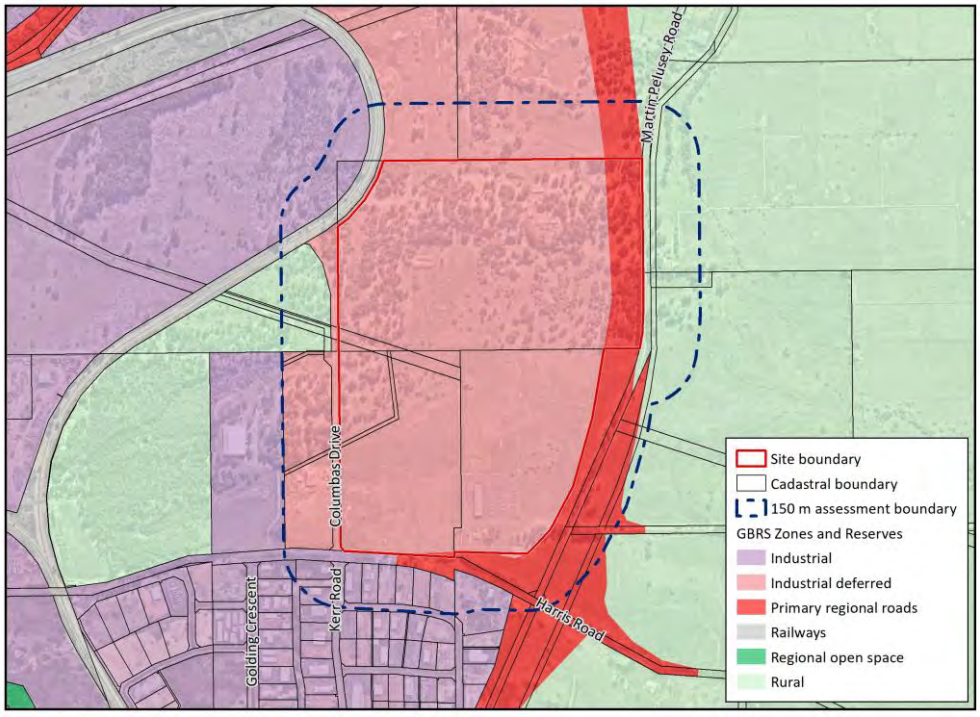

Plate 2: Existing GBRS zoning for the site and surrounds

1.5 Description of land characteristics

The site ranges from 12.0 m Australian Height Datum (AHD) to 23.0 m AHD. The higher elevations and steeper slopes are located along the western and northern boundaries of the site. The lowest areas are generally consistent with the existing drainage channels and farm dams. Topographic contours are shown in **Figure 1**.

The southern portion of the site was historically cleared of a majority of native vegetation (prior to 1996, based on available historic aerial photography) to support agricultural purposes. The northern portion of the site contains a number of paddock grasses located around existing building and sheds.

The land uses surrounding the site (within 150 m) include:

- Immediately to the north of the site is land currently used for agricultural purposes (zoned for future industrial land use) and to the north-west is a freight railway.
- Columbas Drive immediately west of the site and current agricultural land uses further west (zoned for future industrial land use).
- Harris Road immediately to the south of the site, and existing industrial land uses further south.
- Martin-Pelusey Road immediately to the east of the site and current agricultural land uses further east (zoned for future industrial land use).

2 Environmental Considerations

In accordance with the *Bushfire Management Plan – BAL Contour* template prepared by the Department of Planning, Lands and Heritage (2018), this BMP has considered whether there are any environmental values that may require specific consideration through either protection, retention or revegetation. To support this, a review of publicly available databases was undertaken, with particular reference to the Shared Location Information Platform (SLIP) databases. A number of site-specific environmental investigations and surveys have been undertaken to support the Picton Industrial Park Southern Precinct District Structure Plan (DPLH 2018), in addition to the proposed local structure plan for the site. These investigations include:

- *Report on a Level 1 flora and vegetation survey at various lots at Picton East* (Ekologica Pty Ltd 2009)
- *Terrestrial Fauna Survey (Level 1) of Lots 1, 2, 11, 102-104 and 603 Picton (East)* (Harewood 2009)
- *Environmental Assessment Management Strategy* (Emerge Associates 2019a)
- *Local Water Management Strategy* (Emerge Associates 2019b)

The *Environmental Assessment Management Strategy* (Emerge Associates 2019a) consolidates previous environmental reports and comments on new environmental considerations for the site.

A review of the site-specific environmental investigations and publicly available datasets identified a number of environmental values within and surrounding the site and are summarised in **Table 1**. A number of federal and state listed conservation significant fauna species (namely black cockatoo and western ringtail possums) were identified as utilising or having the potential to use areas of remnant vegetation (predominantly paddock trees within the site). Some areas of existing vegetation are proposed to be retained as part of development and are discussed further in **Section 2.2**.

Table 1: Summary of potential environmental considerations that may be associated with the site (based on a search of the SLIP databases)

Key environmental feature (information in brackets refers to mapping data source)	Yes / no / potentially occurring within the site	If yes / potentially, describe value that may be impacted
Conservation category wetlands and buffer (Geomorphic wetlands, Swan Coastal Plain (DBCA-019))	No	Not applicable. The majority of the site is mapped as a multiple use wetland and requires no specific protection and/or retention of values. A resource enhancement wetland is located approximately 350 m to the west of the site however no buffers for this wetland needs to be accommodated within the site.
RAMSAR wetlands (DBCA-010)	No	Not applicable. No RAMSAR sites are located within or nearby to the site.
Threatened and priority flora (Ekologica Pty Ltd 2009)	No	The site has been historically cleared of native vegetation for agricultural purposes and is now dominated by paddock grasses with scattered paddock trees. No Threatened or Priority flora were identified within the site (Ekologica Pty Ltd 2009).

Table 1: Summary of potential environmental considerations that may be associated with the site (based on a search of the SLIP databases) (continued)

Key environmental feature (information in brackets refers to mapping data source)	Yes / no / potentially occurring within the site	If yes / potentially, describe value that may be impacted
Threatened and priority fauna (Harewood 2009)	Yes	Harewood (2009) identified a portion of vegetation within the northern half of the site as containing habitat for the western ringtail possum, through the identification of scats and dreys. Evidence of foraging from the three black cockatoo species were identified in the broader Picton area through the identification of chewed marri nuts and banksia cones.
Threatened ecological communities (TEC) (Ekologica Pty Ltd 2009)	No	Not applicable. The flora and vegetation survey did not identify any TECs (Ekologica Pty Ltd 2009) and based on the site inspection and review of available information no TECs listed since the flora and vegetation survey was completed are likely to occur. While no Tecs are identified within the site, the vegetation has been identified as regionally significant by the EPA (EPA 2008), although has not been recommended for retention.
Bush Forever areas (DOP-071)	No	Not applicable.
Clearing regulations – Environmentally Sensitive Areas (DWER-046)	No	Not applicable. The site has not been identified as an Environmentally Sensitive Area (ESA).
Swan Bioplan Regionally Significant Natural Areas 2010 (DWER-070)	No	Not applicable.
Conservation Covenants Western Australia (DPIRD-023)	No	Not applicable.
Aboriginal heritage (DAA-001)	No	Not applicable. Approximately 20 m to the south of the site is an identified 'Other Heritage Place' Site ID 18886 Bunbury Bypass Archaeological Site 3.
Non-indigenous heritage (SHO-003)	No	Not applicable. No registered non-indigenous heritage sites were identified within or nearby to the site.

