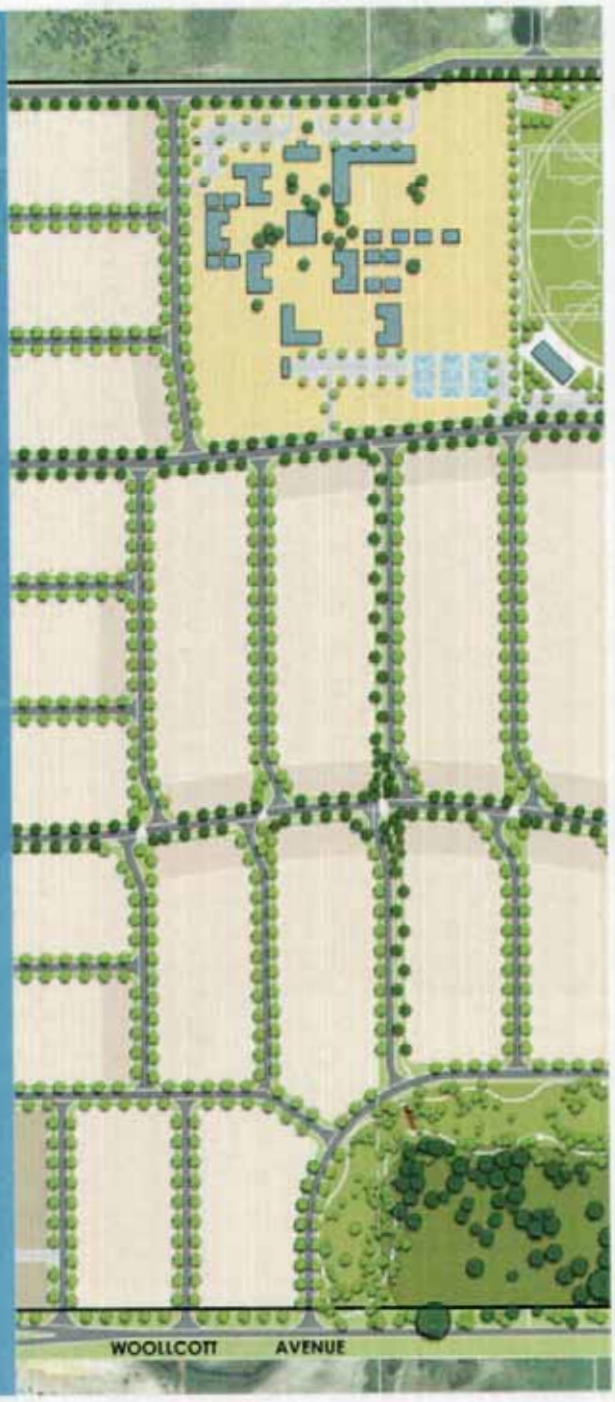
Lots 346 & 347 Woollcott Avenue, Brabham

LOCAL STRUCTURE PLAN 1B



Prepared for Cedar Woods Properties Limited

June 2015

DOCUMENT STATUS

	13/014	Revision	Reviewer	Date Issued
Prepared By:	**Taylor Burrell Barnett Town Planning and Design** 187 Roberts Road SUBIACO WA 6008 Phone: 9382 2911 Fax: 9382 4586 admin@tbbplanning.com.au	0	RC	22.08.13
		1	RC	20.12.13
		2	RC	06.06.14
		3	JF	July 2015
In association with:	**Aurora Environmental** **EPCAD Pty Ltd** **JDA Consultant Hydrologists** **JDSi Consulting Engineers** **Transcore** **FirePlan WA**			

ENDORSEMENT PAGE

This structure plan is prepared under the provisions of the City of Swan Local Planning Scheme No.17

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

14 SEPTEMBER 2015

In accordance with Schedule 2, Part 4, Clause 28 (2) and refer to Part 1, 2. (b) of the *Planning and Development (Local Planning Schemes) Regulations 2015.*

Date of Expiry: **19 OCTOBER 2030**

TABLE OF MODIFICATIONS

Modification Reference Number	Date of Endorsement	Modification Section Number	Modification Description

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

The *Brabham Local Structure Plan 1B* (The 'LSP') has been prepared for Lots 346 and 347 Woollcott Avenue, Brabham by Taylor Burrell Barnett, on behalf Cedar Woods Properties Limited, to guide subdivision and development of the land within the Swan Urban Growth Corridor, in accordance with the *Albion District Structure Plan* (ADSP).

The LSP provides for the predominantly residential use of the land and also sets aside land for public open space (active and passive recreation), a future primary school and a utility reserve to protect the existing Dampier to Bunbury Natural Gas Pipeline. Key Access Roads are also depicted, linking future development within the site with planned development to the north, east and west, in particular. The location of these roads on the LSP is indicative only and will be refined at the subdivision stage, including the provision of additional Local Access Roads.

The LSP (1B) is adjacent to an existing approved *Albion Local Structure Plan 1A* to the west and the proposed *Park Street Local Structure Plan 3A* to the north-east. The following is a summary table of the key statistics and planning outcomes of the LSP.

STRUCTURE PLAN SUMMARY TABLE

Item	Relevant Data	Reference in LSP Report
Total area covered by the LSP	42.1597 hectares	2.2.2
Area of each land use proposed: Residential Utility Primary School	 18.67 hectares 2.2398 hectares 4.50 hectares	 4.2.1 4.4 4.6.1
Estimated lot yield	523 – 656 lots	4.2.2
Estimated number of dwellings	523 – 656 dwellings	4.2.2
Estimated residential site density	12 – 15 dwellings per gross urban hectare 28 – 35 dwellings per site hectare	Table 8
Estimated population (2.68 people per dwelling)	Between 1,401 and 1,758 people	4.2.1
Number of high schools	0 high schools	-
Number of primary schools	1 primary school	4.6.1
Estimated number and % of public open space: Regional open space District open space	 0 hectares, 0% 0 hectares, 0%	 - -
Estimated area and number: neighbourhood parks local parks (credited area within REW buffer)	 3.12 hectares, 1 park 0.6089 hectares, 1 park	 4.3.1 4.3.4
Estimated number and area of natural area and biodiversity assets	2.3345 hectares ('Resource Enhancement' Category Wetland), 1 site	4.3.3

CONTENTS

FIGURES

APPENDICES

PART ONE
STATUTORY SECTION

1 THE STRUCTURE PLAN

1.1 STRUCTURE PLAN AREA

The *Brabham Local Structure Plan 1B* (LSP) shall apply to Lots 346 and 347 Woollcott Avenue, Brabham being the land contained within the inner edge of the line denoting the LSP boundary on the Brabham LSP 1B Map (**Figure 1**). Hereafter within this Report, the land subject to this Local Structure Plan will be referred to as the 'LSP area'.

1.2 STRUCTURE PLAN CONTENT

This LSP Report comprises the following sections:

a) Part 1 – Statutory section

This section contains the structure plan map and statutory planning provisions and requirements.

b) Part 2 – Non-statutory (explanatory) section

This section is to be used as a reference guide to interpret and justify the implementation of Part 1.

c) Appendices – Technical reports and supporting plans and maps.

1.3 INTERPRETATIONS AND SCHEME RELATIONSHIP

Unless otherwise specified in this part, the words and expressions used in this LSP shall have the respective meanings given to them in the City of Swans *Local Planning Scheme No. 17* ('the Scheme') including any amendments gazetted thereto.

Pursuant to *Clause 5A.1.12* of the Scheme:

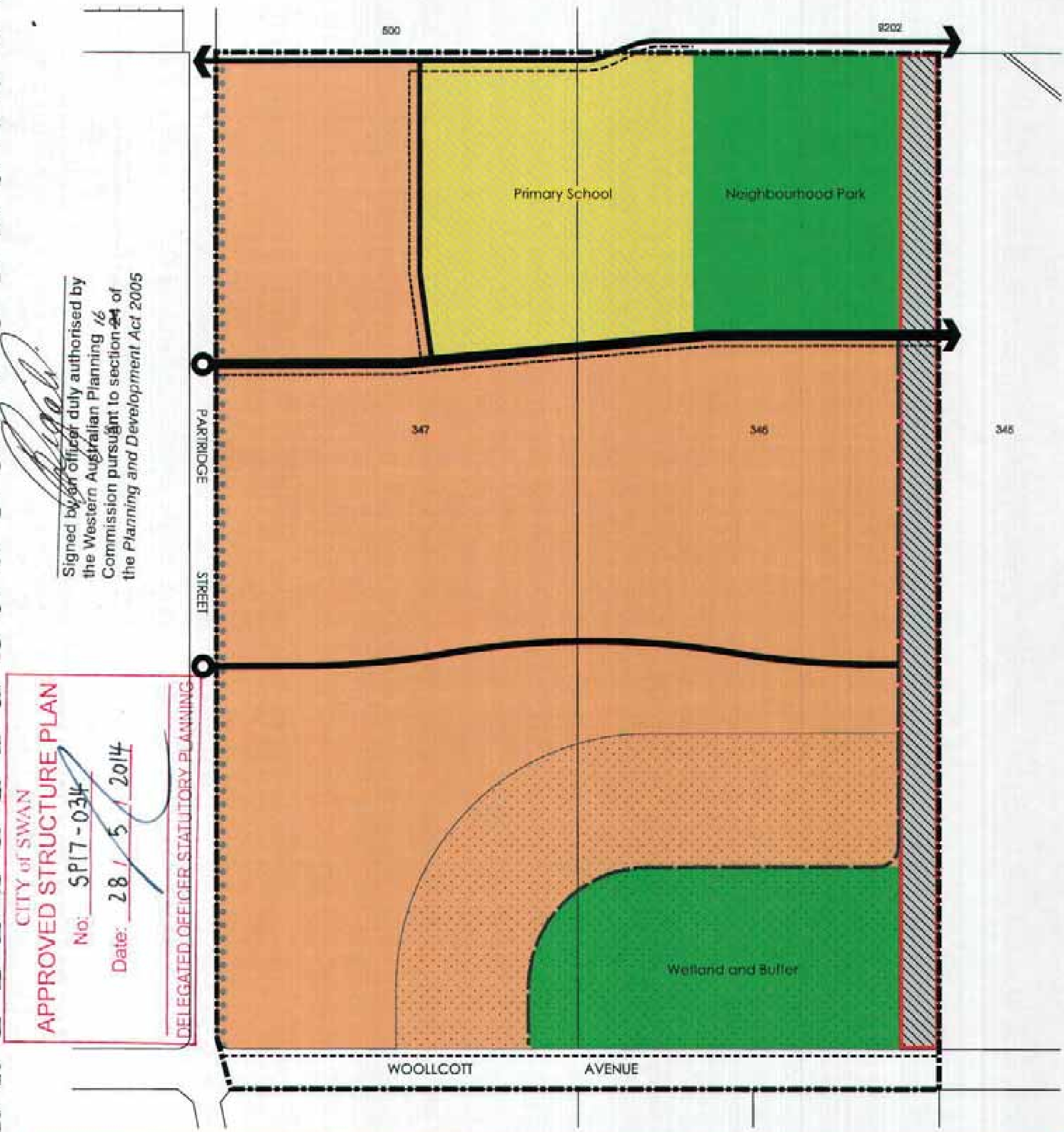
a) The provisions, standards and requirements specified under **Part 1** of this LSP shall have the same force and effect as if they were provisions, standards or requirements of the Scheme. In the event of there being a variation or conflict between the provisions, standards or requirements of the Scheme and the provisions, standards or requirements of this LSP, then the provisions, standards or requirements of the Scheme shall prevail to the extent of the inconsistency.

b) Any other provisions, standards or requirements of **Part 1** of this LSP that are not otherwise contained in the Scheme shall apply to the subject area as though they are incorporated into the Scheme, and shall be binding and enforceable to the same extent as if part of the Scheme; and

c) **Part 2** of this LSP and all appendices are to be used as a reference only to clarify and guide the interpretation and implementation of **Part 1**.

1.4 OPERATION

In accordance with *Clause 5A.1.12.1* of the Scheme, this LSP shall come into operation on the day it is endorsed by the Western Australian Planning Commission (WAPC) pursuant to *Clause 5A.1.12.1 (a)* of the Scheme.



LEGEND

- Local Structure Plan Boundary
- Residential R30/R40*
- Recreation
- Public Purpose - PS (Primary School)
- Public Utilities (DPNGP)
- Neighbourhood Connector
- Key Access Streets (indicative location)
- Shared Paths
- Road Interface
- 4.6m Road Widening
- Roundabouts

Bushfire Management

- Bushfire Prone Area (within 100m of Wetland Vegetation - Indicative Only)

*The allocation of residential densities shall be in accordance with the following criteria:

1) A base density code of R30 shall be provided for all residential lots within the Structre Plan with the exception of those lots coded R40 as set out in 2 below.

2) A medium density code of R40 shall be provided to all lots with a laneway abutting the rear boundary, which are to be located in areas of high amenity and convenience such as adjacent active/passive recreational areas and generally on public transport routes adjacent to Partridge Street.

LOCAL STRUCTURE PLAN

Lots 346 & 347 Woollcott Avenue, Brabham

A Cedar Woods Project

0m 20 40 60m

s: 1:4000@A4
d: 26 Nov 2014
p: 13/014/018J

figure 01

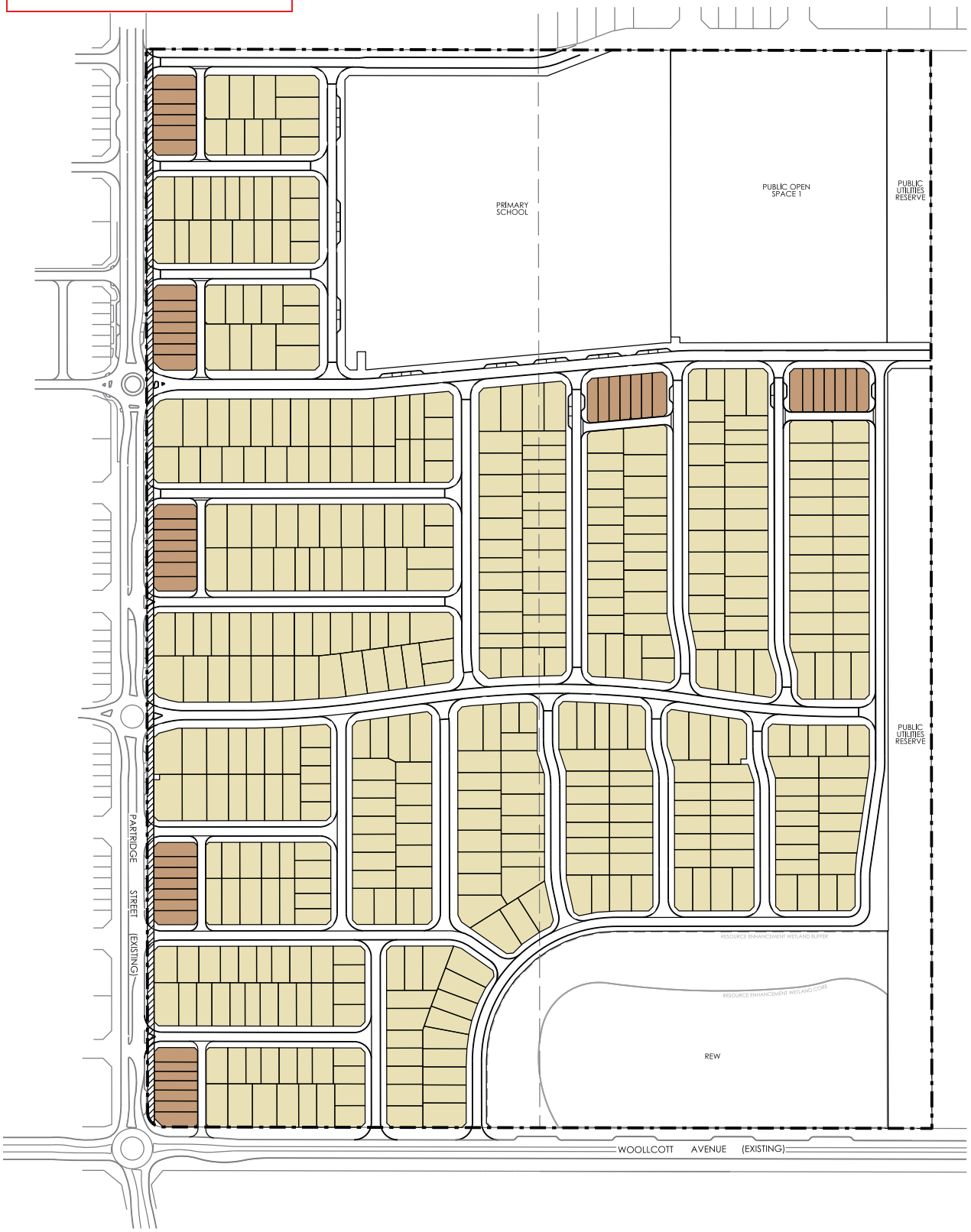
DEPARTMENT OF PLANNING, LANDS AND HERITAGE

DATE	FILE
26-Nov-2018	157063

LEGEND

- RESIDENTIAL R30
- RESIDENTIAL R40

LOT PRODUCT SUMMARY	No.
LANEWAY (R40)	48
FRONT LOADED LOTS (R30)	442



Residential Density Code Plan

LOTS 346 & 347 WOOLLCOTT AVENUE, BRABHAM
A CEDAR WOODS PROJECT

plan: 13/014/075A | designed: JF
date: 04/01/2018 | checked: RC
projection: PCG 94 | drawn: BR
scale: 1:4000@A4 | 1:2000@A2
0 40 80m

Taylor Burrell Barnett Town Planning & Design
187 Roberts Road Subiaco Western Australia 6008
p: (08) 9382 2911 f: (08) 9382 4586 e: admin@tbbplanning.com.au

1.5 LAND USE AND SUBDIVISION REQUIREMENTS

The LSP Map (**Figure 1**) outlines the land use, zones and reserves applicable within the LSP area. The zones and reserves designated under this LSP apply to the land within it as if the zones and reserves were incorporated into the Scheme.

The following land use zones and reserves are provided for in the LSP:

TABLE 1: PROPOSED LSP LAND USES

Zones	Reserves
Residential	Recreation Public Purpose – PS (Primary School) Public Utilities (DBNGP)

Key access roads are also shown where they link existing and future development areas. The location of these roads is indicative only and will be subject to confirmation and approval at the subdivision stage.

1.5.1 LAND USE PERMISSIBILITY IN RESIDENTIAL ZONE

Land use permissibility within the LSP area shall be in accordance with the Zoning Table at Part 4.3 of the Scheme relating to "Residential" zoned land, except for the following additional use classes as identified in **Table 2**:

TABLE 2: ADDITIONAL LAND USES AND SCHEME PERMISSIBILITY

Use Class	Permissibility
Car Park	D
Display Home Centre	D
Residential Sales Office	D

The following definitions shall apply in relation to the above:

> ***"Display Home Centre"*** *– means a single dwelling or group of two or more dwellings, and incidental car parking which is intended to be open for public inspection as examples of dwelling design.*
>
> ***"Residential Sales Office"*** *– a building of either temporary or permanent nature, and incidental car parking, used directly in relation to the sale of land and dwellings in new residential estates.*

1.5.2 RESIDENTIAL DENSITY

i) Figure 1 defines the split residential density codes that apply to the Structure Plan. Lot specific residential densities, within the defined split coding, are to be subsequently assigned in accordance with a Residential Code Plan approved by the Western Australian Planning Commission.

ii A Residential Code Plan is to be submitted at the time of subdivision to the Western Australian Planning Commission and shall indicate the R-Code applicable to each lot within the subdivision and shall be consistent with the Structure Plan, and the split coding identified on Figure 1 and the locational criteria.

iii) The Residential Code Plan is to include a summary of the proposed dwelling yield of the subdivision.

iv) Approval of the Residential Code Plan shall be undertaken at the time of determination of the subdivision application by the Western Australian Planning Commission. The approved Residential Code Plan shall then form part of the Structure Plan and shall be used for the determination of future development applications.

v) Variations to the Residential Code Plan will require further approval of the Western Australian Planning Commission, with a revised Residential Code Plan submitted generally consistent with the approved plan of subdivision issued by the Western Australian Planning Commission. The revised Residential Code Plan shall be consistent with the split coding identified on Figure 1 and the locational criteria.

vi) A revised Residential Code Plan, consistent with (v) above will replace, wholly or partially, the previously approved Residential Code Plan, and shall then form part of the Structure Plan as outlined in (iv) above.

vii) Residential Code Plans are not required if the Western Australian Planning Commission considers that the subdivision is for one or more of the following:

- the amalgamation of lots;
- consolidation of land for "superlot" purposes to facilitate land assembly for future development;
- the purposes of facilitating the provision of access, services or infrastructure; or
- land which by virtue of its zoning or reservation under the Structure Plan cannot be developed for residential purposes.

LOCATIONAL CRITERIA

The allocation of residential densities shall be in accordance with the following criteria:

1) A base density code of R30 shall be provided for all residential lots within the Structure Plan with the exception of those lots coded R40 as set out in 2 below.

2) A medium density code of R40 shall be provided to all lots with a laneway abutting the rear boundary, which are to be located in areas of high amenity and convenience such as adjacent active/passive recreational areas and generally on public transport routes adjacent to Partridge Street.

The Residential Code Plan forming part of this Structure Plan shall indicate the R-Code applicable to each lot in accordance with the locational criteria.

Subdivisions are to achieve a minimum residential density of 22 dwellings per site hectare in accordance with the density targets set out in the Albion District Structure Plan (ADSP).

1.5.3 RESERVE FOR EDUCATION – PRIMARY SCHOOL

Unless otherwise advised by the Department of Education and agreed by the WAPC, the 4.5 hectare future primary school site as denoted on the LSP Map (**Figure 1**) shall be ceded free of cost to the Crown as a reserve for 'Public Purposes – Primary School' at subdivision stage.

The City of Swan, upon the advice of the Department of Education, may recommend to the WAPC that the area of the primary school site is reduced following a variation to this LSP pursuant to *Clause 5A.1.14* of the Scheme.

1.5.4 PUBLIC OPEN SPACE RESERVES

The provision of a minimum of 10% Public Open Space (POS) shall be provided in accordance with the WAPC's *Liveable Neighbourhoods*. POS shall be provided generally in accordance with the LSP Map (**Figure 1**) and **Table 3**, with an updated POS Schedule to be provided at the time of subdivision for determination by the WAPC upon advice of the City of Swan.

The Neighbourhood Park is a community infrastructure item subject to development contributions in the *Development Contribution Plan DCA 1 – Brabham (Albion)* (as amended). Accordingly, the Neighbourhood Park shall be deducted from the gross subdividable area and a pro-rata contribution to the three neighbourhood parks and the local community centre site identified with the Brabham (Albion) DCP shall be included in the POS calculation.

TABLE 3: PUBLIC OPEN SPACE SITES

POS Site	Size (Ha)
Neighbourhood Park	3.12
Resource Enhancement Wetland (REW)	2.3345
REW Buffer	1.2884

The Neighbourhood Park as noted in **Table 3** and depicted on the LSP Map (**Figure 1**) is to be shown as a proposed reserve on the first plan of subdivision of land within the LSP area. The WAPC, on the advice of the City of Swan, may require as a condition of the first subdivision approval for the creation of lots within the LSP area:

i. the proposed reserve being shown on the first deposited plan as a reserve for 'Recreation' and vested in the Crown; and

ii. the proposed reserve being provided with frontage to a constructed road connected to the local road system.

1.5.5 UTILITIES/INFRASTRUCTURE RESERVE

Unless otherwise determined by the Western Australian Planning Commission, the land comprising the existing Dampier to Bunbury Natural Gas Pipeline (DBNGP) easement within Lot 346 as depicted on the LSP Map shall be ceded to the Crown as a 'Reserve for Utilities' and vested with the Department of Lands.

The WAPC, on the advice of the City of Swan and/or relevant utilities service provider, may require as a condition of subdivision approval the preparation and approval of an AS2885 Qualitative Risk Assessment plan in accordance with WAPC guidelines and/or approved methodologies, to be implemented as part of the subdivisional works to the specifications of the WAPC and/or relevant utilities service provides (APA Group).

1.5.6 PARTRIDGE STREET ROAD WIDENING

In accordance with the *Albion District Structure Plan*, Partridge Street is a planned Integrator Arterial B road with a reserve width of 29.2 metres, and is subject to a 4.6 metre road widening to the east, as depicted on the LSP Map (**Figure 1**), at the time of subdivision.

1.5.7 BUSHFIRE MANAGEMENT

The 'Resource Enhancement' category wetland and wetland buffer and all land within 100 metres of the boundary of the 'Resource Enhancement' category wetland buffer as indicated on the LSP Map (**Figure 1**) is declared a 'Bushfire Prone Area' for the purpose of the *Local Planning Scheme No.17* (LPS17) and the *Building Code of Australia*.

Notwithstanding any statement to the contrary within the *Australian Standard – Construction of Buildings in Bushfire Prone Areas* (AS3959-2009) (or equivalent), any Class 1, 2, or 3 building or Class 10a building or deck associated with a Class 1, 2, or 3 building to be erected on residential lots within the 'Bushfire Prone Area' as declared in this LSP shall comply with the requirements of *AS3959-2009* (or equivalent).

The WAPC, on the advice of the City of Swan and/or the Fire and Emergency Service Authority (FESA), may require as a condition of subdivision approval the preparation and approval of a Bushfire Management Plan to the specifications of the City of Swan and/or FESA.

1.6 DETAILED AREA PLANS

The preparation of a Detailed Area Plan (DAP) in accordance with *Clause 5A.1.15* of the Scheme may be required by the WAPC on advice from the City of Swan as a condition of subdivision approval for land comprising, but not limited to:

- Lots smaller than 350m^2;
- Areas where variations to site coverage and setbacks are required to facilitate target densities;
- Lots abutting POS areas where applicable; and
- Narrow/Laneway lots that require special considerations to be set.

1.7 OTHER REQUIREMENTS

Prior to any subdivision or development of the land being supported, the following management plans, reports and strategies are to be prepared, as applicable, to the satisfaction of the relevant authority and provided at the relevant submission stage nominated in **Table 4.**

TABLE 4: MANAGEMENT PLANS, REPORTS AND STRATEGIES

Documentation	Submission Stage	Approving Authority
Urban Water Management Plan	Prepared as a condition of subdivision.	CoS
Bushfire Management Plan	Prepared as a condition of subdivision as required by the WAPC on the advice of the City of Swan.	CoS
Landscaping Plan	Documented in LSP, and prepared/approved as a condition of subdivision approval as required.	CoS
Traffic and Transport Management Strategy	Documented in LSP, to be further refined in conjunction with subdivision.	CoS
Acid Sulphate Soils Management Plan	Prepared/approved as a condition of subdivision approval as required by the WAPC on the advice of the Department of Environment Regulation.	DER
AS2885 Qualitative Risk Assessment	Prepared/approved as a condition of subdivision approval as required by the WAPC on the advice of the City of Swan and/or relevant utilities service provider.	APA Group
Construction Management Plan	Prepared/approved as a condition of subdivision approval as required by the WAPC on the advice of the City of Swan.	CoS

1.7.1 DEVELOPER CONTRIBUTIONS

Land within the LSP area is within Development Contribution Area 1 (DCA 1) as identified in the Scheme Map and Schedule 13 of the Scheme (as amended), and the *Development Contribution Plan DCA 1 - Brabham (Albion)* (as amended) should be read in conjunction with this LSP.

A landowner shall be liable to make a cost contribution at the time and in the circumstances contemplated in Part 5A.2 of the Scheme (as amended), and this will be imposed as a condition of subdivision or development approval, generally whichever is granted first.

PART TWO
EXPLANATORY INFORMATION

2 PLANNING BACKGROUND

2.1 INTRODUCTION AND PURPOSE

The *Brabham Local Structure Plan 1B* has been prepared by Taylor Burrell Barnett Town Planning & Design (TBB) on behalf of Cedar Woods Properties Ltd (the 'developer') acting for Eucalypt Property Pty, a wholly owned subsidiary of Cedar Woods Properties Ltd (the 'landowners'), in relation to Lots 346 and 347 Woollcott Avenue, Brabham (collectively hereafter referred to as the 'site').

The site forms part of the *Albion District Structure Plan* (ADSP) which was endorsed by the WAPC on 15 December 2010. The ADSP has been divided into three Local Structure Plan areas, being LSP 1, LSP 2 and LSP 3. The site is located within the LSP 1 area. The ADSP provides the necessary land use and reporting framework for future local structure planning and subdivision approvals. The design of the LSP, including provision of facilities and infrastructure, is consistent with the intention of the area as outlined in the ADSP.

Key areas within the LSP are also addressed, including the Resource Enhancement Wetland (REW) in the southern portion of the site. A *Wetland Management Plan* has been prepared for the whole of the REW and associated REW buffer, to ensure that development will not have a detrimental impact on the environmental integrity of this feature, notwithstanding its current degraded state. The LSP also provides an efficient and useable design response with regards to the interface of the two gas pipelines located in close proximity to the eastern boundary.

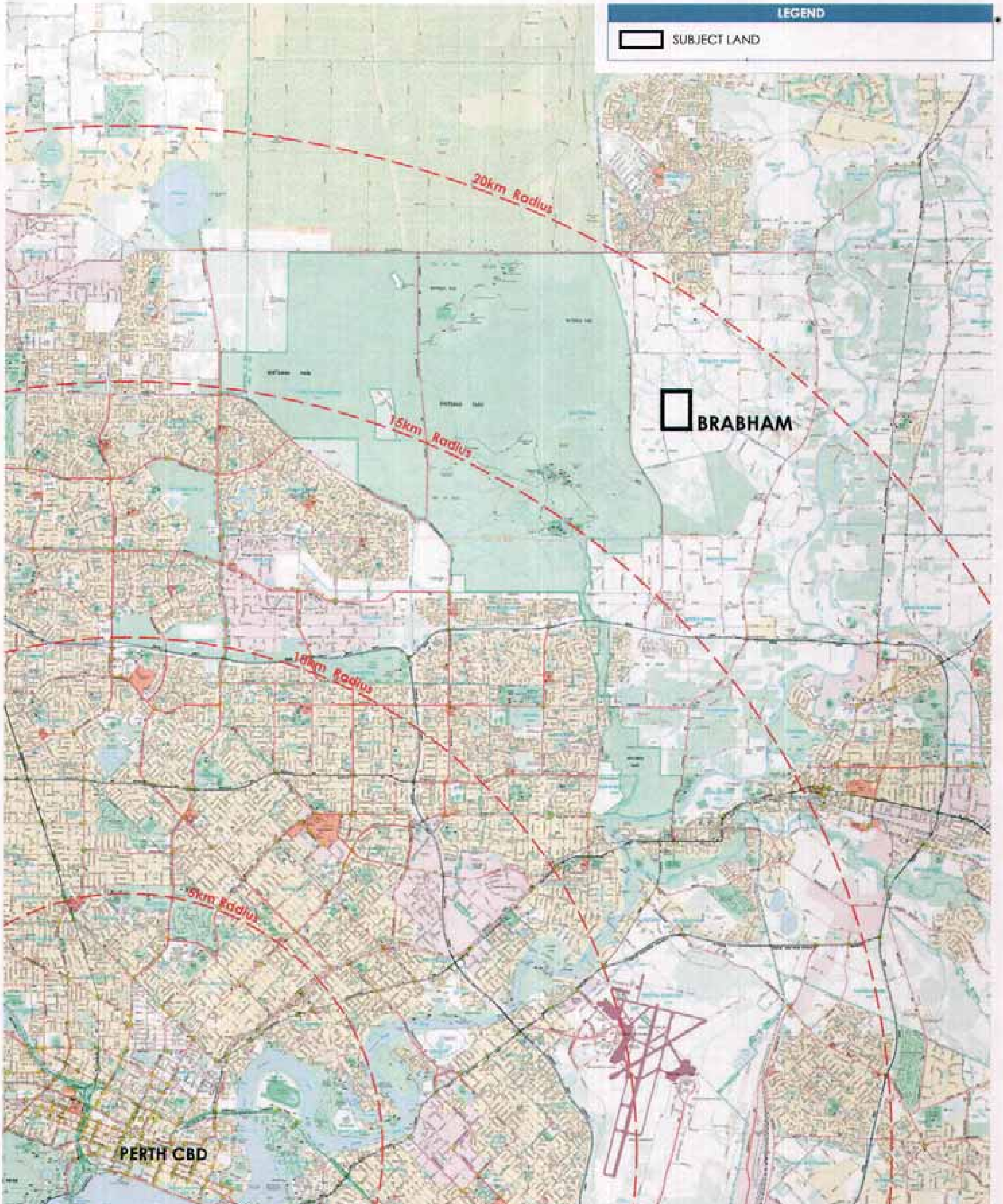
This Report details the sites location, physical characteristics and context with adjacent and surrounding landholdings, noting it confirms the LSP will not compromise the development potential of the balance of the LSP 1 area, and is consistent with proper and orderly planning for the locality.