2.1 Native vegetation – modification and clearing

The vegetation within the proposed public open space, in the north-west corner of the site, is proposed to be retained in accordance with the structure plan. The majority of the remaining vegetation within the site will most likely be removed as part of the proposed industrial development or retained where possible in road reserves or lots as part of future subdivision (but modified to be considered low threat). Clearing of native vegetation needs to be in accordance with a clearing permit (pursuant to the EP Act) or a valid exemption. Clearing of native vegetation undertaken in accordance with addressing conditions associated with a subdivision approval, pursuant to the *Planning and Development Act 2005*, are exempt from requiring a clearing permit pursuant to Schedule 6 of the *Environmental Protection Act 1986* (where approved by a responsible authority).

2.2 Revegetation and landscape plans

The existing vegetation within the proposed public open space in the north-west corner of the site is proposed to be retained and also revegetated with local native species to support the enhancement of fauna habitat and ecological linkages within the site. This area of public open space is located adjacent to areas of regionally significant vegetation outside the site that has been recommended for retention by the EPA (2008).

Within the remainder of the site road reserves and drainage reserves are proposed to be landscaped as part of the future development. These areas will be designed to achieve low threat vegetation in accordance with Section 2.2.3.2 of AS 3959. The management of the landscaped areas will be the responsibility of the proponent initially prior to handover to the Shire of Dardanup, with ongoing management likely to include:

- Regular mowing/slashing of grass to a minimum of 100 mm in height or under the Shire of Dardanup's fire control notice less than 50 mm in height (where present).
- Irrigation of grass and garden beds (only temporary establishment irrigation is required prior to handover to the Shire of Dardanup).
- Regular removal of weeds and built up dead material (such as fallen branches, leaf litter etc.).
- Low pruning of trees (branches below 2 m in height removed where appropriate).
- Application/replacement of ground/surface covers such as mulch or non-flammable materials as required.

3 Bushfire Assessment Results

Bushfire risk for the site has been appropriately considered in the specific context of the Guidelines (WAPC and DFES 2017) and AS 3959. The objective of AS 3959 is to reduce the risk of ignition and loss of a building to bushfire. It provides a consistent method for determining a radiant heat level (radiant heat flux) as a primary consideration of bushfire attack on a building or object. It also prescribes simple construction responses that can resist the determined radiant heat level at a given distance from the fire and is based on six Bushfire Attack Level (BAL) ratings: BAL-LOW, BAL-12.5, BAL-19, BAL-29, BAL-40 and BAL-FZ.

The building construction requirements outlined within AS 3959 only apply to Class 1, 2, 3 and 10a buildings, which are not generally associated with industrial development. Accordingly, higher building construction requirements in accordance with AS 3959 are unlikely to apply. However, development within the site will still be required to demonstrate built form achieves a BAL rating of BAL-29 or less (in accordance with SPP 3.7), and can satisfy the bushfire protection criteria, and accordingly is still relevant.

Two separate methods are outlined in AS 3959 for determining the impact of bushfire on dwellings and have been outlined below:

- **Method 1**, outlined in Section 2 and Appendix A of AS 3959, provides a basic assessment of radiant heat flux levels at various distances from classified vegetation (up to 100 m). This method assumes standard fuel loads for classified vegetation as outlined in AS 3959 and considers the effective slope beneath vegetation. This method can be used to determine appropriate setbacks to dwellings to achieve different levels of radiant heat exposure (i.e. BAL-12.5 to BAL-FZ).
- **Method 2**, outlined in Appendix B of AS 3959, provides access to the formula used to derive the Method 1 values. Where justified it enables the inputs used in Method 1 to be varied, to reflect true site conditions to provide a site-specific assessment of the radiant heat level at any given distance from the fire.

Not all vegetation is a classified bushfire risk. Vegetation and ground surfaces that are exempt from classification as a potential hazard is identified as low threat under Section 2.2.3.2 of AS 3959. Low threat vegetation includes the following:

a) Vegetation of any type more than 100 m from the site.
b) Single areas of vegetation less than 1 ha in area and not within 100 m of other areas of vegetation being classified.
c) Multiple areas of vegetation less than 0.25 ha in area and not within 20 m of the site or each other.
d) Strips of vegetation less than 20 m wide (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20 m of the site or each other, or other areas of vegetation being classified.
e) Non-vegetated areas, including waterways, roads, footpaths, buildings and rocky outcrops.
f) Low threat vegetation, including grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves and parkland, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and wind breaks.

3.1 Bushfire attack level (BAL) assessment

In accordance with Appendix Five of the Guidelines, a method 1 BAL assessment has been undertaken to support the proposed structure plan for the site in order to understand appropriate setbacks based on the vegetation classification and effective slope, and to prepare the associated BAL contour plan.

3.1.1 Assessment inputs

Assessing bushfire hazards takes into account the classes of vegetation within the site and surrounding area for a minimum of 150 m, in accordance with AS 3959. The assignment of vegetation classifications is based on an assessment of vegetation structure, which includes consideration of the various fuel layers of different vegetation types. For example, fuel layers in a typical forest environment can be broken-down into five segments as illustrated in **Plate 3** below. These defined fuel layers are considered when determining the classification of vegetation and associated bushfire hazard levels.

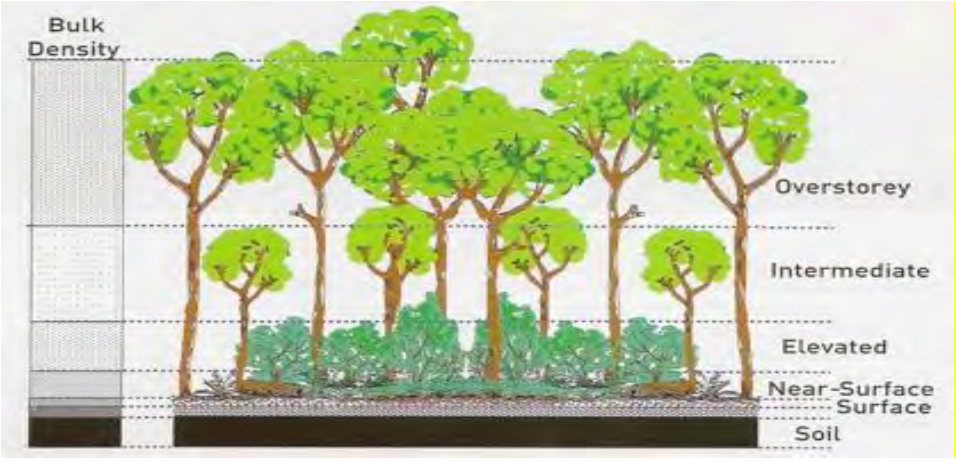

Plate 3: The five fuel layers in a forest environment that could be associated with fire behaviour (Gould et al. 2007)

An assessment of existing vegetation within the site and surrounding 150 m as well as effective slope was undertaken on 20th August 2019 in accordance with AS 3959 and the Guidelines.

Table 2 outlines:

- The pre-development AS 3959 vegetation classifications (and associated photo locations), which are also shown in **Figure 2**. Additional photo locations not included in **Table 2** are provided in **Appendix B**.
- The bushfire hazard ratings are shown in **Figure 3**.
- The post-development AS 3959 vegetation classifications, which are also shown in **Figure 4**.
- The effective slope for each area of classified vegetation present in the post-development scenario, which is also shown in **Figure 5**.