2.2 LAND DESCRIPTION

2.2.1 LOCATION

LOCAL SETTING

The site is located immediately north of Woollcott Avenue and to the east of the recently constructed Partridge Street extension. Undeveloped land surrounds the site to the north and east. **Figure 2 – Location Plan** indicates the location of the site relative to the Perth Metropolitan area and the Midland Regional Centre. The site's location in the context of existing surrounding development is shown in **Figure 3 – Local Context**, noting Whiteman Park, a 4,000 ha bushland area, is located approximately 1 km to the west on the opposite side of Lord Street. **Figure 4 – Existing Site Plan** shows the lot boundaries of the site, existing features, and relevant cadastre and contour detail.



LOCATION PLAN

Lots 346 & 347 Woollcott Avenue, Brabham

A Cedar Woods Project

s: 1:100,000@A4
d: 18 June 2013
p: 13/014/011

figure 02

LOCAL CONTEXT PLAN

Lots 346 & 347 Woollcott Avenue, Brabham

A Cedar Woods Project

0m 100 200 300m

s: NTS@A4
d: 16 July 2013
p: 13/014/021A

figure 03

EXISTING CADASTRAL PLAN

Lots 346 & 347 Woollcott Avenue, Brabham

A Cedar Woods Project

0m 20 40 80m

s: 1:4000@A3
d: 12 July 2013
p: 13/014/019

figure 04

REGIONAL SETTING

The site is located within the 'Swan Urban Growth Corridor' approximately 20kms north-east of Perth Central Business District (CBD) and approximately 7.5 km northwest of the Midland Regional Centre. The site is fully within the jurisdiction of the City of Swan.

Figure 5 – Opportunities and Constraints Plan demonstrates the existing features on the site, surrounding uses and development opportunities and constraints (existing and proposed) that require specific consideration in the design of the LSP. In particular, the REW and REW buffer, the gas pipeline utility corridor, the future primary school, the neighbourhood park as reflected in the ADSP, and drainage flows and other surrounding influxes from planned future development, are identified.

2.2.2 LEGAL DESCRIPTION AND OWNERSHIP

The LSP comprises two major landholdings, with a combined area of 40.5394 ha. The relevant property and ownership details are provided in **Table 5** as follows:

TABLE 5: LEGAL DESCRIPTION

Ownership	Street Address	Lot Number	Plan	Volume	Folio	Area (ha)
Eucalypt Property Pty Ltd	226 Woollcott Avenue, Brabham	346	4560	1404	359	20.2722
Eucalypt Property Pty Ltd	254 Woollcott Avenue, Brabham	347	4560	1389	783	20.2672

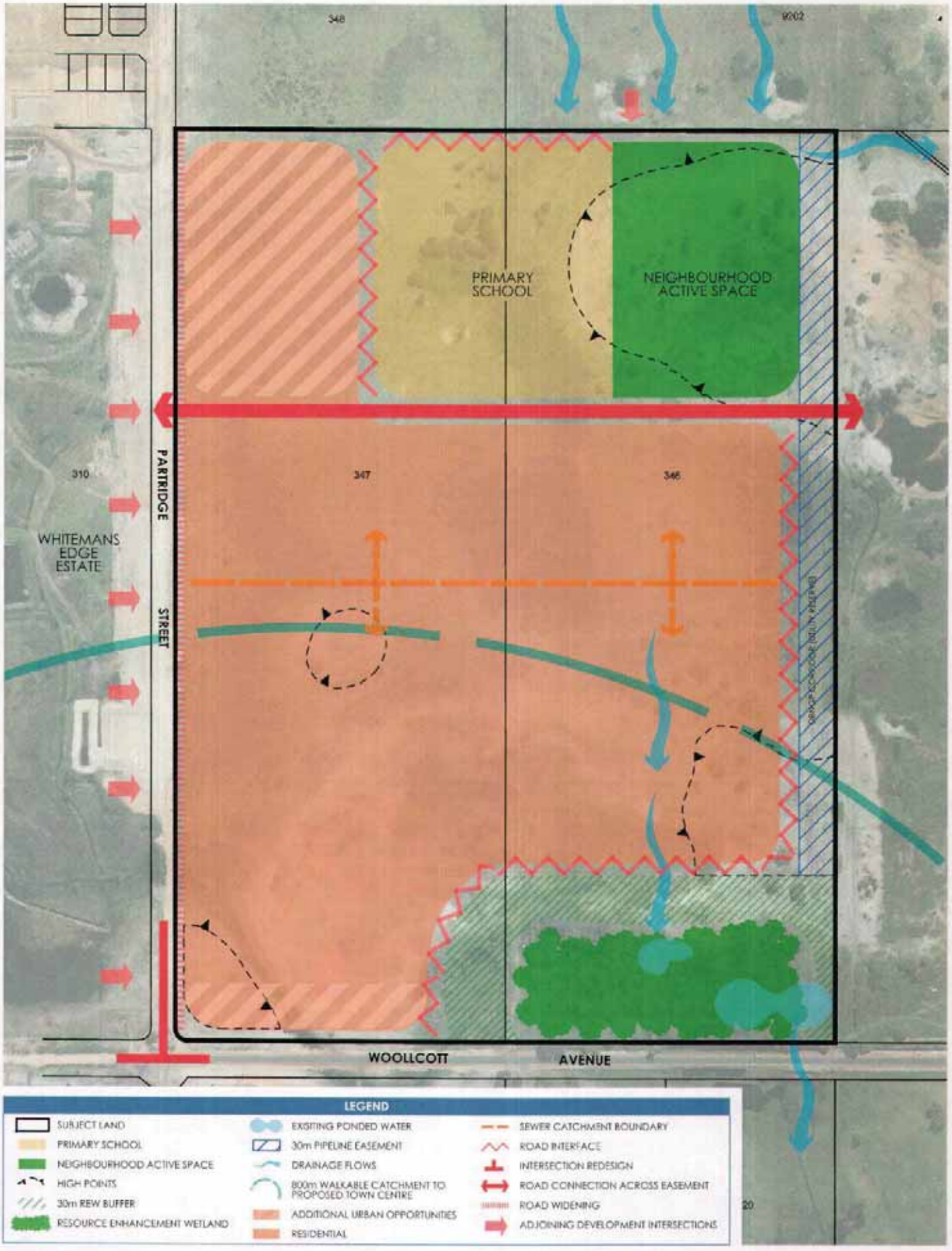
A copy of the *Certificate of Title* for each lot is included within **Appendix A**.

2.2.3 AREA AND LAND USE

The site is predominantly cleared, although it does not appear to have been used for any intensive rural or grazing purposes in recent years, noting the land was in the ownership of the City of Bayswater for some time prior to being purchased by the landowner. It is understood the site has been used by the City of Bayswater for sand extraction in the past, however this use appears to have ceased some time ago.

Based on a review of historical aerial photos for the site, it appears that much of the clearing of Lots 346 and 347 occurred between the mid-1950s and the mid-1960s, although there is evidence in the 1953 photo indicating that a drain was constructed to drain the REW. The drain is visible at the eastern end of the REW.

Whilst historically the land would have had a predominant rural purpose, the size of the lots and the fragmented ownership of the surrounding area, in addition to the areas known development potential has seen many of the lots in the area 'land banked' for future development and subsequently under-utilised. Given the intentions for the land, noting its location in the 'Swan Urban Growth Corridor', the site is considered a 'greenfield' site suitable for urban development.



OPPORTUNITIES AND CONSTRAINTS PLAN

Lots 346 & 347 Woollcott Avenue, Brabham

A Cedar Woods Project

0m 20 40 60m

s: 1:4000@A4
d: 12 Aug 2013
p: 13/014/017A

figure 05

The 2.3ha portion of the REW in the LSP is designated by the Department of Parks and Wildlife as UFI 8805 or by Hill et al (1996) as Wetland 127.

It is proposed to rehabilitate and restore the REW, including the surrounding REW buffer in accordance with the recommendations of various environmental reporting contained within both the ADSP and the LSP. A 35m wide (average) buffer is provided, between the edge of the REW and the adjacent road reserve.

Two gas pipelines run north/south in close proximity to the eastern boundary of the site. Whilst both have been considered within the LSP design, only one is located on site. The *Dampier to Bunbury Natural Gas Pipeline* (DBNGP) is currently protected via a 30m easement running the full length of the eastern boundary of the site. To ensure its ongoing protection and management, it is proposed to encompass the pipeline easement area in a Utility Reserve.

Adjoining lots to the north and east are presently rural in character, with similar characteristics to the site, noting this land is also identified for future urban purposes. To the west, residential subdivision is currently under construction, noting the construction and widening of Partridge Street is being undertaken by the adjoining developer in accordance with existing subdivision approvals.

2.2.4 DISTRICT STRUCTURE PLAN CONTEXT AND RELATIONSHIP WITH ADJOINING DEVELOPMENT

The site sits within the area denoted on the ADSP as 'LSP 1', which is effectively bounded by Park Street to the north, Lord Street to the west, Youle-Dean Road to the south and (generally along) the Dampier to Bunbury Natural Gas Pipeline corridor to the east. Two other LSP areas are shown on the ADSP, to the south (LSP 2) and east (LSP 3) respectively. A series of smaller local structure plans, have been, or are in the process of being prepared for the LSP 1 area, consistent with the development intentions of the ADSP.

Precedence within the ADSP has been for larger land holdings to develop individual LSPs in accordance with the objectives of the various land owners within the area, their development timeframes and the associated delivery schedule of supporting infrastructure. The initial LSP 1A relating to the Whiteman's Edge development only provides the necessary local development context over a small portion of the LSP 1 area, as does the St Leonard's Estate LSP and the future development for pertaining to Terranovis' land holding of LSP 3A. The LSP areas as denoted on the ADSP are therefore noted for what they are, effectively an indicative line on a District Structure Plan.

In considering the context and extent of LSP 1B, TBB considered the development of a standalone LSP to be appropriate in this instance. Given the limited detail and land use diversity (residential only) provided by the ADSP across Lot 348 to the north, and the stated development intentions of the landowner, LSP 1B has been designed to facilitate future development of this lot in the future. In due course this lot will provide its own LSP, noting the broad parameters of the ADSP, which have been reflected by both LSP 1B and the proposed *Park Street LSP 3A* currently being assessed by the City.

Having met with the landowner and their representatives, continuing the current approach previously adopted for surrounding LSP's sits comfortably with all parties involved, given this landowner has previously undertaken a partial LSP fronting Park Street, has indicated they are unable to provide a development timeframe at this point and is unwilling to commit funds towards the future studies required at this point in time.

The advancement of development for LSP 1B, will not have a detrimental impact to the remaining undeveloped land, most notably Lot 348, as supported by the *Traffic Assessment*, *Local Water Management Strategy* and *Service Report* prepared as a requirement of this LSP.

2.3 PLANNING FRAMEWORK

2.3.1 ZONING AND RESERVATIONS

CITY OF SWAN LOCAL PLANNING SCHEME NO. 17 (THE SCHEME)

The site is zoned 'Special Use – Albion' under the provisions of the City's *Local Planning Scheme No. 17* (the Scheme). **Figure 6 – Local Planning Scheme No. 17** shows the current zoning of the site and surrounding landholdings.

Schedule 4 of the Scheme relating to the zone requires the preparation and approval of a District Structure Plan (DSP) and Local Structure Plan prior to the subdivision and development of future urban land. The requirement for a DSP has been satisfied through the preparation and approval of the ADSP, adopted by the City on 4 February 2009 and by the WAPC on 15 December 2009.

Schedule 4 also requires certain environmental reporting to be satisfied prior to the land being available for subdivision and development. These requirements been addressed through the various technical reports that have been prepared for both the ADSP and the LSP. In summary the following environmental reports are required:

- Acid Sulphate Soils Management Plan;
- Urban Water Management Plan;
- Wetland Management Plan;
- Construction Management Plan; and
- Bushfire Management Plan.

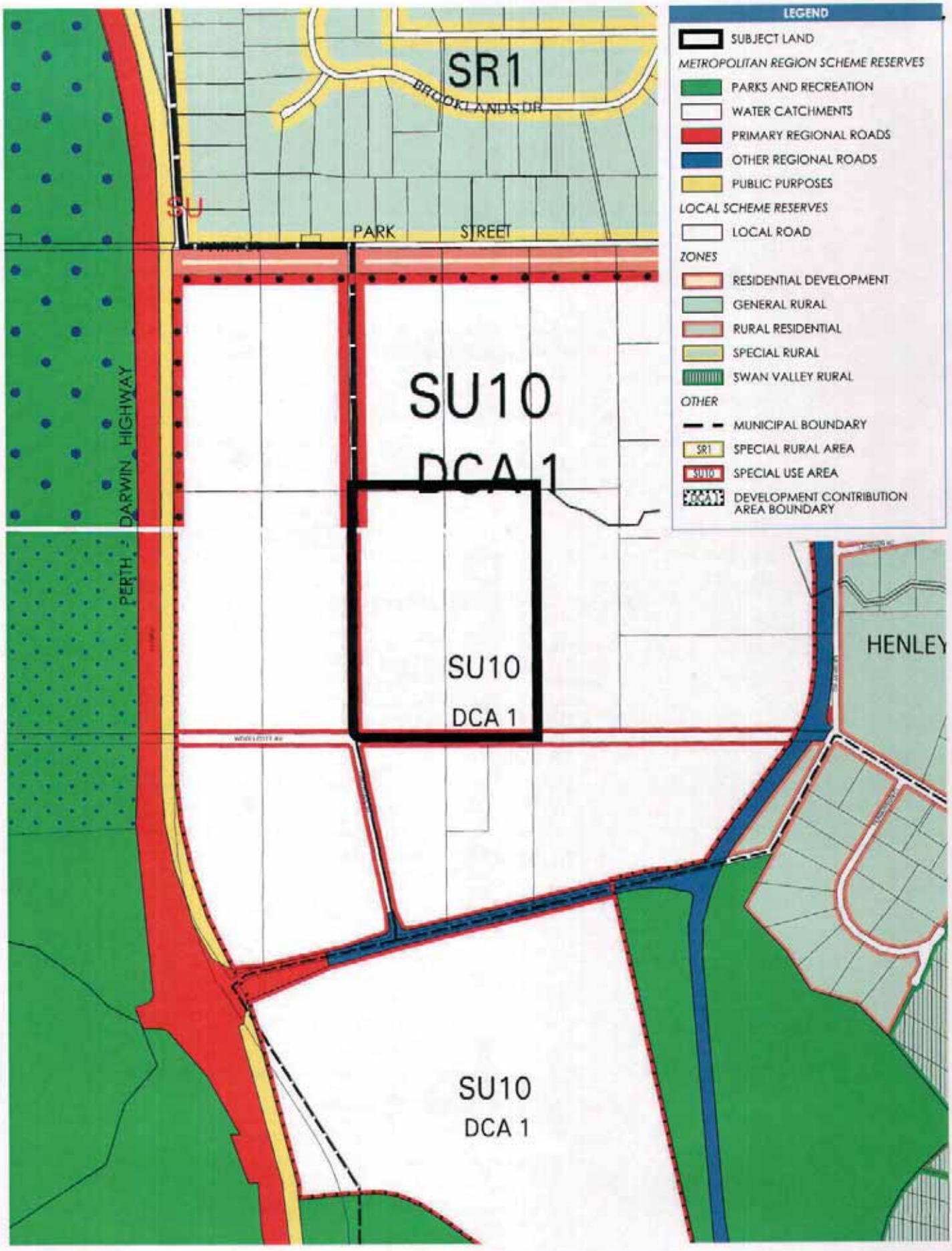
As detailed within **Part 1**, the above reports have been listed for provision at various stages of the development of the site, consistent with the expectations of the Scheme.