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Table 2: Vegetation classification, effective slope and future management

Pre-development (see Figure 2 and Figure 3)			Post development (see Figure 4 and Figure 5)	
Plot no.	**AS 3959 classification and bushfire hazard rating**	**Site photo/s (location points shown in Figure 2)**	**Plot no.**	**AS 3959 classification, effective slope and assumptions**
1, 2	An area of forest vegetation has been identified to the north-west of the site on the western side of the railway line (Plot 1) and within Harris Road reserve (Plot 2). These areas of vegetation are not managed and are associated with multiple fuel layers, including near-surface, understorey, elevated and overstorey. **AS 3959 classification (Figure 2):** Forest (Class A) **Bushfire hazard rating (Figure 3):** Extreme **Photo points:** 20	 *Photo location 20: forest vegetation in the background on the photo on the opposite side of the railway line, looking west.*	1, 2	The forest vegetation associated with Plot 1 is assumed to remain in its existing condition in the long term on the basis that the EPA has identified this area to be regionally significant and has recommended it be retained and protected as part of any future rezoning, subdivision or development (EPA 2008). The forest vegetation within Harris Road reserve (Plot 2) is expected to remain in its current condition. Therefore, the forest vegetation associated with both Plot 1 and Plot 2 is assumed to remain a bushfire hazard to future development. **AS 3959 classification (Figure 4):** Forest (Class A) **Effective slope (Figure 5):** Flat/upslope

Table 2: Vegetation classification, effective slope and future management (continued)

Pre-development (see Figure 2 and Figure 3)			Post development (see Figure 4 and Figure 5)	
Plot no.	**AS 3959 classification and bushfire hazard rating**	**Site photo/s (location points shown in Figure 2)**	**Plot no.**	**AS 3959 classification, effective slope and assumptions**
3	Woodland vegetation has been identified throughout the site and is characterised by an overstorey of primarily *Agonis flexuosa*, with unmanaged understorey of grasslands and leaf litter fuel loads. **AS 3959 classification (Figure 2):** Woodland (Class B) **Bushfire hazard rating (Figure 3):** Extreme **Photo points:** 7, 18, 23, 24, 28, 31	 *Photo location 7: woodland vegetation within the site, looking south-east.*  *Photo location 18: woodland vegetation in the northern portion of the site, looking south-east.*  *Photo location 23: woodland vegetation, looking east.*  *Photo location 28: woodland vegetation with a grassy understorey, looking north.*	18	The majority of the site will be converted to non-vegetated areas in the form of buildings, hardstand areas, driveways and roads and is therefore considered to be low threat in accordance with (exclusion clause 2.2.3.2(e)). It is noted that some of these areas will contain managed grass, garden areas or verges in the future (as development is completed), however for ease of reference have been excluded as non-vegetated on the basis that these will form part of future lots. **AS 3959 classification (Figure 4):** Non-vegetated (exclusion clause 2.2.3.2(e)). **Effective slope (Figure 5):** Not applicable

Table 2: Vegetation classification, effective slope and future management (continued)

Pre-development (see Figure 2 and Figure 3)			Post development (see Figure 4 and Figure 5)	
Plot no.	**AS 3959 classification and bushfire hazard rating**	**Site photo/s (location points shown in Figure 2)**	**Plot no.**	**AS 3959 classification, effective slope and assumptions**
3	Continued from above.	Continued from above.	20, 21	The north-west corner of the site will be converted to an area of public open space approximatley 3.9 ha in size. This area is proposed to be revegetated with local native species to support the enhancement of fauna habitat and ecological linkages within the site. Based on the area being revegetated, the area of public open space has been assessed as forest vegetation in the post-development scenario based on multiple fuel layers being present, and will therefore be a hazard to future development within the site. **AS 3959 classification (Figure 4):** Forest (Class A) **Effective slope (Figure 5):** Downslope 0-5^{0}C Flat/upslope

Table 2: Vegetation classification, effective slope and future management (continued)

Pre-development (see Figure 2 and Figure 3)			Post development (see Figure 4 and Figure 5)	
Plot no.	**AS 3959 classification and bushfire hazard rating**	**Site photo/s (location points shown in Figure 2)**	**Plot no.**	**AS 3959 classification, effective slope and assumptions**
4-10	Woodland vegetation has been identified outside the site in adjacent landholdings to the east, north and west of the site. These areas of vegetation have been subject to previous disturbance and contains a mix of overstorey species with a grass understorey and do not appear to be subject to management. **AS 3959 classification (Figure 2):** Woodland (Class B) **Bushfire hazard rating (Figure 3):** Extreme **Photo points:** 6, 13, 14, 40	 *Photo location 6: woodland vegetation in adjacent landholdings to the west of the site, looking west.*  *Photo location 13: woodland vegetation to the west of the site, looking north-west.*  *Photo location 14: woodland vegetation outside the site, looking south.*  *Photo location 40: woodland vegetation east of the site, looking west.*	4-10	The majority of woodland vegetation located outside the site is situated in land that will be subject to future industrial development, however as the timing of development is unknown these areas have been assumed to remain a bushfire hazard. **AS 3959 classification (Figure 4):** Woodland (Class B) **Effective slope (Figure 5):** Flat/upslope

Table 2: Vegetation classification, effective slope and future management (continued)

Pre-development (see Figure 2 and Figure 3)			Post development (see Figure 4 and Figure 5)	
Plot no.	**AS 3959 classification and bushfire hazard rating**	**Site photo/s (location points shown in Figure 2)**	**Plot no.**	**AS 3959 classification, effective slope and assumptions**
11	Areas of scrub vegetation have been identified within the northern portion of the site These areas of vegetation are associated with predominantly *Melaleuca* species that species with a canopy height of between 2 m and 6 m. These areas do not appear to be subject to any regular maintenance. **AS 3959 classification (Figure 2):** Scrub (Class D) **Bushfire hazard rating (Figure 3):** Extreme **Photo points:** 12, 15, 16, 17, 21, 22, 42 Continued below.	 *Photo location 15: scrub vegetation within the site, looking south.*  *Photo location 17: scrub vegetation within the northern portion of the site, looking south.*  *Photo location 21: scrub vegetation in the north-west corner of the site, looking east.*  *Photo location 22: scrub vegetation, looking north-west.*	18	The majority of the site will be converted to non-vegetated areas in the form of buildings, hardstand areas, driveways and roads and is therefore considered to be low threat in accordance with (exclusion clause 2.2.3.2(e)). It is noted that some of these areas will contain managed grass, garden areas or verges in the future (as development is completed), however for ease of reference have been excluded as non-vegetated on the basis that these will form part of future lots. **AS 3959 classification (Figure 4):** Non-vegetated (exclusion clause 2.2.3.2(e)). **Effective slope (Figure 5):** Not applicable

Table 2: Vegetation classification, effective slope and future management (continued)

Pre-development (see Figure 2 and Figure 3)			Post development (see Figure 4 and Figure 5)	
Plot no.	**AS 3959 classification and bushfire hazard rating**	**Site photo/s (location points shown in Figure 2)**	**Plot no.**	**AS 3959 classification, effective slope and assumptions**
11	Continued from above.	Continued from above.	20, 21	The north-west corner of the site will be converted to an area of public open space approximatley 3.9 ha in size. This area is proposed to be revegetated with local native species to support the enhancement of fauna habitat and ecological linkages within the site. Based on the area being revegetated, the area of public open space has been assessed as forest vegetation in the post-development scenario based on multiple fuel layers being present, and will therefore be a hazard to future development within the site. **AS 3959 classification (Figure 4):** Forest (Class A) **Effective slope (Figure 5):** Downslope 0-5^{0}C Flat/upslope