2.3.2 REGIONAL AND SUB-REGIONAL STRUCTURE PLANNING

METROPOLITAN REGION SCHEME

The *Metropolitan Region Scheme* (MRS) is the statutory land use planning scheme for the Perth Metropolitan Region. The principal functions are to reserve and zone land and control development on reserved and zoned land. The MRS reflects the agreed strategic direction for land within the metropolitan region and is a catalyst for changes to planning controls at the local level and subsequent local area planning.

The site is zoned 'Urban' under the MRS as reflected in **Figure 7 – Metropolitan Region Scheme (MRS)**, with the intention being to facilitate urban development subject to appropriate structure planning and subdivision design.



CITY OF SWAN LOCAL PLANNING SCHEME No. 17

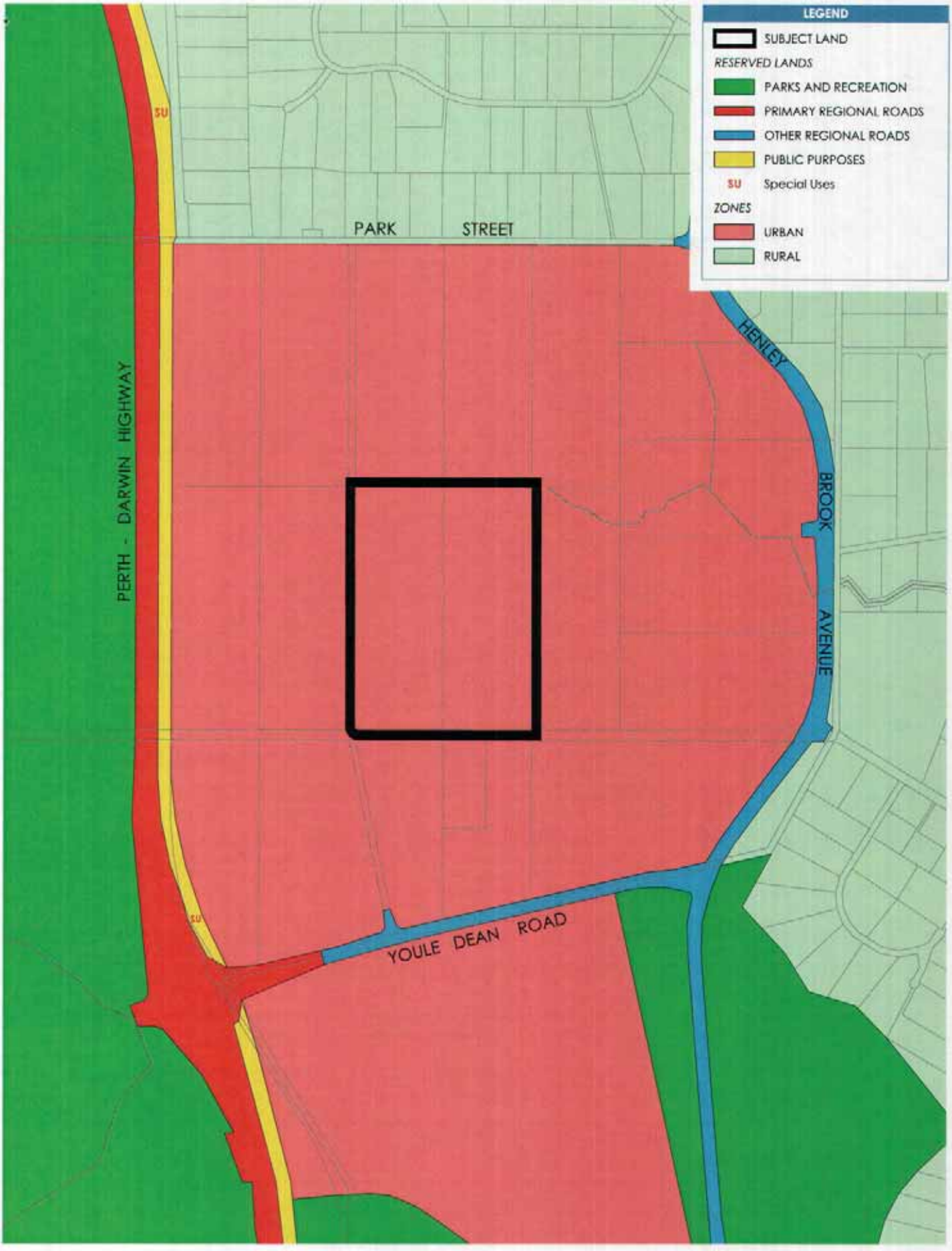
Lots 346 & 347 Woollcott Avenue, Brabham

A Cedar Woods Project

0m 100 200m

s: 1:15,000@A4
d: 16 July 2013
p: 13/014/013A

figure **06**



METROPOLITAN REGION SCHEME
Lots 346 & 347 Woollcott Avenue, Brabham
A Cedar Woods Project

0m 100 200m
s: 1:15,000@A4
d: 26 June 2013
p: 13/014/016

figure **07**

SWAN URBAN GROWTH CORRIDOR SUB-REGIONAL STRUCTURE PLAN

In accommodating the expected future population growth of the Perth Metropolitan Region, in particular the 1,100 ha future urban growth cells of Henley Brook/Albion, West Swan and Caversham, the *Swan Urban Growth Corridor Sub-Regional Structure Plan* (the 'Sub-Regional Structure Plan') was jointly prepared by the Department of Planning, City of Swan, landowners and relevant government agencies.

The *Sub-Regional Structure Plan* was adopted in February 2009 and is a strategic document that aims to guide urban development within a 14 km urban growth corridor linking Midland/Guildford with Ellenbrook. Located approximately 20 km from the Perth CBD, this urban corridor is planned to provide a 12,500 new dwelling units and more than 33,000 new residents and as such will accommodate a significant proportion of the demand for new dwellings and associated infrastructure within the Perth Metropolitan Region.

Figure 8 – Swan Urban Growth Corridor Sub-Regional Structure Plan reflects the proposed planning intentions of the Sub-Regional Structure Plan.

2.3.3 ALBION DISTRICT STRUCTURE PLAN (ADSP)

In accordance with Schedule 4 of the Scheme, the ADSP was prepared to guide future land use and development within Henley Brook (Albion). The ADSP was endorsed by the WAPC in December 2009 and provides a land use and reporting framework for future local structure planning and subdivision applications.

The site, in the context of the ADSP, is depicted in **Figure 9 – Albion District Structure Plan (ADSP).**

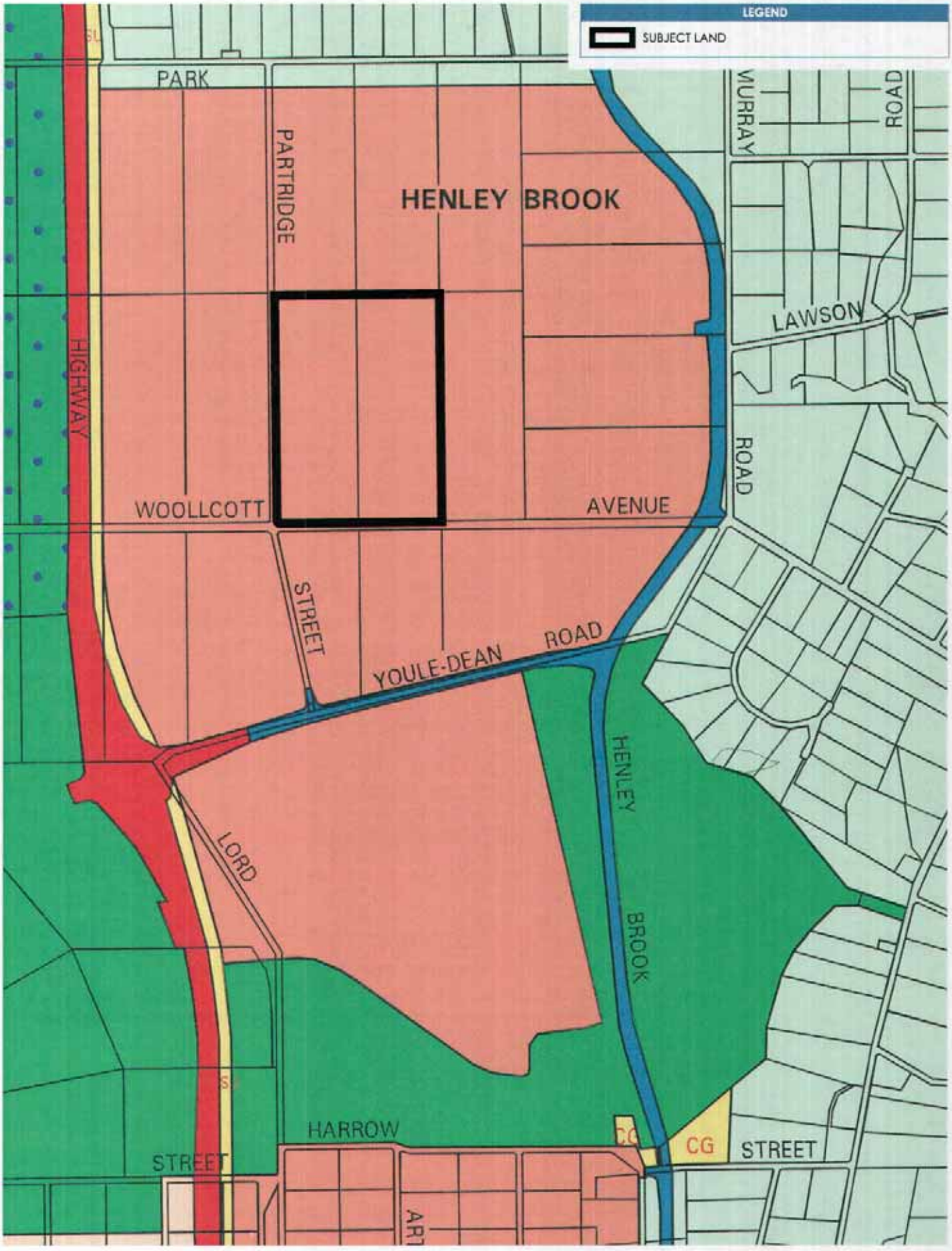
KEY DEVELOPMENT PRINCIPLES

The key development principles of the ADSP, relevant to this LSP as detailed within *Section 3.1 – Development Principles* of the ADSP Report are shown in italics below and grouped according to context as follows:

STRATEGIC PLANNING

- *Provide a framework for urban land uses within the District Structure Plan area that integrates with the Sub Regional context.*
- *Respond to the social and economic needs of the community in a timely way.*
- *Provide a framework for future Local Structure Planning and subdivision, allowing for refinement of detail and recognition of previous uses.*

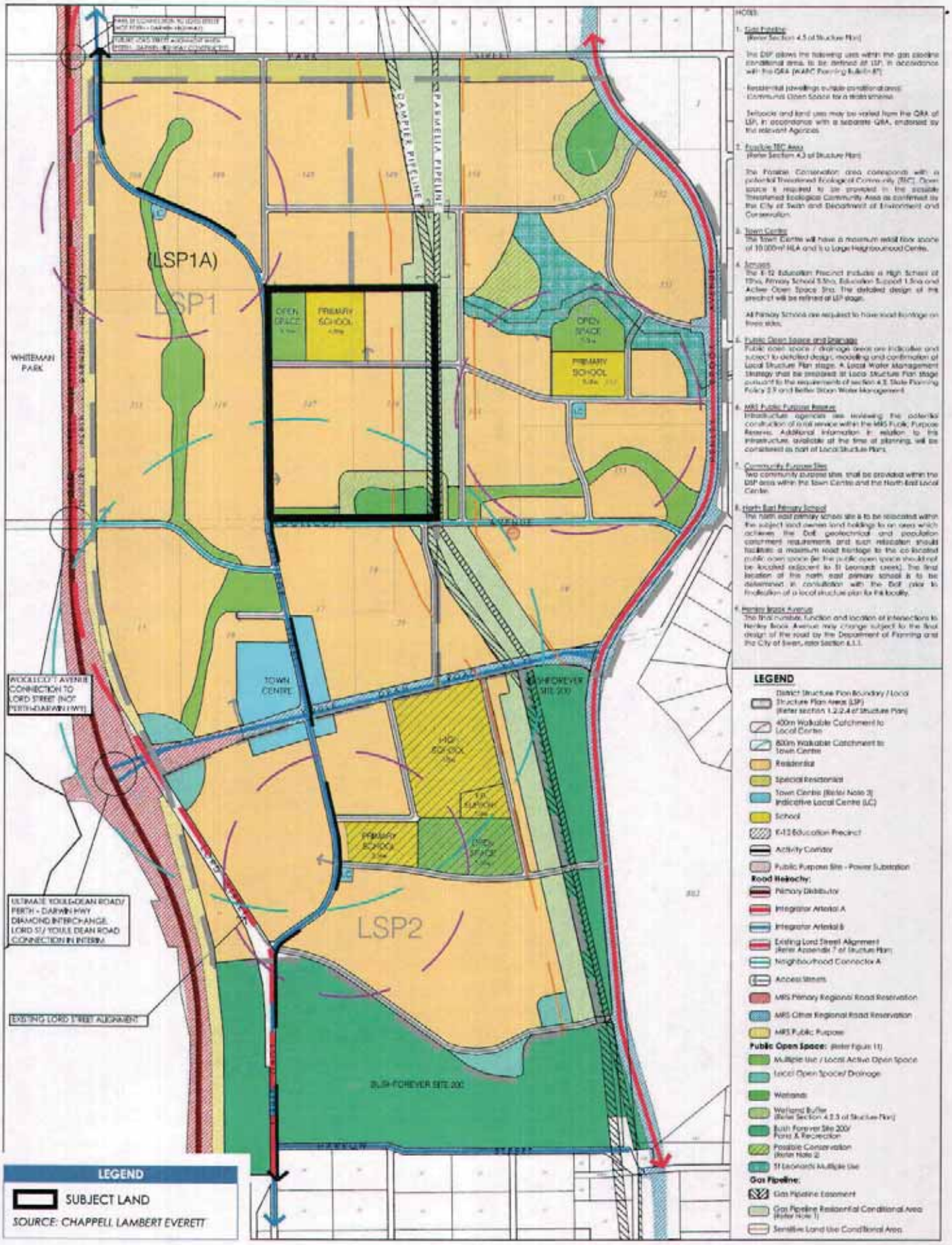
The LSP is consistent with the planning framework and land use allocation as shown on the ADSP. The provision of a range of housing typologies and community facilities will facilitate the proper and orderly planning of the location, consistent with the expectations of the ADSP during future stages of the development process.



SWAN URBAN GROWTH CORRIDOR
SUB-REGIONAL STRUCTURE PLAN
Lots 346 & 347 Woollcott Avenue, Brabham
A Cedar Woods Project

s: NTS@A4
d: 26 June 2013
p: 13/014/015

figure
08



ALBION DISTRICT STRUCTURE PLAN

Lots 346 & 347 Woollcott Avenue, Brabham

A Cedar Woods Project

s: NTS@A4
d: 19 June 2013
p: 13/014/012

figure 09

BUILT FORM

- *Provide for a variety of housing choice through a range of densities, predominately at an R30 density with higher codings (up to R60) within and around the neighbourhood centre and other nodes.*
- *Provide for sustainable land use and lot design that responds to solar orientation principles as well as Crime Prevention through Environmental Design.*

Consideration against various density targets has shaped the lot design and overall LSP layout, noting those areas of higher density within this LSP (R40) are typically provided in areas of higher amenity or in areas with high connectivity to main streets. The design of dwellings fronting community facilities and areas of public open space will be controlled via future detailed area plans, to maximise passive surveillance opportunities, whilst the road network has been deliberately provided with a high level of connectivity to provide informal surveillance of urban areas by passing motorists.

COMMUNITY

- *Provide integrated Primary and High School sites that meet the needs of the catchment.*

The educational needs of the LSP 1 catchment as detailed within the ADSP have been met via the provision of the proposed primary school site, noting an indicative design of both the primary school and the co-located neighbourhood park has been undertaken to demonstrate the efficiencies and compatibility of the two land uses.

ENVIRONMENTAL

- *An integrated open space, conservation and drainage network, balancing environmental, recreational and drainage objectives.*

The LSP has been designed to ensure environmental objectives of the ADSP are met, by utilising various protection and rehabilitation techniques within the REW, and ensuring this provides both a (passive) recreational and drainage function. The neighbourhood park meets the active recreational needs of future residents, consistent with the broader intentions of the ADSP. The LSP seeks to ensure multiple benefits are achieved across the site and areas of intrinsic and environmental values are retained.

MOVEMENT

- *Define a robust road network reflecting and accommodating public and private transport priorities, responding to the Sub Regional transport network.*
- *Reflect and integrate the development area with surrounding land uses.*

The LSP provides connectivity with existing movement corridors, and facilitates connections to surrounding landholding earmarked for future development. The connections provided are as per the ADSP intentions and locations, ensuring the proposed street network can easily integrate and access the various land uses within the wider growth corridor.

2.3.4 PLANNING STRATEGIES

WAPC DIRECTIONS 2031 AND BEYOND – SPATIAL PLANNING FRAMEWORK FOR PERTH AND PEEL (DIRECTIONS 2031)

Directions 2031, the WAPC's strategic planning framework document for Metropolitan Perth and Peel, is a high level strategic plan that establishes a vision for the future growth of the Perth and Peel regions. It guides the detailed planning and delivery of housing, infrastructure and services necessary to accommodate population growth noting there are specific density targets identified for various areas dependant on where likely growth pressures will occur in the future.

Directions 2031 seeks a 50% increase in the current average residential density of 10 dwellings per gross urban hectare in the north-east metropolitan sub-region and has subsequently set a residential density target of 15 dwellings per gross urban hectare of land in new development areas. The LSP provides a density of range, dependant on the breakdown and percentages of future lot sizes, of between 12 and 15 dwellings per gross urban hectare noting the following:

- The density yield is skewed, noting the site is severely limited in its ability to provide a high density and associated yield given the requirements to provide or retain the REW, a primary school, a neighbourhood park, and the gas pipeline utility corridor as shown on the ADSP. This is an unusual amount of undevelopable land associated with a single urban development parcel.

Noting the requirements of the ADSP and *Liveable Neighbourhoods*, calculations have also been undertaken based on the yield per site hectare. Both the aforementioned documents make reference to a yield of 22 dwelling units per site hectare. The development achieves a yield of between 28 and 35 dwellings per site hectare.

LIVEABLE NEIGHBOURHOODS

Liveable Neighbourhoods (2007, WAPC) operates as a neighbourhood design code, to facilitate the development of sustainable communities and is used in the design and assessment of structure plans (at various levels) and subdivisions in the metropolitan area, on both greenfield and urban infill sites.

Liveable Neighbourhoods was prepared to implement the objectives of the *State Planning Strategy*, which aimed to guide sustainable development within Western Australia up until 2029. The LSP has been prepared taking into consideration the guiding planning principles and design elements of *Liveable Neighbourhoods*. An assessment against the principles of *Liveable Neighbourhoods* has been included within **Part 4.2.4** of this Report.

STATE SUSTAINABILITY STRATEGY

The proposal is consistent with the guiding principles and priorities for action outlined in the *State Sustainability Strategy* which seeks to achieve simultaneous environmental, social and economic improvements. It assists in managing urban growth by providing future residents with access to an urban form which will engender a strong sense of community with services, employment and recreational opportunities in close proximity.

The LSP achieves multiple sustainability objectives, guided by the ADSP which provides an established planning framework for the development of future urban growth, complemented by an array of land use, economic, environmental and community opportunities.

PLANNING FOR BUSHFIRE PROTECTION GUIDELINES

The *Planning for Bushfire Protection Guidelines (*the 'Bushfire Protection Guidelines') seek to ensure that bushfire hazards are considered at all stages of the planning process to avoid undue fire risk to life and property. The guidelines have been prepared in accordance with *Clause 6* of *State Planning Policy 3.4 Natural Hazards and Disasters* (SPP 3.4) and seek to ensure long term fire safety from any retained vegetation, or from vegetation on surrounding land which may pose risk to future resident safety.

Despite the previous use of the site for sand extraction, which has rendered large portions of the site void of vegetation, the *Bushfire Protection Guidelines* should nevertheless be considered during the LSP and subdivision stages of the development particularly considering the retention of the vegetation within the REW and REW buffer. By identifying potential bushfire hazards and ensuring adequate separation from potential hazards is provided through appropriate design, the future risk to both life and property can be significantly reduced. In addition to the *Bushfire Hazard Assessment* (refer to **Appendix B**), a *Bushfire Management Plan* (BMP) will be subject to confirmation and approval at the subdivision stage, which will detail future specific fire mitigation and protection strategies within the LSP.

2.3.5 CITY OF SWAN POLICIES

URBAN GROWTH POLICIES

As a means of supporting the proposed urban growth strategy, the City has prepared and adopted an urban growth policy package, incorporating the urban growth policy, the neighbourhood planning policy, the environmental planning policy and the community and economic planning policy. In summary, these policies contain objectives for structure plans including (although not limited to):

- responding to the social and economic needs of the community;
- encouraging innovation and best practices in urban design and environmental management;
- taking a partnership approach with government, non-government and other landowners in the urban growth corridor in respect to land use and water management;
- providing choice and affordability in housing;
- creating safe and convenient access;
- encouraging an identifiable sense of place;
- minimising the impact on the natural environment;
- minimising energy, infrastructure and water costs; and
- ultimately ensuring that the urban growth contributes to sustainable urban communities.

From a community perspective the above policy suite identifies the purposes and requirements for community and economic development planning, which are to be undertaken simultaneously with the preparation of structure plans, development plans and/or major development proposals.

Key community facilities include educational establishments (i.e. primary and high schools), whilst key economic facilities include commercial centres (both local and neighbourhood centres) and mixed business precincts. The LSP provides a primary school site for future community purposes, noting there are no economic facilities provided as the *Sub-Regional Structure Plan* and the ADSP do not identify any land requirement for this particular use.

Noting the above, the endorsed *Development Contribution Plan* sets out the district and sub-regional facilities that will be required at the broader level and a contribution from the developer will be subject to confirmation and approval at the subdivision stage.

In addition, a pro-rata contribution will be required from surrounding developers by the Department of Education for future educational sites. This is discussed in greater detail later in this Report.

CONSULTATION WITH ADJOINING LANDOWNERS

It is a requirement of developers to demonstrate an acceptable level of consultation with surrounding landowners to ensure that the relevant landowners impacted by a structure plan proposal have been informed of the Plan components, implementation, staging and subsequent financial contributions. As part of the preparation of the LSP, the preliminary meetings were held with the majority of landowners adjoining the LSP area. A list of the parties liaised with, and a summary of the discussion points is included in **Appendix C – Pre-Lodgement Consultation Schedule**.

FINANCIAL ASSESSMENT REPORT

The above policy also requires developers prepare a *Financial Assessment Report* that needs to estimate the lifecycle costs for new and existing infrastructure (where required) and for provision, management, operation and renewal of such infrastructure, The *Financial Assessment Report* is required to provide details on the provision of:

i. *Public and civic open space systems;*
ii. *Environmental and water management systems;*
iii. *Transport networks and pathways;*
iv. *Community facilities and services;*
v. *Public utilities;*
vi. *Any associated studies required for later stages of planning and monitoring;*
vii. *Any other items the City considers relevant to the proper and orderly planning and development of the Structure Plan area.*
viii. *Detailed costings will be subject to confirmation at the subdivision stage.*

In addition to the above, the policy also requires the equitable provision of various items identified for collective provision, notably those facilities listed in the City's DCP. **Section 4.11 – Developer Contribution Arrangements** of this Report details the future DCP arrangements.

STRUCTURE PLANNING AREAS – SUBDIVISION AND DEVELOPMENT (DRAFT POLICY)

This draft policy aims to ensure that the design of proposed Structure Plans is undertaken in a co-ordinated and integrated manner to provide the optimal development outcome. The information provided within the draft policy is intended to ensure applicants clearly understand the expectations of the City with respect to the preparation of structure plans and to ensure endorsed structure plans present data and information in a consistent format.

It is understood the policy has never progressed past the point of public advertising. Notwithstanding the draft nature of the policy, its intent has been considered in the preparation of the LSP. For the purposes of this LSP report, the structure and content has been prepared in accordance with the WAPC's adopted *Structure Plan Preparation Guidelines* (August 2012) which will be applied by the WAPC in the assessment of all new Structure Plans submitted to Local Government on or after the 5 November 2012.

The LSP has been prepared in accordance with the above WAPC guidelines.

PUBLIC OPEN SPACE (INTERIM POLICY)

This interim policy details the relevant standards and requirements of the City in relation to the provision of POS in residential areas. Whilst the policy provides useful standards and clarification of certain expectations, the more relevant policy is the WAPC's *Development Control Policy 2.3 – Public Open Space in Residential Areas* (DC 2.3) and *Element 4 – Public Parkland* of *Liveable Neighbourhoods*. The policy specifies particular design requirements and minimum standards which will be reflected in a future *Landscaping Plan*, subject to confirmation and approval at the subdivision stage.

The provision of POS in the LSP complies with DC 2.3 and *Liveable Neighbourhoods* and will be designed to meet relevant City standards.

BUILDING AND DEVELOPMENT STANDARDS – RESIDENTIAL ZONES

This policy prescribes various building and development standards applicable to all development within the Residential and Residential Development Zones and ensures that the development of land within residential areas is consistent with the principles of proper and orderly planning.

The detailed design of future subdivision proposals will be in accordance with the requirements of *Liveable Neighbourhoods*, whilst the design of future residential dwellings will be in accordance with the requirements of the R-Codes, and the DAP provisions identified in **Part 1** of this Report.

3 SITE CONDITIONS AND CONSTRAINTS

3.1 BIODIVERSITY AND NATURAL AREA ASSETS

An environmental assessment of the site conducted by Aurora Environmental confirmed that the site is almost completely degraded as a result of previous land uses which have included agriculture (presumably grazing by livestock) and small scale sand extraction. These uses have significantly impacted upon the structure and composition of native vegetation on the site.

In a draft Environmental Review, Ecoscape (2006) reported that a flora and vegetation survey of the ADSP area confirmed that three vegetation types were present on the site, being:

- Degraded areas which occupied the vast majority of the site;
- Banksia/Eucalypt woodland located on a sand dune in the north-east portion of the site; and
- *Melaleuca rhaphiophylla* and *Melaleuca preissiana* Woodland associated with the REW.

Ecoscape (2006) mapped the vegetation condition on the site ranging from 'Completely Degraded' to 'Good'. Areas of good quality vegetation were associated with the REW and a small pocket of remnant *Melaleuca* woodland in the north-west corner of the site. The area associated with the Banksia/Eucalypt woodland in the north-east of the site was mapped as degraded. The balance (and majority of the site) was mapped as being completely degraded.

Aurora Environmental conducted a site assessment in July 2013 to review the vegetation condition mapping. The vegetation mapping by Ecoscape (2006) for the most part is considered appropriate. However, the area of Banksia/Eucalypt Woodland in the north-east of the site is now considered to be completely degraded and the small remnant of *Melaleuca* Woodland in the north-west portion of the site is now considered to be degraded.

A botanist undertook a site assessment of the REW to record the flora present. The assessment was conducted on 22 July 2013. A total of 42 taxa were recorded with only nine species being native and the remaining 33 species being introduced. None of the native species recorded are threatened or priority listed taxa.

Based on the condition of the vegetation remaining within the site, it is highly unlikely that any of the remnant vegetation is represents a threatened ecological community, nor is it likely to host any threatened or priority flora. Similarly, the highly degraded vegetation on the site offers extremely limited habitat for fauna. A fauna assessment conducted by Bamford (1996) concluded that the northern portion of the ADSP would only support a depleted fauna assemblage. With this in mind, the likely significance of the site for conservation significant fauna is considered extremely low.

In the context of the site, the REW is considered the most significant area from a conservation perspective. This view was supported by Bamford (1996), noting that the REW is likely to provide some habitat for waterbirds and amphibians.

3.2 VEGETATION AND FLORA

3.2.1 BIOGEOGRAPHICAL INFORMATION

The site is located in the Swan Coastal Plain biogeographical region, one of 89 bioregions recognized under the Interim Biogeographic Regionalisation for Australia (IBRA). There are two sub-regions in the Swan Coastal Plain bioregion, these being SWA01 (Dandaragan Plateau) and SWA02 (Perth).

The site is located in SWA02 which is a low-lying coastal plain mainly covered by woodlands. It is dominated by Banksia and Jarrah or Tuart on sandy soils, *Casuarina obesa* on outwash plains and paperbark in swampy areas.

3.2.2 BEARD VEGETATION MAPPING

The site is located in the South West Botanical Province and the Darling Botanical District. This region typically consists of forest country with related woodlands and is divided into four sub-regions or botanic districts.

The site is located in the Swan Coastal Plain sub-region in the Drummond Botanical sub-district and is mapped as comprising a mosaic, medium forest comprising Jarrah-Marri/low woodland of Banksia/low forest of tea tree/low woodland of *Casuarina obesa* (Beard Vegetation Association 1018).

3.2.3 VEGETATION COMPLEX

Heddle *et al.* (1978) mapped the area as containing one Swan Coastal Plain vegetation complex, this being the Southern River Complex: Open Woodland of *Corymbia calophylla – Eucalyptus - Banksia* spp with fringing woodland of *E. rudis – Melaleuca rhaphiophylla* along creek beds.