Table 2: Vegetation classification, effective slope and future management (continued)

Pre-development (see Figure 2 and Figure 3)			Post development (see Figure 4 and Figure 5)	
Plot no.	**AS 3959 classification and bushfire hazard rating**	**Site photo/s (location points shown in Figure 2)**	**Plot no.**	**AS 3959 classification, effective slope and assumptions**
12, 13	Areas of scrub vegetation have been identified to the north-west and west of the site. These areas of vegetation are associated with predominately *Melaleuca* species with a canopy height of between 2 m and 4 m. These areas do not appear to be subject to any regular maintenance. **AS 3959 classification (Figure 2):** Scrub (Class D) **Bushfire hazard rating (Figure 3):** Extreme **Photo points:** 8, 9, 10, 19	 *Photo location 8: scrub vegetation to the west of the site, looking north-west.*  *Photo location 9: scrub vegetation, looking west.*  *Photo location 10: scrub vegetation, looking north.*  *Photo location 19: scrub vegetation in the background of the photo, looking west.*	12, 13	The areas of scrub vegetation identified within Plot 13 is assumed to remain in its existing condition in the long term on the basis that the EPA has identified this area to be regionally significant and has recommended it be retained and protected as part of future rezoning, subdivision or development (EPA 2008). The area of scrub vegetation identified within Plot 12 is situated in land that will be subject to future industrial development, however as the timing of development is unknown these areas have been assumed to remain a bushfire hazard. **AS 3959 classification (Figure 4):** Scrub (Class D) **Effective slope (Figure 5):** Flat/upslope

Table 2: Vegetation classification, effective slope and future management (continued)

Pre-development (see Figure 2 and Figure 3)			Post development (see Figure 4 and Figure 5)	
Plot no.	**AS 3959 classification and bushfire hazard rating**	**Site photo/s (location points shown in Figure 2)**	**Plot no.**	**AS 3959 classification, effective slope and assumptions**
14	Grassland vegetation has been identified throughout the site, with the southern portion of the site predominately grassland. Paddock grasses within the site are subject to grazing by livestock however is not maintained less than 100 mm in height regularly and therefore has been identified as a bushfire hazard. **AS 3959 classification (Figure 2):** Grassland (Class G) **Bushfire hazard rating (Figure 3):** Moderate **Photo points:** 5, 29, 35, 37	 *Photo location 5: grassland vegetation in the southern portion of the site, looking east.*  *Photo location 29: grassland vegetation in the foreground of the photo, looking south-west.*  *Photo location 35: grassland vegetation in the central portion of the site, looking north-east.*  *Photo location 37: grassland vegetation within the site, looking north-east.*	18	The majority of the site will be converted to non-vegetated areas in the form of buildings, hardstand areas, driveways and roads and is therefore considered to be low threat in accordance with (exclusion clause 2.2.3.2(e)). It is noted that some of these areas will contain managed grass, garden areas or verges in the future (as development is completed), however for ease of reference have been excluded as non-vegetated on the basis that these will form part of future lots. **AS 3959 classification (Figure 4):** Non-vegetated (exclusion clause 2.2.3.2(e)). **Effective slope (Figure 5):** Not applicable

Table 2: Vegetation classification, effective slope and future management (continued)

Pre-development (see Figure 2 and Figure 3)			Post development (see Figure 4 and Figure 5)	
Plot no.	**AS 3959 classification and bushfire hazard rating**	**Site photo/s (location points shown in Figure 2)**	**Plot no.**	**AS 3959 classification, effective slope and assumptions**
14	Continued from above.	Continued from above.	20, 21	The north-west corner of the site will be converted to an area of public open space approximatley 3.9 ha in size. This area is proposed to be revegetated with local native species to support the enhancement of fauna habitat and ecological linkages within the site. Based on the area being revegetated, the area of public open space has been assessed as forest vegetation in the post-development scenario based on multiple fuel layers being present, and will therefore be a hazard to future development within the site. **AS 3959 classification (Figure 4):** Forest (Class A) **Effective slope (Figure 5):** Downslope 0-5^{0}C Flat/upslope

Table 2: Vegetation classification, effective slope and future management (continued)

Pre-development (see Figure 2 and Figure 3)			Post development (see Figure 4 and Figure 5)	
Plot no.	**AS 3959 classification and bushfire hazard rating**	**Site photo/s (location points shown in Figure 2)**	**Plot no.**	**AS 3959 classification, effective slope and assumptions**
15-17	Grassland vegetation has been identified in adjacent landholdings outside of the site to the south, east, north and west, and is associated with existing agricultural land uses an/or agricultural drains. The areas of paddock grasses outside the site may be subject to some management, but this appears to be intermittent and therefore has been identified as a bushfire hazard. **AS 3959 classification (Figure 2):** Grassland (Class G) **Bushfire hazard rating (Figure 3):** Moderate **Photo points:** 3, 4, 11, 25, 30, 33, 34, 39, 41	 *Photo location 3: grassland vegetation in adjacent landholdings to the west of the site, looking west.*  *Photo location 4: grassland vegetation within Columbas Drive road reserve, looking north.*  *Photo location 11: areas of grassland vegetation to the west of the site, looking west.*  *Photo location 34: grassland vegetation immediately east of the site, looking south.*	15-17	The majority of woodland vegetation located outside the site is situated in land that will be subject to future industrial development, however as the timing of development is unknown these areas have been assumed to remain a bushfire hazard. **AS 3959 classification (Figure 4):** Grassland (Class G) **Effective slope (Figure 5):** Flat/upslope

Table 2: Vegetation classification, effective slope and future management (continued)

Pre-development (see Figure 2 and Figure 3)			Post development (see Figure 4 and Figure 5)	
Plot no.	**AS 3959 classification and bushfire hazard rating**	**Site photo/s (location points shown in Figure 2)**	**Plot no.**	**AS 3959 classification, effective slope and assumptions**
18	Non-vegetated areas such as roads, driveways, existing industrial buildings and hardstand areas, water bodies including dams and drains within and surrounding the site have been excluded in accordance with Clause 2.2.3.2(e) of AS 3959. **AS 3959 classification (Figure 2):** Non-vegetated (exclusion clause 2.2.3.2(e)) **Bushfire hazard rating (Figure 3):** Low, however as required under the Guidelines, any areas within 100 m of moderate or extreme hazards would be considered moderate hazard, to reflect the potential increased risk. **Photo points:** 2, 26, 27, 32, 36, 38	 *Photo location 2: Columbas Drive immediately west of the site, looking north.*  *Photo location 27: existing buildings and bare mineral earth within the northern portion of the site, looking east.*  *Photo location 36: rural drain within the central portion of the site, looking north-east.*  *Photo location 38: existing industrial buildings within the southern portion of the site, looking east.*	18	The existing maintenance regimes for all existing non-vegetated areas surrounding the site are assumed to continue in the long-term based on current land uses and management arrangements and will remain low threat. In addition, areas within the site that have been identified as non-vegetated will remain non-vegetated when converted to public roads and/or industrial lots as part of the proposed development of the site. **AS 3959 classification (Figure 4):** Non-vegetated (exclusion clause 2.2.3.2(e)) **Effective slope (Figure 5):** Not applicable

Table 2: Vegetation classification, effective slope and future management (continued)