The Environmental Protection Authority's (EPA) document *Levels of Assessment for Proposals Affecting Natural Areas within System 6 Region and Swan Coastal Plain Portion of the System 1 Region* (EPA, 2006) gives an estimate of the percentage of each complex that remains compared to its pre-European settlement extent, so an estimate of the scarcity of each complex can be determined.

On the Swan Coastal Plain, 19.8% of the Southern River Complex is estimated to remain (EPA, 2006).

3.2.4 VEGETATION TYPES

There have been numerous flora and vegetation studies conducted in the ADSP area. The flora and vegetation mapping included within the draft Environmental Review prepared by Ecoscape (2006) shows the subject site as predominantly degraded. Within the description of degraded, Ecoscape (2006) described the following vegetation types:

- Cleared areas comprising pasture grasses and weeds where agricultural activity is, or was predominant;

- *Xanthorrhoea brunonis* over weeds – areas that have been cleared in the past. Includes a cover of moderately dense *Xanthorrhoea sp.* with occasional trees of *Melaleuca preissiana, Eucalyptus rudis* or *Corymbia calophylla.* Weeds dominate the ground layer including *Ehrharta calycina, Ehrharta longifolia, Romula rosea, Ursinia anthemoides, Hypochaeris glabra, Aira caryophyllaceus* and *Arctotheca calendula;*
- Sedgeland of *Juncus pallidus* on large, low-lying cleared areas of the northern parcel.

Of the above vegetation types, the majority of the subject site is best described as Cleared areas comprising pasture grasses and weeds. There are scattered remnants of *Melaleuca preissiana* and *Juncus pallidus* on low-lying areas of the subject site.

An additional two vegetation types were mapped by Ecoscape (2006) on the subject site, these being:

- Eucalyptus/Banksia woodland – Over-storey composition of this community varied considerably across the site and included species such as Banksia attenuata, B. menziesii, B. grandis, B. ilicifolia, Corymbia calophylla, Eucalyptus marginata, E. todtiana, Allocasuarina fraseriana and Nuytsia floribunda.
- Melaleuca rhaphiophylla and M. preissiana woodland – Over-storey of Melaleuca rhaphiophylla and occasional Melaleuca preissiana on streamlines and freshwater wetlands. Under-storey species dominated by Juncus pallidus.

Ecoscape (2006) reported that the under-storey and herb layer of the *Eucalyptus/Banksia* woodland was diverse. However, Aurora noted that the area mapped as *Eucalyptus/Banksia* woodland on Lot 346 has been substantially degraded such that there is no under-storey and very few remnant trees remaining. The *Melaleuca rhaphiophylla/M. preissiana* woodland is restricted in the southern portion of the site and is associated with a REW (UFI 8805). However, the under-storey is mostly dominated by weed species.

Vegetation types across the ADSP were originally mapped by Ecoscape (2006) and have since been verified for the site by Aurora Environmental as shown within **Figure 10 – Vegetation Type**.

3.2.5 VEGETATION CONDITION

Previous land uses have significantly impacted upon the structure and composition of native vegetation on the site. The portion of the REW that is located on site was originally mapped as being in 'Good' condition. However, a recent site assessment concluded that for the most part, the vegetation condition assigned by Ecoscape (2006) is appropriate; however some areas within the REW are 'Completely Degraded' and 'Degraded to Good'. Revised and updated vegetation mapping is presented within **Figure 11 – Vegetation Condition**.

3.2.6 FLORA

A spring flora and vegetation survey has not been conducted within the REW. However, a site inspection recorded a total of 42 species of flora in the wetland area, including nine native species and 33 introduced species. The number of introduced species is reflective of the historical use which has led to substantial degradation of the REW's ecological values. For this reason, it is considered a spring survey is not warranted as it is highly unlikely that there are conservation significant taxa present in the REW.

3.3 FAUNA

A fauna habitat assessment of the ADSP was originally undertaken by Bamford (1996). The assessment comprised desktop research including a review of relevant literature and surveys conducted in the region. The findings from the desktop research phase were supplemented by a site assessment which reviewed the fauna habitats present in the ADSP and recorded opportunistic sightings of fauna that were present at the time of the inspection. The site assessment did not involve any trapping.

Bamford (1996) concluded that the northern two-thirds of the ADSP was substantially degraded and as such would only support a depleted fauna assemblage. The REW was identified as an area of habitat that would potentially be utilised by waterbirds and other avifauna and amphibians.

3.3.1 FAUNA HABITAT AND HABITAT CONDITION

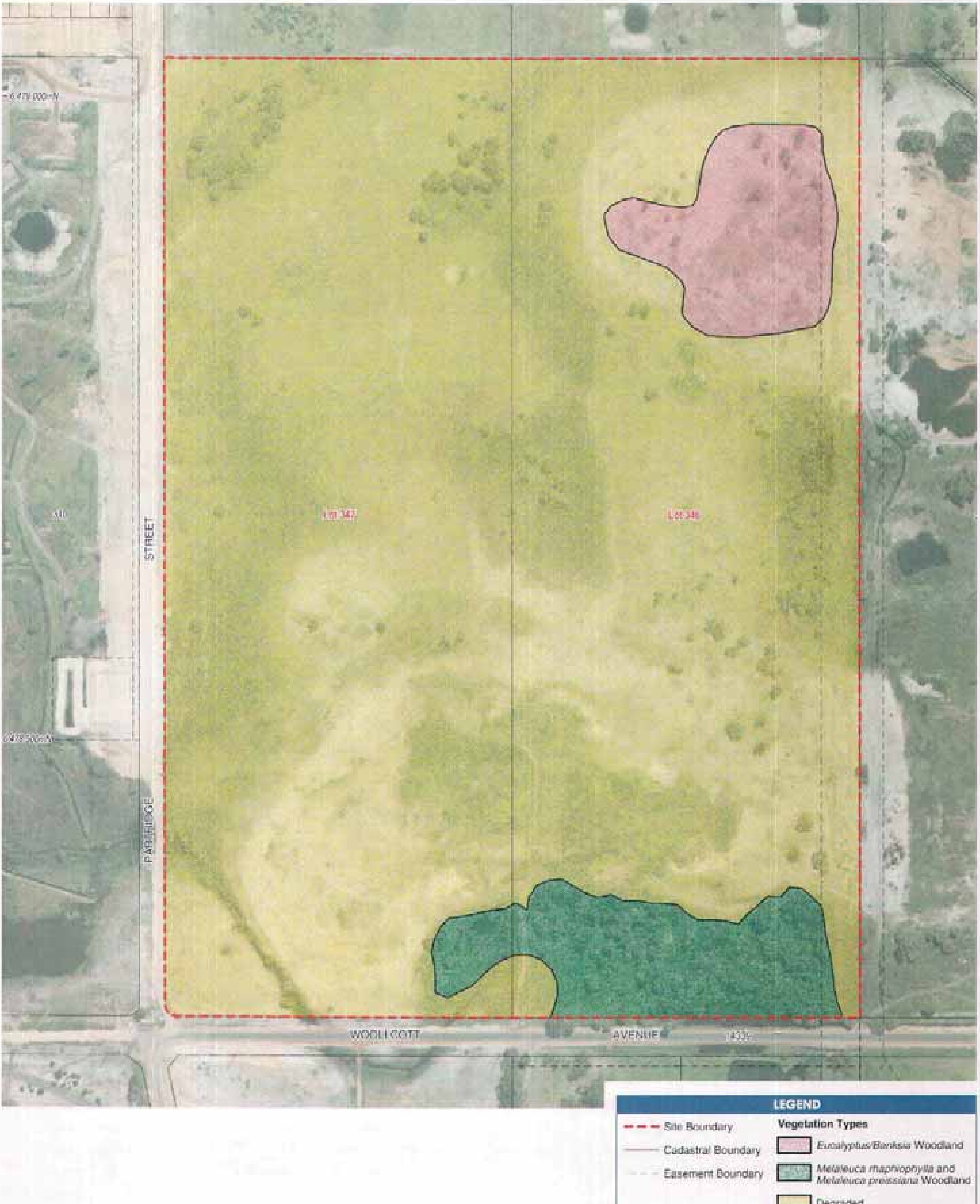
The REW offers one habitat type, this being Freshwater Paperbark wetland. Areas within the REW and surrounding the REW are comprised of pasture grasses. A small area of open water is evident, which may provide some habitat for waterbirds and amphibians. However, on balance, the remnant habitat in the REW has been substantially degraded through weed infestation and previous land uses.

3.3.2 FAUNA POTENTIALLY PRESENT

A search of DPaW's NatureMap and the Department of Sustainability, Environment, Water Population and Communities' (DSEWPaC) Protected Matters Search Tool was conducted for the subject site. A 2 km and 5 km buffer was used for the NatureMap search and a 5 km buffer was used for the Protected Matters Search. The complete search results are provided in **Appendix D**.

NatureMap identified one amphibian, 16 bird species, one mammal and five reptile species as potentially occurring within the search area. Of these, one bird species (*Plegadis falcinellus* – Glossy Ibis) is subject to an International Agreement and the mammal species (*Isoodon obesulus* subsp. *fusciventer* – Southern Brown Bandicoot) is a Priority 5 taxon. All other species identified are common to the Perth metropolitan region. The Protected Matters Search Tool identified a total of seven threatened species listed for protection under the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*, as well as seven migratory species that are protected under international agreements which have the potential to occur within the search area.

Bamford (1996) assessment of the site and review of literature identified that there was potential for 13 species of amphibians, 58 species of reptiles, 109 bird species and 18 species of mammals that could be present in the general region of the ADSP. However, not all of the identified species would be present in the ADSP or within the site due to the absence of suitable habitat. Bamford did note that REW may provide suitable breeding habitat for various frog species (e.g. *Litoria adelaidensis, L. moorei* and *Limnodynastes dorsalis*. A total of 41 reptile species were identified as potentially occurring in the ADSP, however Bamford (1996) concluded that most of these would be restricted to the Caversham Airbase site if they were present with fewer than ten species being present in the degraded areas of the ADSP.



VEGETATION TYPE

Lots 346 & 347 Woollcott Avenue, Brabham

A Cedar Woods Project

0m 20 40 60m

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p: 13/014/031

figure 10

VEGETATION CONDITION

Lots 346 & 347 Woollcott Avenue, Brabham

A Cedar Woods Project

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d: 01 Aug 2013
p: 13/014/030

figure 11

In terms of avifauna, Bamford (1996) note that 109 species of bird had been recorded in the Whiteman Park and Ellenbrook regions, with many of these being expected to occur in the ADSP. Those species which favour modified environments would most likely be found within areas such as the site such include the Grey Teal and the Australian Wood Duck which could be found within the REW or the Straw-necked Ibis which would potentially utilise the cleared paddock areas. However, the majority of the 109 species would favour the more intact habitat located on the Caversham Airbase site south of Youle-Dean Road. The mammal fauna of Whiteman Park is depauperate and nearly half of the recorded species in Whiteman Park were introduced species (Bamford, 1996). It is highly unlikely that any mammals would persist within the site other than kangaroos or introduced species such as rabbits.

Given the limited fauna habitat within the site, it is expected that an impoverished fauna assemblage would utilise the site.

FAUNA OF CONSERVATION SIGNIFICANCE

A search of the NatureMap database and the Department of Sustainability, Environment, Water, Population and Communities' (DSEWPaC) Protected Matters identifies a number of conservation significant fauna which may be found within the vicinity of the subject site excluding the listed marine species. These are listed within **Table 6**.

TABLE 6: CONSERVATION SIGNIFICANT FAUNA

Species	State Classification	Federal Classification	Comment
Calyptorhynchus banksii naso Forest Red-tailed Black Cockatoo	Schedule 1	Vulnerable	Species is a possible infrequent visitor to the subject site, although the species typically is found on the Darling Scarp or close to the Scarp. Very limited foraging or roosting habitat available within the subject site for the species.
Calyptorhynchus baudinii Baudin's Black Cockatoo	Schedule 1	Vulnerable	Species is a possible infrequent visitor to the subject site, although the species typically is found further south on the coastal plain. Very limited foraging or roosting habitat available within the subject site for the species.
Calyptorhynchus latirostris Carnaby's Black Cockatoo	Schedule 1	Endangered	Species is a possible infrequent visitor to the subject site. Very limited foraging or roosting habitat available within the subject site for the species. The species is likely to preferentially forage on available resources in the nearby Whiteman Park or the Caversham Airbase site.
Leipoa ocellata Malleefowl	Schedule 1	Vulnerable	Species highly unlikely to be present due to absence of suitable habitat.
Rostratula australis Australian Painted Snipe	Schedule 1	Endangered	Species unlikely to be present on the subject site as it is more commonly found in the eastern states of Australia. It generally remains in areas with dense cover for foraging and resting. This type of habitat is generally absent on the subject site.

Species	State Classification	Federal Classification	Comment
Dasuyrus geoffroii Chuditch / Western Quoll	Schedule 1	Vulnerable	This species is highly unlikely to be present on the subject site. The chuditch is typically found in sclerophyll forest, dry woodlands or mallee shrublands. These habitat preferences are not within the subject site.
Idiosoma nigrum Shield-backed Trapdoor Spider / Black Rugose Trapdoor Spider	Schedule 1	Vulnerable	This species of trapdoor spider is only found within the dry woodlands east of the Darling Scarp in southern Western Australia. The subject site does not contain the species preferred habitat and is therefore unlikely to be present.
Apus pacificus Fork-tailed Swift	Schedule 3	Migratory	This migratory species is known to inhabit a large proportion of Australia. Although there is potential that this species could be found occasionally in the region, the subject site does not offer any particular unique habitat that this species would rely upon for its survival. Being an aerial feeder, the development of the subject site is unlikely to significantly impact the species.
Haliaeetus leucogaster White-bellied Sea Eagle	Schedule 3	Migratory	Unlikely that this species would utilise the subject site. The White-bellied Sea Eagle prefers to forage for fish and therefore are typically seen in coastal areas. The species forages across a wide range and is therefore unlikely to be impacted by development within the subject site.
Merops ornatus Rainbow Bee-eater	Schedule 3	Migratory	This species may occasionally utilise the subject site. The Rainbow Bee-eater occupies a large range and is known to construct burrows in soft sand in open areas, including paddocks. The subject site does contain some relic Bassendean dunes which could provide suitable burrowing opportunities for this species. However, this species is widespread and is highly mobile. Therefore the development of the subject site is unlikely to result in a significant impact on the species.
Ardea alba Great Egret / White Egret	Schedule 3	Migratory	This species is one of the largest Australian Egrets and is typically found near water, salt or fresh, and feeds in wetlands, streams, ponds and tidal flats. It nests in trees near water. It is possible that the species may visit the site given that a large proportion of the site is palusplain wetland. However, the species is highly mobile and is unlikely to rely upon the subject site for its survival.
Ardea ibis Cattle Egret	Schedule 3	Migratory	This species is a relatively small egret found in grasslands, woodlands and wetlands. Cattle Egret pairs are monogamous for the breeding season, and they breed in colonies, usually with other waterbirds. It is possible that the species may visit the site given that a large proportion of the site is palusplain

Species	State Classification	Federal Classification	Comment
			wetland. However, the species is highly mobile and is unlikely to rely upon the subject site for its survival.
Rostratula benghalensis (sensu lato) Painted Snipe	Schedule 1	Endangered	The species has a scattered distribution throughout many parts of Australia. The Painted Snipe is a resident in some areas and nomadic in other areas. The Murray-Darling basin appears to be an important area for the species. The decline of the species in the Kimberley region of far north Western Australia appears to be associated with stock grazing. Given the long history of stock grazing, it is unlikely that the species would utilise the subject site. If the species were to utilise the site it is most likely to be found in the area occupied by the Resource Enhancement wetland (UFI8805) in the southern portion of Lot 346.