Pre-development (see Figure 2 and Figure 3)			Post development (see Figure 4 and Figure 5)	
Plot no.	**AS 3959 classification and bushfire hazard rating**	**Site photo/s (location points shown in Figure 2)**	**Plot no.**	**AS 3959 classification, effective slope and assumptions**
19	Surrounding the site, areas of low threat vegetation have been identified and are largely associated with either existing managed road verges and managed gardens/verges associated with surrounding industrial development. **AS 3959 classification (Figure 2):** Low threat vegetation (exclusion clause 2.2.3.2(f)) **Bushfire hazard rating (Figure 3):** Low, however as required under the Guidelines, any areas within 100 m of moderate or extreme hazards would be considered moderate hazard, to reflect the potential increased risk. **Photo points:** 1	 *Photo location 1: low threat vegetation within the industrial area to the south of the site, looking east.*	19	The maintenance regimes for all existing low-threat vegetation surrounding the site is assumed to continue in the long-term based on current land uses and management arrangements, in accordance with the requirements of the Shire of Dardanup fire control notice and community expectations. **AS 3959 classification (Figure 4):** Low threat vegetation (exclusion clause 2.2.3.2(f)) **Effective slope (Figure 5):** Not applicable

3.1.1.1 Post development assumptions

The BAL assessment, to determine the predicated BAL ratings applicable to the site, has assumed the following:

- **Designated FDI**: 80
- **Flame temperature**: 1090 K
- **Vegetation classification**: forest (Class A), woodland (Class B), scrub (Class D) and grassland (Class G) vegetation identified within the post-development scenario, see **Figure 4**.
- **Effective slope beneath classified vegetation**: Downslope 0-5^{0}C and flat/upslope (see **Figure 5**)
- **Setback distances**: as per Table 2.5 in AS 3959 with the relevant distances used to inform the BAL contour plan summarised in **Table 3** with the BAL contour provided in **Figure 6**.

In addition to the above, the following key assumptions have informed this assessment:

- The 3.9 ha of public open space, located in the north-west corner of the site, will be revegetated with local native species and has been classified as the forest (Class A) vegetation in the post-development scenario. No future management of this area has been assumed.
- The drainage reserves within the site will be managed to low threat in accordance with Section 2.2.3.2 of AS 3959. Management of the drainage reserves will be the responsibility of the proponent initially and the Shire of Dardanup following handover (usually two years).
- The remainder of the classified vegetation within the site will be removed or modified to achieve low threat in accordance with Section 2.2.3.2 of AS 3959. Management of low threat areas are may include (but is not limited to):
    - Removal of grassland vegetation and/or regular mowing/slashing of grass to less than 100mm in height.
    - Establishment irrigation of grass and garden beds
    - Regular maintenance including removal of weeds and dead material
    - Low pruning of trees
    - Application of ground covers such as mulch or non-flammable materials
- Areas of low threat vegetation outside of the site will continue to be managed and/or considered to achieve low threat (in accordance with Section 2.2.3.2 of AS 3959) based on the existing maintenance regimes, and/or as per the Shire of Dardanup's fire control notice.
- Classified vegetation that has been identified outside of the site has been assumed to remain in its current state (unless stated otherwise) and will therefore remain a bushfire hazard to development within the site.

3.1.2 Assessment outputs

The BAL assessment completed for the site indicates that a BAL rating of BAL-29 or less can be achieved at future built form based on the indicated spatial layout for the structure plan (**Appendix A**). A portion of the development areas adjoining the northern, western and southern boundaries of the site are likely to be subject to a BAL rating of BAL-FZ, however future lots can be suitably sized to accommodate built form that will not be exposed to a BAL rating exceeding BAL-29. It is important to note that portions of the site have a BAL rating of BAL-FZ as a result of vegetation that will be subject to future industrial development. The proposed public open space in the north-western corner of the site is assumed to be a bushfire hazard, however suitable separation from this area can be provided based on the proposed road layout and if required in lot setbacks.

Table 3 provides a summary of the setback distances necessary from classified vegetation to achieve the indicated BAL ratings, with the BAL Contour Plan (**Figure 6**) being a visual representation of these distances. The setback distances are based on the post-development classified vegetation (**Figure 4**), effective slope (**Figure 5**) and are taken from Table 2.5 of AS 3959.

Table 3: Setback distances based on vegetation classification and effective slope and Table 2.5 of AS 3959, as determined by the method 1 BAL assessment

Post development plot number (see Figure 4)	Vegetation classification (see Figure 4)	Effective slope (see Figure 5)	Distance to vegetation (from Table 2.5 of AS 3959)	BAL rating (see Figure 6)
Plot 1, 2, 20	Forest (Class A)	Flat/upslope	< 16 m	BAL-FZ
			16 - < 21 m	BAL-40
			21 - < 31 m	BAL-29
			31 - < 42 m	BAL-19
			42 - < 100 m	BAL-12.5
			> 100 m	BAL-LOW
Plot 21	Forest (Class A)	Downslope 0-5^{0}C	< 20 m	BAL-FZ
			20 - < 27 m	BAL-40
			27 - < 37 m	BAL-29
			37 - < 50 m	BAL-19
			50 - < 100 m	BAL-12.5
			> 100 m	BAL-LOW
Plot 4-9	Woodland (Class B)	Flat/upslope	< 10 m	BAL-FZ
			10 - < 14 m	BAL-40
			14 - < 20 m	BAL-29
			20 - < 29 m	BAL-19
			29 - < 100 m	BAL-12.5
			> 100 m	BAL-LOW
Plot 12, 13	Scrub (Class D)	Flat/upslope	< 10 m	BAL-FZ
			10 - < 13 m	BAL-40
			13 - < 19 m	BAL-29
			19 - < 27 m	BAL-19
			27 - < 100 m	BAL-12.5
			> 100 m	BAL-LOW

Table 3: Setback distances based on vegetation classification and effective slope and Table 2.5 of AS 3959, as determined by the method 1 BAL assessment (continued)

Post development plot number (see Figure 4)	Vegetation classification (see Figure 4)	Effective slope (see Figure 5)	Distance to vegetation (from Table 2.5 of AS 3959)	BAL rating (see Figure 6)
Plot 15-17	Grassland (Class G)	Flat/upslope	< 6 m	BAL-FZ
			6 - < 8 m	BAL-40
			8 - < 12 m	BAL-29
			12 - < 17 m	BAL-19
			17 - < 50 m	BAL-12.5
			> 50 m	BAL-LOW

4 Identification of Bushfire Hazard Issues

From a bushfire hazard management perspective, the key issues that are likely to require management and/or consideration as part of future development within the site include:

- Provision of appropriate separation distance from permanent bushfire hazards within or surrounding the site (i.e. the public open space in the north-west corner of the site) to ensure a BAL rating of BAL-29 or less can be achieved at future built form. Consideration will also need to be given to providing appropriate separation from any temporary bushfire hazards (i.e. unmanaged vegetation within the site) that may exist as part of staged development.
- Ensuring that drainage reserves and road reserves are appropriately designed and managed to achieve low threat standards in accordance with AS 3959 and the requirements of the Shire of Dardanup.
- Provision of appropriate vehicular access to ensure that when development within the site is fully constructed, egress to at least two different destinations will be available to future workers and emergency personnel. The site is located immediately north of Harris Road, immediately east of Columbas Drive and west of Martin-Pelusey Road which provides egress to the north to South Western Highway and to the south to Boyanup-Picton Road. Temporary egress opportunities will be considered as part of staged development.
- Provision of appropriate water supply and associated infrastructure.

These issues are considered further in **Section 5.**

5 Assessment Against the Bushfire Protection Criteria

This BMP provides an outline of the mitigation strategies that will ensure that as development progresses within the site, an acceptable solution and/or performance-based system of control can be adopted for each of the bushfire protection criteria detailed within Appendix Four of the Guidelines (WAPC and DFES 2017). The bushfire protection criteria identified in the Guidelines and addressed as part of this BMP are:

- Element 1: Location of the development
- Element 2: Siting and design of the development
- Element 3: Vehicular access
- Element 4: Water supply.