As outlined in **Table 6**, there is potential for a number of conservation species to potentially use the site on an infrequent basis. However, given the condition of the remaining habitat on the site, it is considered highly unlikely that any of these species would rely upon the site for their survival.

ENVIRONMENTALLY SENSITIVE AREAS

A search of the DEC's Native Vegetation Viewer did not identify any environmentally sensitive areas as occurring within or adjacent to the site.

3.4 LANDFORM AND SOILS

3.4.1 TOPOGRAPHY

The site is generally flat, grading from the north-west at RL30, to the south-east at approximately RL26. There are several localised mounds/hills ranging from RL30-RL35 around the eastern extremities of the site. Existing contour data was obtained via a previous Lidar Survey undertaken by MAPS in early 2013. The site has been partially excavated as part of previous sand extraction operations, thus the natural landform has been partially altered.

At the time of writing, the developers' surveyors are in the process of preparing a full feature survey of the site to verify existing ground levels. Upon receipt of the feature survey the developers' consulting engineers will adopt the findings and incorporate these into the future preliminary design concepts.

3.4.2 SOIL TYPES

Historical geological mapping presented in the *Drainage and Water Management Plan* (DWMP) included as part of the Swan Urban Growth Corridor indicates the site is overlain with white to grey bassendean sands up to 2-2.5m in depth in some locations, with underlain Guildford formation of course grained silt with variable clay and sand content. No rock has been identified in the area however the DWMP indicated some areas of peaty material in the southern portion of the site particularly associated with the REW.

It is recommended further detailed geotechnical investigation be undertaken prior to development.

GEOTECHNICAL INVESTIGATIONS

Douglas Partners (engineering consultants) have been appointed as the geotechnical consultant for the development and are currently undertaking a detailed geotechnical investigation for the site. This includes the excavation and sampling of approximately 35 test pits evenly distributed over the site. Some preliminary test pit data has been received, the results which conclude the soil profile consists of sands for the most part with some peaty material found in the REW. The results have also identified scattered areas of loose to moderate clay layers encountered between 1.3m to 2.0m below the natural surface, which may require removal and replacement. This will be subject to the recommendations of the investigation.

ACID SULPHATE SOILS (ASS)

The presence of acid sulphate soils (ASS) has been a recognised issue of concern in Western Australia since 2002. ASS are naturally occurring soils and sediments that are either acidic or have the potential to become acidic when exposed to air. They are harmless when left in a waterlogged, undisturbed environment. However, if exposed to air via drainage/dewatering or excavation, the iron sulfides contained in the soil react with oxygen to produce iron compounds and sulfuric acid. This acid can in turn release into the environment other substances present in the soil, including heavy metals which can have a detrimental impact to the receiving environment.

In Western Australia, predictive ASS risk mapping was undertaken using existing 1:50,000 urban and environmental geology map series in conjunction with analysis of the surficial landforms that are likely to host ASS in their natural environment. Targeted field investigations have previously been undertaken to validate the risk mapping within and in the vicinity of Lots 346 and 347.

The ASS risks are classified into two categories on the basis of ASS occurrence within the soil profiles and are described as follows (DEC, 2013):

- Class 1: High to moderate risk of ASS occurrence within 3m from natural surface soils; and
- Class 2: Moderate to low risk of ASS occurring within 3m of natural surface elevation but high to moderate risk of ASS beyond 3m of natural surface soils.

In terms of ASS risk, the area occupied by the REW is mapped 'High' to 'Moderate Risk'.

A preliminary ASS assessment has commenced on site. The objective of the assessment is to collect more site specific data and to characterize the ASS risk according to landform across the site as a preliminary measure in order to assist the civil design process. Further assessment will be undertaken once detailed civil design has been undertaken and when key disturbance areas are known (e.g. proposed deep sewer alignments, etc.).

In general, the recommendation for dealing with ASS if encountered is to remove to the full depth encountered and replace with clean fill for areas that will require structural fill only. The ASS may remain insitu for POS areas that do not require structural stability.

A comprehensive review of previous ASS studies and investigations is detailed within **Appendix E – Environmental Assessment**, noting the review indicates that there are three main areas where updated information will cause portions of the previous investigations to be non-conforming with current DEC practices and requirements. These non-conformities relate to:

- The use of old risk map categories and development of four risk categories whereas the DEC has now simplified risk mapping to just two categories;
- Bassendean sands at the site were assessed against an original texture-based risk criteria of 0.03%S however, it has recently been identified that where Bassendean Sands have an S_{Cr} value of <0.03%S and the pH_{Fox} is <3, the soil would require neutralisation treatment as though it contained 0.03%S; and
- Laboratory assessment of soil samples was undertaken using a detection limit of 0.02%S whereas it is now required that all analyses of sand samples be undertaken using a detection limit of 0.005%S.

While the DEC's *Management Guidelines (2011)* have also been updated, it is mainly the soil investigation data and its interpretation in terms of management requirements which will be affected. It is considered likely that the primary impact this may have for the proposed development of the site is that more soil across the site will be classified as ASS and thus treatment and monitoring regimes are likely to be more extensive than may have been anticipated from the findings of the previous investigations.

CONTAMINATION

A search of the DEC's Contaminated Sites database indicated that the site is not listed as a registered contaminated site.

A review of historical aerial photos for Lots 346 and 347 indicates that the site has been used for agricultural purposes, most likely for grazing with some sand mining having occurred in the southern portion of the site. The sand mining is considered a low level risk in terms of contamination on the basis that the operation was small, localised and did not appear to involve any storage of hydrocarbons, nor is there any particular evidence that backfilling excavated areas with waste occurred on the site.

Ecoscape (2006) conducted a preliminary investigation into potential contamination issues within the ADSP area. This investigation did not identify any potential contamination issues on site however two potentially contaminated sites were identified within the ADSP area, these being the former poultry farm on Lot 351 Park Street and the Caversham Airbase (south of Youle-Dean Road). Based on the inferred direction groundwater flow being in a south-easterly direction, neither of these sites is likely to impact Lots 346 and 347.

Given the historical land use activity, it is considered a low risk that there is potential soil or groundwater contamination present on Lots 346 and 347. Therefore, no further investigations are warranted.

3.5 GROUNDWATER AND SURFACE WATER

In 2009, JDA Consultant Hydrologists (JDA) prepared the *Albion Local Water Management Strategy* (Albion LWMS) to support the ADSP. The Albion LWMS presents both district and local level drainage information and addresses the Scheme requirements in relation to urban water management processes.

To avoid duplication of the local scale information provided in the Albion LWMS, it was agreed with the Department of Water that a concise Local Water Management Strategy (LWMS) could be prepared to support this LSP for the site (refer to **Appendix F**).

The Albion LWMS provides a substantial amount of information appropriate to the LSP however in reviewing the current planning for the site, a few gaps have been identified in the water planning which are not addressed in the Albion LWMS. These gaps specifically relate to:

- Limited information being available relating to the REW, noting it is proposed to confirm the hydrology of this feature and its ability to be utilised as a possible drainage utility;
- The need to confirm the extent of any constraints posed by the groundwater production well 'Well Head Protection Zone' that intercepts the south-western corner of the site (provided as part of the adjoining *Whiteman's Edge* development);
- The need to confirm the management techniques of any external surface drainage entering the site from adjoining land, particularly from the north; and
- Identifying specific locations for internal stormwater detention in order to ensure the site is as self sufficient as possible from a drainage perspective.

The LWMS has addressed the items above in more detail, in accordance with the requirements of the Department of Water's *Better Urban Water Management* document and the City's urban stormwater management policies and guidelines. The LWMS will form part of the overall urban water management strategy in the context of the ADSP and the *Sub-Regional Structure Plan*.

3.5.1 PRE-DEVELOPMENT MONITORING

Given the two years of pre-development monitoring conducted previously by JDA and Parsons Brinckerhoff and reported in the Albion LWMS, it is not considered an additional two years of monitoring is required. It is therefore proposed to undertake an additional six months of monitoring (covering winter 2013) which will be detailed in the *Urban Water Management Plan* (UWMP), which is likely to be submitted around May 2014 and will be subject to confirmation and approval at the subdivision stage.

3.5.2 SURFACE WATER HYDROLOGY

Currently the majority of the site drains towards the south eastern corner of the site, into the existing REW. The REW discharges into the Woollcott Avenue roadside drain which in turn connects with St Leonards Creek before ultimately draining east into the Swan River.

GROUNDWATER

Groundwater beneath the site is contained within four aquifers, these being:

- Unconfined Superficial aquifer;
- The semi-confined Mirrabooka aquifer;
- The confined Leederville aquifer; and
- The confined Yarragadee aquifer.

The Superficial Aquifer is an unconfined aquifer contained within sand and clay. This aquifer is directly recharged via the infiltration of rain and is mostly recharged through the sandy soils.

The Mirrabooka Aquifer is a semi-confined aquifer which receives recharge from the overlying Superficial Aquifer or from the underlying Leederville Aquifer by leakage. The Mirrabooka Aquifer system is locally important for the public drinking water supply.

The Leederville Aquifer is a major aquifer that is present to the north and west of the Gnangara Mound and has an average thickness of about 300m. The Leederville Aquifer is reserved for public water supply in this area and new allocations are generally not permitted.

3.5.3 WATER RESOURCES – IRRIGATION WATER SUPPLY

Consistent with the ADSP, the LSP includes a primary school and a neighbourhood park. An irrigation supply for the primary school and neighbourhood park is still to be confirmed, noting the most cost effective irrigation water supply is local groundwater resources.

The site is located in the Mirrabooka Groundwater Area. The management subarea for the superficial aquifer is Whiteman Park and for the deeper confined aquifers, the confined Mirrabooka aquifer. At the time of publication the Albion LWMS stated the superficial aquifer of the Whiteman Park subarea was only 23% allocated. Currently the Whiteman Park subarea is over allocation at 468%. There is also currently no water available within the confined Mirrabooka and Leederville aquifers.

The developer has commenced discussions with the Department of Water and the City to consider different options for the delivery of water to the neighbourhood park. At a meeting held 27 June 2013 a number of different options were discussed and discarded on the basis they were unlikely to be successful/feasible once a detailed assessment was completed.

It was subsequently agreed that the best approach to 'free up' an irrigation water supply for the site is via a strategy to manage irrigation demand across the City. The strategy will be developed by the City with assistance from Department of Water. As this approach may take some time the following options will also be pursued by the developer in the interim:

- Licence Transfer – There are a limited number of users in the groundwater area, but the option should be explored given the modest quantity of water required; and
- Consider a Brabham Landowner Group – The developer could discuss the benefits of the neighbourhood park with other landowners to see if any other developers could assist.

3.6 BUSHFIRE HAZARD ASSESSMENT

A preliminary *Bushfire Hazard Assessment* (refer **Appendix B**) has been undertaken over the LSP design in accordance with performance criteria and acceptable solutions as outlined in the *Bushfire Protection Guidelines* and *Australian Standard 3959-2009 'Construction of buildings in bushfire-prone areas'* (AS3959). This assessment sets out the bushfire attack level appropriate for subdivision and development to proceed.

In order to ensure fire agencies or individual property owners have the ability to defend assets, it is necessary for prevention and preparedness works to be undertaken by the developer during the various stages of development to reduce the risk to future landowners/occupiers. Future remedial works and preventative measures will be undertaken in accordance with the recommendations of the future *Bushfire Management Plan*, subject to confirmation and approval at the subdivision stage.

3.6.1 VEGETATION CLASSIFICATION

The site consists predominantly of degraded pasture and a single REW (with limited native bushland) in the south east of the site. The vegetation comprises of Melaleuca, the occasional Eucalypt (Marri) and Banksia with an understorey of weeds and grasses. The vegetation contained on and near the site is deemed to be 'available bushfire fuels' for the purposes of calculating the bushfire risk assessment.

The site has been assessed against the requirements of the *Bushfire Protection Guidelines,* with the vegetation classification of 'Woodland', being predominantly located wholly within the REW and REW buffer. For this purposes of this assessment, it has been assumed that individual trees located sporadically across the site will be removed, given the extent of future earthworks (cut and fill) required to create a developable and level platform.

Whist the preliminary *Bushfire Hazard Assessment* has confirmed there are no undue impediments to future development, vegetation modification (via the re-vegetation or removal of existing vegetation) may alter the preliminary Bushfire Attack Level (BAL) calculation currently assigned to the land.

3.6.2 BUSHFIRE ATTACK LEVEL (BAL) CALCULATION

As outlined in the *Bushfire Protection Guidelines* and AS3959, the minimum setback distance required from 'Woodland' classified vegetation and proposed buildings under the *BAL–Low* construction standards is 100 metres. Noting the conditions of the site, where the 100m separation is not achievable, the distance of future dwellings from available bushfire fuels will need to be determined, noting the closer the building to the fire hazard the greater the construction standard required under AS3959.

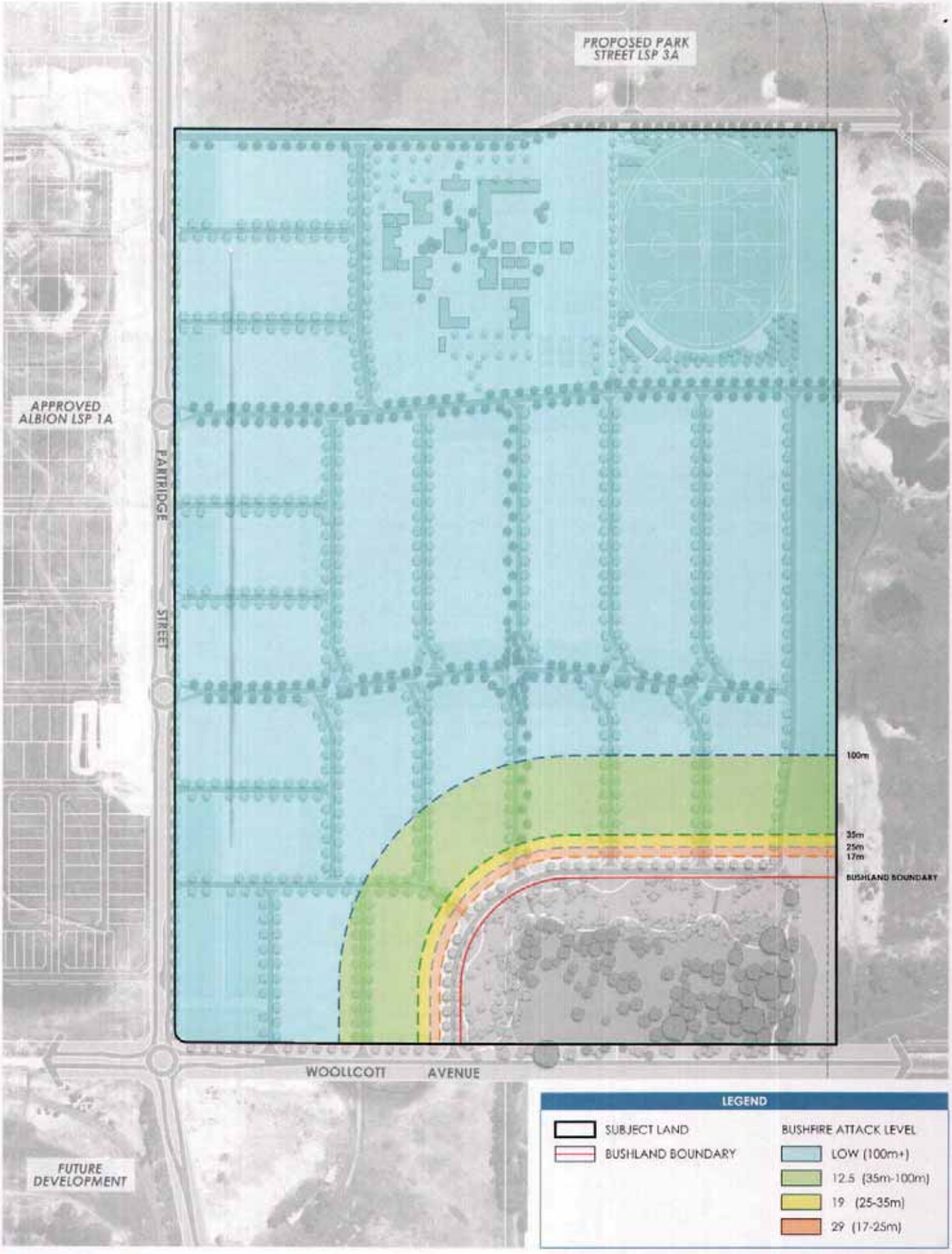
The BAL rating is calculated based on the both the effective slope under the vegetation (must not exceed 20 degrees), and the relationship of the site to the vegetation (upslope, flat or downslope). In this instance the site, and in particular those future lots within 100m of the REW buffer, will require construction standards relating to BAL-29 or lower to be applied in accordance with **Figure 12 – Preliminary Bushfire Attack Level**.