As part of future development, the intent of the bushfire protection criteria can be satisfied through acceptable solutions. A summary of how this can be achieved and an associated compliance statement for each has been provided in **Table 4**.

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Table 4: Summary of bushfire protection criteria and compliance statement

Bushfire protection criteria	Intent	Method of compliance		Proposed bushfire management strategies	Compliance statement
		Acceptable solution	Performance principle		
Element 1: Location	To ensure that strategic planning proposals, subdivision and development applications are located in areas with the least possible risk of bushfire to facilitate the protection of people, property and infrastructure.	A1.1 Development location Yes.	N/A	It is possible for all future buildings[1] to be located in an area subject to a low or moderate bushfire hazard, given buildings will be located within areas identified as low threat in accordance with Clause 2.2.3.2(e) of AS 3959. Appendix Two of the Guidelines (WAPC and DFES 2017) states that non-vegetated or low threat areas will be considered a 'low' hazard, except where within 100 m of a moderate or extreme hazard (associated with areas of classified vegetation), and in that case would be subject to a 'moderate' hazard. The proposed structure plan is therefore able to satisfy the acceptable solution. The acceptable solution can therefore be satisfied.	Based on the outlined management measures, future development would be able to comply with and meet the intent of Element 1: Location.

[1] The Planning and Development (Local Planning Scheme) Amendment Regulations 2015 (the Regulations) (which enact the requirement for the consideration of bushfire risk) indicates that the requirement for a BAL assessment applies to a 'development site'. **Development site**, as defined by the Regulations, "*means that part of a lot on which a building that is the subject of development stands or is to be constructed".* Therefore, consideration of the habitable building rather than the 'lot' is in line with the Regulations when considering the location of the habitable building and the requirements of SPP 3.7 for the development site.

Table 4: Summary of bushfire protection criteria and compliance statement (continued)

Bushfire protection criteria	Intent	Method of compliance		Proposed bushfire management strategies	Compliance statement
		Acceptable solution	Performance principle		
Element 2: Siting and design	To ensure the siting and design of development minimises the level of bushfire impact.	A2.1 Asset Protection Zone		One of the most important bushfire protection measures influencing the safety of people and property is to create an Asset Protection Zone (APZ) around buildings. The APZ is a low fuel area immediately surrounding a building, and can include non-flammable features such as irrigated landscapes, gardens, driveways, public roads and managed public open space. Bushfire hazards likely to pose a risk to future development include classified vegetation within adjacent landholdings surrounding the site to the north, east, south and west as well as the proposed public open space within the north-western portion of the site. The vegetation within surrounding landholdings to the east of Martin Pelusey Road, west and north of the site are subject to future industrial development, however the timing of development is unknown. As outlined above, the outcomes of the BAL assessment (see **Figure 6**) indicates that there is sufficient space within the structure plan to enable future built form to be located in areas subject to a BAL rating of BAL-29 or less, with the majority of the future development areas likely to be subject to a BAL rating of BAL-LOW. Separation from bushfire hazards can be accommodated through the public road network and/or future lot sizes and in lot setbacks. Industrial lots are typically larger lots that will be able to accommodate any setbacks. A portion of the development areas adjoining the eastern, western and southern boundaries of the site and nearby to the public open space may be subject to BAL-FZ and BAL-40, however future lots can be sized to accommodate built form, ensuring it doesn't exceed BAL-29. Vegetation to the west and north of the site is associated with future industrial development and will likely be removed in the long term, whilst the vegetation located immediately to the east of the site will be removed in the future as part of planned upgrades to Martin Pelusey Road. The construction standards pursuant to AS 3959 are unlikely to apply to industrial development within the site unless building classes include Class 1, 2, 3 or 10a buildings. Overall, the acceptable solution can be satisfied for all future built form.	Based on the outlined management measures, future development would be able to comply with and meet the intent of Element 2: Siting and design.
		Yes.	N/A		

Table 4: Summary of bushfire protection criteria and compliance statement (continued)

<table>
<tr><th rowspan="2">Bushfire protection criteria</th><th rowspan="2">Intent</th><th colspan="2">Method of compliance</th><th rowspan="2">Proposed bushfire management strategies</th><th rowspan="2">Compliance statement</th></tr>
<tr><th>Acceptable solution</th><th>Performance principle</th></tr>
<tr><td rowspan="4">Element 3: Vehicular access</td><td rowspan="4">To ensure vehicular access serving a subdivision/ development is available and safe during a bushfire event.</td><td colspan="2">A3.1 Two access routes</td><td rowspan="2">The proposed development will have direct access to Martin-Pelusey Road (via at least two connections), which provides egress opportunities to the north and south, including South Western Highway to the north and Boyanup-Picton Road to the south. Martin Pelusey will also connect to the Bunbury Outer Ring Road (to be constructed in the future), a major regional connector.

The site will also connect to Harris Road to the south, and Columbas Drive to the west, and once development in adjacent landholdings progresses, connection to the north of the site will be available.</td><td rowspan="4">Based on the outlined management measures, future development would be able to comply with and meet the intent of Element 3: Vehicular access.</td></tr>
<tr><td>Yes.</td><td>N/A</td></tr>
<tr><td colspan="2">A3.2 Public road</td><td rowspan="2">The proposed new public roads within the site, can and will comply with the minimum standards outlined in Appendix Four of the Guidelines (WAPC and DFES 2017) or as agreed with the Shire of Dardanup and includes a minimum 6 m-wide trafficable surface. An excerpt of the requirements (from Table 6 of Appendix Four the Guidelines) has been provided below. This can be accommodated through the subdivision process.

Excerpt of Table 6 from Appendix Four of the Guidelines (WAPC & DFES 2017)
<table>
<tr><th>TECHNICAL REQUIREMENTS</th><th>1 Public road</th><th>2 Cul-de-sac</th><th>3 Private driveway</th><th>4 Emergency access way</th><th>5 Fire service access routes</th></tr>
<tr><td>Minimum trafficable surface (m)</td><td>6*</td><td>6</td><td>4</td><td>6*</td><td>6*</td></tr>
<tr><td>Horizontal clearance (m)</td><td>6</td><td>6</td><td>6</td><td>6</td><td>6</td></tr>
<tr><td>Vertical clearance (m)</td><td>4.5</td><td>N/A</td><td>4.5</td><td>4.5</td><td>4.5</td></tr>
<tr><td>Maximum grade <50 metres</td><td>1 in 10</td><td>1 in 10</td><td>1 in 10</td><td>1 in 10</td><td>1 in 10</td></tr>
<tr><td>Minimum weight capacity (t)</td><td>15</td><td>15</td><td>15</td><td>15</td><td>15</td></tr>
<tr><td>Maximum crossfall</td><td>1 in 33</td><td>1 in 33</td><td>1 in 33</td><td>1 in 33</td><td>1 in 33</td></tr>
<tr><td>Curves minimum inner radius (m)</td><td>8.5</td><td>8.5</td><td>8.5</td><td>8.5</td><td>8.5</td></tr>
<tr><td colspan="6">*Refer to E3.2 Public roads: Trafficable surface</td></tr>
</table></td></tr>
<tr><td>Yes</td><td>N/A</td></tr>
</table>

Table 4: Summary of bushfire protection criteria and compliance statement (continued)

Bushfire protection criteria	Intent	Method of compliance		Proposed bushfire management strategies	Compliance statement
		Acceptable solution	Performance principle		
Element 3: Vehicular access (continued from above)	Continued from above.	A3.3 Cul-de-sac (including dead-end-road)		As part of staging of development within the structure plan area, it is possible that one temporary dead-end road may be required within the site (as shown in **Figure 7**). This is associated with the connection to future industrial development to the north of the site, which may not be progressed at the time of development. No lots will need to be serviced by this road and instead are serviced by the loop road network (hence it is a dead-end road) , and a temporary turn-around area is unlikely to be required given the road reserve will be sufficiently wide enough (i.e. 25 m wide) to enable turning of emergency service vehicles. If any temporary or permanent cul-de-sac/dead-end roads are required as part of future planning these will need to comply with Appendix Four of the Guidelines, including: • Have a minimum 6 m-wide trafficable surface and support a minimum weight capacity of 15 tonnes. • Minimise the length of the cul-de-sac/dead-end road (with 200 m the indicated maximum length where no emergency access way is provided). • Provide turn-around areas with a minimum 17.5 m kerb-to-kerb.	Continued from above.
		Yes (temporary)	N/A		
		A3.4 Battle-axe		If battle-axe properties are proposed as part of the development within the site, these will need to comply with Appendix Four of the Guidelines, including minimum width and length requirements and the provision of appropriate turn around areas.	
		Yes	N/A		
		A3.5 Private driveway longer than 50 m		Due to the large lot sizes it is possible that private driveways longer than 50 m may be required as part of the development approval stage. If private driveways longer than 50 m in length are required, they will need to meet the minimum requirements outlined within Table 6 of Appendix Four of the Guidelines, including minimum horizontal and vertical clearance, overtaking bays (of required) and appropriate turn around areas. This can be confirmed at the development approval stage.	
		Yes	N/A		
		A3.6 Emergency access way		Given the proposed structure plan layout provides for egress to at least two different destinations it is unlikely that permanent emergency access ways will be required as part of future development within the site. Temporary emergency access ways may be required as part of staged development and if so, will need to comply with the requirements outlined within Table 6 of Appendix Four of the Guidelines, and as a minimum should have a 6 m-wide trafficable surface suitable for two-wheel drive vehicles.	
		Yes	N/A		

Table 5: Summary of bushfire protection criteria and compliance statement

Bushfire protection criteria	Intent	Method of compliance		Proposed bushfire management strategies	Compliance statement
		Acceptable solution	Performance principle		
Element 3: Vehicular access (continued from above)	Continued from above.	A3.7 Fire service access routes (perimeter roads)		Not applicable. Future development within the site will be provided with appropriate vehicular access, as outlined above, and therefore fire service access routes are not required.	Continued from above
		N/A	N/A		
		A3.8 Firebreak width		Once development is progressed within the site, in accordance with the Shire of Dardanup fire control notice (or as specified by the Shire of Dardanup in accordance with Section 33 of the *Bush Fires Act 1954*), firebreaks are unlikely to be required. Instead industrial zoned landholdings will be required to be managed clear of all flammable matter to a height of no greater than 50 mm.	
		Yes.	N/A		
Element 4: Water	To ensure water is available to the subdivision, development or land use to enable people, property and infrastructure to be defended from bushfire.	A4.1 Reticulated areas		Development is located within an Emergency Services Levy (ESL) Category 5 area, which indicates that bushfire events are responded to by the State Emergency Services (SES) if required and a bush fire brigade. Fire response services require ready access to an adequate water supply during bushfire emergencies. The site will connect with a reticulated water supply and will include fire hydrants installed by the developer to meet the specifications of the relevant water authority (i.e. Aqwest) or the Water Corporation (Design Standard DS 63) and DFES. It is possible that the water pressure may not be sufficient to support fire-fighting requirements within individual lots, and as a result each lot may be required to install additional tank and pump infrastructure for fire-fighting purposes. This will be confirmed as part of future development stages and can be appropriately addressed as part of development approval.	Based on the outlined management measures, future development would be able to comply with and meet the intent of Element 4: Water.
		Yes.	N/A		
		A4.2 Non-reticulated areas		Not applicable.	
		N/A	N/A		
		A4.3 Individual lots within non-reticulated areas (only for use if creating 1 additional lot and cannot be applied cumulatively)		Not applicable.	
		N/A	N/A		

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5.1 Additional management strategies

5.1.1 Future approval considerations

The BAL assessment within this document is considered to be a conservative assessment of potential bushfire risk posed to future built form within the site based on the assumptions outlined in **Section 3** and will be a relevant consideration as part of future development to ensure a BAL rating of BAL-29 oe less is achieved at future built form.

The measures to be implemented through this structure plan and associated future subdivision process have been outlined as part of this BMP and can be used to support future planning and development approval processes. A revised BMP is likely to be required to support any future subdivision applications, particularly if the development layout is different to that outlined within this document, and will need to respond to the subdivision design (and/or stage of development).

No Class 1, 2 or 3 buildings are likely to be constructed within the site based on the typical built form associated with industrial development, and accordingly higher construction standards in accordance with AS 3959 are unlikely to apply.

5.1.2 Landscape management

5.1.2.1 Within the site

Public open space

The existing vegetation within the proposed public open space (located in the north-west corner of the site) will be retained and also revegetated with local native species to support the enhancement of fauna habitat and ecological linkages within the site. This area has been assumed to achieve a forest (Class A) classification, and no future management of this area has been assumed.

Drainage reserves and road reserves

Within the remainder of the site road reserves and drainage reserves are proposed to be landscaped as part of the future development. These areas will be designed to achieve low threat vegetation in accordance with Section 2.2.3.2 of AS 3959. The management of the landscaped areas will be the responsibility of the proponent initially prior to handover to the Shire of Dardanup, with ongoing management likely to include:

- Regular mowing/slashing of grass to a minimum of 100 mm in height or under the Shire of Dardanup's fire control notice less than 50 mm in height (where present).
- Irrigation of grass and garden beds (only temporary establishment irrigation is required prior to handover to the Shire of Dardanup).
- Regular removal of weeds and built up dead material (such as fallen branches, leaf litter etc.).
- Low pruning of trees (branches below 2 m in height removed where appropriate).
- Application/replacement of ground/surface covers such as mulch or non-flammable materials as required.

Future lots

All lots within the site will be managed to a low threat standard by the proponent initially, and once sold this will be the responsibility of applicable landowners in accordance with the relevant BMP and Shire of Dardanup fire control notice (as published).

5.1.2.2 Surrounding the site

Within existing private landholdings

Where indicated as low threat in **Figure 4**, it is assumed that the private landholdings surrounding the site will be managed by the applicable landowners in accordance with the Shire of Dardanup fire control notice (as published) and/or in accordance with existing maintenance regimes.

Existing public road reserves

Where road reserves surrounding the site have been identified as bushfire hazards, no future maintenance of these areas has been assumed.

5.1.3 Shire of Dardanup fire control notice

The Shire of Dardanup releases a fire control notice annually (or as required) to provide a framework for bushfire management within the Shire. The Shire of Dardanup is able to enforce this order in accordance with Section 33 of the *Bush Fires Act 1954* and landowners will need to ensure compliance with the fire control notice, as published, or any directions provided by the Shire of Dardanup.

In particular, in accordance with the fire control notice, industrial areas must slash all flammable material/vegetation (except living trees) to a height of no greater than 50 mm and flammable material must be removed.

5.1.4 Vulnerable or high-risk land uses

It is possible that future industrial land uses within the site may meet the definition of 'high-risk land uses' as provided in Clause 6.6 of SPP 3.7 and the Guidelines, however the specific presence of these land uses will not be known until after subdivision and future lots are sold. Therefore, policy measure 6.6 of SPP 3.7 is not applicable at this stage of the planning process.

However, in consideration of policy measure 6.6 of SPP 3.7, the proposed structure plan layout provides access for emergency evacuation and or response through the proposed public road network, which provide egress to the existing public road network surrounding the site. Industrial land uses typically have larger lots (particularly when compared to standard residential development), which means that future lots will have sufficient area to enable separation between surrounding bushfire hazards and future built form to be accommodated within individual lots if required.

As part of future planning stages, if a high-risk land uses are proposed, the requirements of policy measure 6.6 SPP 3.7 will need to be addressed, including the assessment of bushfire risk and/or the preparation of an emergency evacuation plan and/or risk management plan.

5.1.5 Public education and preparedness

Community bushfire safety is a shared responsibility between individuals, the community, government and fire agencies. DFES has an extensive Community Bushfire Education Program including a range of publications, a website and Bushfire Ready Groups. The DFES publication '*Prepare. Act. Survive.'* (DFES 2014) provides excellent advice on preparing for and surviving the bushfire season. Other downloadable brochures are available from http://www.dfes.wa.gov.au/safetyinformation/fire/bushfire/pages/publications.aspx

The Shire of Dardanup provides bushfire safety advice to residents available from their website https://www.dardanup.wa.gov.au/environment/fire-management/. Professional, qualified consultants also offer bushfire safety advice and relevant services to workers and businesses in high risk areas in addition that that provided in this BMP.

In the case of a bushfire in the area, advice would be provided to future workers/businesses by DFES, the Department of Biodiversity Conservation and Attractions (DBCA) and/or the Shire of Dardanup on any specific recommendations with regard to responding to the bushfire, including evacuation if required. However, it is highly recommended that workers/businesses make themselves aware of their responsibilities with regard to preparing for and responding to a potential bushfire that may impact upon them, their property and their visitors at the time, regardless of the BAL rating the building is subject to.

6 Responsibilities for Implementation and Management of Bushfire Measures

Table 6 outlines the future responsibilities of the proponent (developer) and the Shire of Dardanup associated with implementing this BMP with reference to ongoing bushfire risk mitigation measures for existing land uses (through compliance with the Shire of Dardanup fire control notice) or future mitigation measures to be accommodated as part of the development process. These responsibilities will need to be considered as part of the subsequent development and implementation process.

Table 6: Responsibilities for the implementation of this BMP

Management action	Timing
Developer/landowner	
Provide a copy of this BMP to the relevant decision makers to support approval of the proposed local structure plan.	To support the structure plan approval process.
If required, prepare a new/revised BMP in accordance with SPP 3.7, the Guidelines and AS 3959 to support future subdivision applications, based on the proposed detailed layout and in consideration of existing bushfire hazards or those that will be present following development. In addition, if the assumptions regarding the treatment of the public open space, drainage and road reserves change as part of future detailed design stages, a revised BMP will be required.	To support each future subdivision application.
Where required, and based on the outcomes this BMP or subsequent BMP/s, make spatial provision within the subdivision layout/design to accommodate: • A suitable road network that provides access to at least two different destinations which may include temporary emergency access ways depending upon staging of the subdivision. Public roads should be at least 6 m-wide and consider the minimum requirements of Appendix Four in the Guidelines (or as agreed with the Shire of Dardanup). The proposed structure plan currently supports this requirement. • If cul-de-sacs/dead-end roads, battle axe lots and private driveways longer than 50 m in length are proposed, ensure these meet the requirements outlined in Appendix Four of the Guidelines (if applying an acceptable solution), or as agreed with the Shire of Dardanup. • Ensure future buildings are able to be located so that BAL-29 or less applies. Separation distances should be in accordance with the minimum distances outlined in **Table 3** of this BMP for the corresponding vegetation plot/classification, or as determined in subsequent BMPs/BAL assessments. This may include the provision of public roads and/or managed drainage reserves between built form and bushfire hazards, or by ensuring lots are an adequate depth or width to ensure BAL-29 is not exceeded at future built form.	To support each future subdivision application.
Comply with the Shire of Dardanup fire control order as required.	At all times, where applicable.
Shire of Dardanup	
Maintaining fuel loads in existing public road reserves and public open space (under their management) to appropriate standards to minimise fuel loads (as per current maintenance regimes).	Ongoing, as required.
Monitoring vegetation fuel loads in private landholdings against the requirements of the Shire's fire control order (and/or existing maintenance regimes outlined in this BMP) and liaising with relevant stakeholders to maintain fuel loads at minimal/appropriate fuel levels.	Ongoing, as required.

7 Applicant Declaration

7.1 Accreditation

This BMP has been prepared by Emerge Associates who have been providing bushfire risk management advice for more than seven years, undertaking detailed bushfire assessments (and associated approvals) to support the land use development industry.

Anthony Rowe is a Fire Protection Association of Australia (FPAA) Level 3 Bushfire Planning and Design (BPAD) accredited practitioner (BPAD no. 36690) with over nine years' experience and is supported by a number of team members who have undertaken BPAD Level 1 and Level 2 training and are in the processing of gaining formal accreditation.

7.2 Declaration

I declare that the information provided is true and correct to the best of my knowledge.

Signature:

Name: Anthony Rowe

Company: Emerge Associates

Date: 13th November 2019

BPAD Accreditation: Level 3 BPAD no. 36690

Signature:

Name: Kirsten Knox

Company: Emerge Associates

Date: 13th November 2019

8 References

8.1 General references

Department of Fire and Emergency Services (DFES) 2014, *Prepare. Act. Survive.*, Perth. August 2014.

Department of Planning, Lands and Heritage, (DPLH) 2018, *Picton Industrial Park Southern Precinct - Districts Structure Plan*, Perth.

Ekologica Pty Ltd 2009, *Report on a Level 1 flora and vegetation survey of various lots at Picton East*.

Emerge Associates 2019a, *Local Structure Plan, Lots 103, 110 and 603 Picton East Environmental Assessment Management Strategy*, EP12-039(03)--015 HPB, 1.

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Environmental Protection Authority (EPA) 2008, *Advice on areas of conservation significance in the Preston Industrial Park*, Perth.

Harewood, G. 2009, *Terrestrial Fauna Survey (Level 1) of Lots 1, 2, 11, 102-104 and 603 Picton (East)*, 1.

Standards Australia 2009, *AS 3959-2009 Construction of buildings in bushfire-prone areas*, Sydney.

Western Australian Planning Commission (WAPC) 2015, *State Planning Policy 3.7 Planning in Bushfire Prone Areas*, Perth.

Western Australian Planning Commission (WAPC) 2019, *Waterloo Industrial Park District Structure Plan (draft)*, Perth.

Western Australian Planning Commission and Department of Fire and Emergency Services (WAPC and DFES) 2017, *Guidelines for Planning in Bushfire Prone Areas Version 1.3*, Western Australia. December 2017.

8.2 Online references

Department of Water 2008, *LIDAR derived 1 m elevation contours* dataset, Government of Western Australia.

Landgate 2019, *Locate V5,* viewed October 2019, <https://maps.slip.wa.gov.au/landgate/locate/>

Office of Bushfire Risk Management (OBRM) 2019, *Map of Bush Fire Prone Areas*, viewed October 2019, https://maps.slip.wa.gov.au/landgate/bushfireprone/