3.6.3 EMERGENCY ACCESS

The LSP provides a connected and integrated movement network in an urban environment, which is envisaged to be maintained to a low fuel state via typical maintenance practices. The site, despite predominantly being considered a 'low' risk fire zone with some areas of 'moderate' consideration, provides no cul-de-sacs, preferring convenient access to an array of road connections which can be utilised for emergency access should these be needed. Specifically the LSP will provide:

- Multiple road access/egress links for every stage of development; and
- A series of fire fighting water supply/hydrants installed a minimum of every 200 metres in accordance with the specifications of the Department of Fire and Emergency Services (DFES) and the Water Corporations' *No. 63 Water Reticulation Standard*.

Given the proposed location of both Woollcott Avenue (east/west emergency access) and Partridge Street (north/south emergency access) and the overall fire risk associated with the site, the access points and alternative routes provided sufficiently allow for emergency evacuation of future residents should this be required in the future. The emergency access points are likely to be confirmed within the *Bushfire Management Plan*, subject to confirmation and approval at the subdivision stage.



PRELIMINARY BUSH FIRE ATTACK LEVEL

Lots 346 & 347 Woollcott Avenue, Brabham

A Cedar Woods Project

0m 20 40 60m

s: 1:4000@A4
d: 10 June 2014
p: 13/014/024C

figure 12

3.7 HERITAGE

3.7.1 EUROPEAN HERITAGE SITES

Following review of the Heritage Council of WA and the National Trust of Australia's Heritage databases, it is deemed that there are no significant sites (either recorded or existing) of European heritage within the LSP area.

3.7.2 INDIGENOUS HERITAGE SITES

A *Cultural Heritage Management Plan* has been prepared (refer **Appendix G**) to ensure that the development fulfils its obligations with respect to the *Aboriginal Heritage Act 1972* and the requirements of the Scheme.

A search of the Department of Indigenous Affairs' register of Aboriginal heritage sites provides an understanding of the archaeological and ethnographic sites in a given area as well as providing information about previous surveys. The results from a database search indicate that there are no registered Aboriginal heritage sites located on site.

Given there are no known heritage sites present, no specific actions have been recommended however, the *Cultural Heritage Management Plan* outlines procedures to be followed during site works in the event that a previously unidentified Aboriginal heritage site is uncovered during the course of site works.

3.8 GAS PIPELINES

The *Dampier to Bunbury Natural Gas Pipeline* (DBNGP) is located along the eastern boundary of Lot 346, and runs north/south for the entire length of the lot.

Preliminary discussions with the City in regards to the *DBNGP* area have indicated a general unwillingness for this area to be included as POS. The ultimate objective is to beautify the land encompassed in the easement corridor for an improved amenity to benefit the future residents of Brabham. Final design and treatment of the easement will be determined through consultation with the pipeline operator and council.

RESIDENTIAL DEVELOPMENT ABUTTING THE GAS PIPELINES

Discussions with DBP Group (DBP), the asset managers of the DBNGP, have clarified that development of residential lots would be accepted up to the boundary of the proposed 30m utility corridor. It has also been advised that a *Qualitative Risk Assessment* (QRA) for the development would not be necessary given the results of previous QRA's undertaken for similar developments in the area.

UTILITY CORRIDOR WITHIN THE RESOURCE ENHANCEMENT WETLAND

The DBNGP has been previously constructed within the REW which is currently protected by a 30m wide easement. As detailed above, superficial treatment of the easement along the entire length, including the REW buffer, will be further explored in consultation with Council and pipeline manager to ensure the best outcome for the future community of Brabham and the operation as a utility corridor.

EARTHWORKS WITHIN UTILITY CORRIDOR

In regards to earthworks within the utility corridor, it has been advised by DBP that under no circumstance would a reduction of the existing cover levels (above the existing pipeline) be supported. Whilst it has been confirmed that road and service crossing infrastructure would be permitted, no deep excavations or other infrastructure would be allowed within the utility corridor. This was supported by further advice from RDL, who confirmed these restrictions are in place to protect existing and future gas infrastructure planned for the easement corridor. DBP and RDL also advise that battering and/or retaining up to the utility corridor boundary would be acceptable, although no footing infrastructure would be permitted within the utility corridor.

3.8.1 PARMELIA GAS PIPELINE (PGP)

The *Parmelia Gas Pipeline* (PGP) is located on the adjacent Lot 345 to the east. This pipeline runs north/south for the entire length of the lot however, unlike the DBNGP, is not located on site.

Preliminary discussions with APA Group (APA), the asset managers for the PGP, concluded that given there is no planned infrastructure crossing the PGP as part of the LSP, there was no perceived risk, and therefore it is unlikely a QRA is necessary. This was subject to internal review and assessment internally, however APA was confident there were no issues.

4 LAND USE AND SUBDIVISION REQUIREMENTS

4.1 LAND USE

The proposed LSP seeks to facilitate development primarily for residential purposes whilst additional secondary land uses are dictated by the ADSP, including the REW, Primary School, Neighbourhood Park and the Utility Corridor.

Given the close proximity of the future Town Centre to the south (and the desire for non-residential land uses to be consolidated within this activity centre), there are no commercial or business related land uses contemplated within the LSP area. The LSP provides strong north/south connections and access to the surrounding road network to ensure access to these additional land uses can be readily accessed.

The land use allocation associated with the LSP is identified below in **Table 7**. These are discussed in greater detail later in this Report.

TABLE 7: LAND USE ALLOCATION

Land Use	Section Reference
Residential	4.2
Public Open Space	4.3
Utility Corridor	4.4
Key Access Roads	Refer to 'Movement Network' in **Part 4.5**
Educational Facilities (Primary School)	4.7

Precise residential lot yields can only be accurately determined as detailed design progresses. **Figure 13 – Concept Plan** and predicted lot yield analysis do illustrate however, how the proposal will provide for a diversity of housing types, create high amenity settings and provide a variety of housing choice in the locality.

The design review of the LSP as reflected on the Concept Plan reflects the design principles of *Liveable Neighbourhoods*. A variety of housing types and forms are able to be provided within the LSP, which respond to the long term strategic intentions of the area whilst addressing current predicted market conditions. The following development principles have therefore been applied and have been visually demonstrated on the Concept Plan:

- Provision of a permeable street design and layout that promotes walkability, particularly to the proposed neighbourhood park, future town centre and the proposed primary school;
- Provision of a variety of lot sizes and housing types which seek to maximise benefits in terms of public amenity and convenience whilst addressing specific strategic density targets;

- The creation of accessible, attractive and functional areas of public open space with the preservation and subsequent restoration of the REW where possible;
- The need to adequately accommodate stormwater drainage on-site, in accordance with best practice urban water management techniques; and
- The need to formulate an integrated LSP that is responsive to the characteristics of the site, surrounding ownership patterns and anticipated development timeframes in the planning context of surrounding landholdings.

The above principles are discussed in greater detail in the following Report sections.

4.2 RESIDENTIAL

4.2.1 RESIDENTIAL DENSITY

Consistent with the *Sub-Regional Structure Plan*, the ADSP provides for a minimum net residential density of 22 dwellings per site hectare, compared with the *Directions 2031* target density of 15 dwellings per gross urban hectare.

The ADSP seeks to *"provide for a variety of housing choice through a range of densities, predominately at an R30 density with higher codings (up to R60) within and around the neighbourhood centre and other nodes."*

The density range associated with the LSP is predominantly R30 coded lots, with some higher density R40 coded lots provided in strategic locations. This R-Code density mix is consistent with the demographic profile and housing needs as identified by the *Housing & Urban Research Institute* of *Western Australian* (HURIWA) in their March 2006 study titled *'An Assessment of Housing, Socio-economic and Sustainability Demands with reference to the future settlement of Albion'*. This study identified that *"despite changing household structure there is still demand for detached housing due to privacy, mobility and choice with a preference for lots between 500-800m².*"

The proposed lot layout and size is consistent with this stated preference.

POPULATION DENSITY

The ADSP states the future population of Albion is estimated to be 14,700 persons, based on a household occupancy of 2.68 persons per household with an expected yield of approximately 5,500 lots. HURIWA have predicted household occupancy rates are predicted to decline from 2.85 to 2.68 persons per household and one-person households are also expected to increase (HURIWA, 2006).

This figure (2.68) has been used to inform LSP population projections and it is estimated the LSP will accommodate between 1,401 and 1,758 future residents.

4.2.2 LOT YIELD

The intended R-Code allocation across the LSP is detailed below within **Table 8.** The land area able to be considered as part of the total site hectare for residential purposes (excluding deductions and road reserves) is approximately 18.67 ha.

TABLE 8: R-CODE ALLOCATION AND PROPOSED LOT YIELD

R-Code	Lot Type	#	Du/Gross Urban Ha	Du/Site Ha	Area	%
R30	Option 1: Front loaded lots, averaged to 300 m²	529			15.87528 ha	85%
	Option 2: Front loaded lots, averaged to 400 m²	396			15.87528 ha	85%
R40	Laneway lots, squate lots etc, with minimum average lot sizes of 220 m²	127			2.8073 ha	15%
TOTAL – Option 1		**656**	**15**	**35**	18.6768 ha	**100%**
TOTAL – Option 2		**523**	**12**	**28**	18.6768 ha	**100%**

Given the layout of the LSP and the provision of rear laneways as shown on **Figure 13 – Concept Plan**, the number of R40 coded lots is more certain, given the specific design responses required in order to facilitate this type of product.

There are two calculations reflected above which have been used to determine the dwelling yield for the LSP area. Under *Directions 2031* the gross urban hectare area of 40 hectares has been used to calculate the residential density, whilst under the *ADSP* and *Liveable Neighbourhoods* the residential density has been calculated based on the per site hectare method. Both options are shown above, noting the proposed development can readily achieve a density target of between 12–15 dwellings per gross urban hectare and between 28 and 35 dwellings per site hectare. These figures have demonstrated, subject to final lot mix and detailed design at subdivision stage, that the density targets can be met for the LSP area, being 15 du/gross urban hectare and 22 du/site hectare respectively.

4.2.3 LAYOUT AND BLOCK STRUCTURE

Where possible, lots have been designed in an east/west configuration to maximise solar orientation of the future built form. The developer will encourage dwellings constructed on north-south orientated lots to provide maximum solar orientation.

4.2.4 LIVEABLE NEIGHBOURHOODS ASSESSMENT

An assessment of the LSP has been undertaken against the design elements of *Liveable Neighbourhoods* as detailed below in **Table 9**. *Liveable Neighbourhoods* has been adopted by the WAPC as operational policy, and is to be followed in the design and approval of urban development, in this case specific to the preparation of the LSP and will be subject to confirmation and approval at the subdivision stage.

TABLE 9: LIVEABLE NEIGHBOURHOODS ASSESSMENT

Design Elements	Intention	Comment
Community Design	Seeks to identify how future town and neighbourhoods should be structured, including guidance with regard to the layout of street networks, block structures, urban design issues and the provision of various land-use typologies to support an inclusive community.	The overall community design of the LSP has been informed by the adopted ADSP. The LSP is a component of that particular community vision.
Movement Network	Seeks to determine appropriate street design, movement networks, construction standards and public transport considerations with a focus on connectivity, safety and efficiency.	The proposed movement network closely follows the approved ADSP layout, particularly with regard to identified access streets. The movement network is responsive to specific future land uses provided by the LSP, noting the predominant purpose of the majority of the movement network is to provide access to residential housing. Refer **Appendix H** for a full copy of the *Traffic Assessment and Report*.
Lot Layout	Seeks to clarify the intention of lot layout from an orientation perspective and how these connect with the broader *Community* and *Movement* design elements to achieve variation of lot product, site responsive design and improved built form outcomes.	The LSP provides the ability to provide a range of lots sizes between 180 m^2 and 510 m^2, the provision of which has been undertaken to ensure density targets are considered. The lot product provided is compatible with the street network, noting lot frontage is provided specific to product type.
Public Parkland	Seeks to inform the provision and design of areas uses for passive and active recreational purposes, noting their distribution, function, accessibility and future targeted population catchment.	The primary public parkland relating to the LSP is associated with the neighbourhood park adjacent to the primary school. The proposed layout, and ability for future facilities has been guided by both advice from the City (given their expected developer contribution items) and the Department of Education's school needs.
Urban Water Management	Seeks to promote opportunities for linking water management infrastructure with the urban built form and landscape design, by provided an integrated water management system for water supply, stormwater and wastewater.	A comprehensive drainage, public open space and water management system has been provided within the LSP, linking both active and passive areas of open space to environmental assets with ecological value. Restoration of the REW and the use of the REW buffer for both passive recreation and drainage purposes allow both the objectives of the ADSP and *Liveable Neighbourhoods* to be met in a sustainable and water efficient manner.
Utilities	Seeks to ensure servicing requirements within new residential estates give sufficient consideration to ensuring, via appropriate design solutions, that efficient and appropriate sustainable objectives are met.	Each proposed lot will be connected to the full range of urban services in accordance with **Section 4.9** of this Report.
Activity Centres and Employment	Seeks to ensure detailed consideration is given to the design, function and layout of town centres, employment centres, activity nodes etc as proposed	N/A. The site provide no specific activity centre or

Design Elements	Intention	Comment
	within higher level strategic planning documents.	employment nodes, noting future employment opportunities will be afforded within other areas as identified within the Swan Urban Growth Corridor.
Schools	Seeks to ensure there are various future scenarios for the provision of schools, noting the interface with adjoining residential land is priority. The provision of school sites directly correlates to the number of residential lots, and the strategic location of school sites ensures ready access to educational facilities.	The location and size of the proposed primary school was established within the ADSP, with the current location and design considerations afforded to the school consistent with the Department of Education's preferences. Road access, co-location with the neighbourhood park and the shared use of facilities has been factored into the development arrangement associated with the primary school.

CONCEPT PLAN

Lots 346 & 347 Woollcott Avenue, Brabham

A Cedar Woods Project

0m 20 40 80m

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figure 13

4.3 PUBLIC OPEN SPACE

The sites previous land uses has resulted in little to no remnant vegetation remaining on the site and as such significant trees that could be retained within the development's POS areas are few and far between. The main exception is within the REW, where there is the occasional endemic and exotic trees which are generally able to be retained and incorporated into the REW and REW buffer to provide instant amenity.

Figure 14 – Indicative Overall Landscaping Concept Plan visually demonstrates the strategy behind the development of future POS and landscaped areas, the intention being to provide a readily useable, aesthetic and liveable environment for future residents.

Streetscapes throughout the development shall incorporate a variety of treatments in response to the road hierarchy system. In all cases landscape works shall incorporate tree planting in accordance with accepted traffic standards on the standard street tree alignment in relation to the service utility corridor. Treatments may include soft works such as street trees, hedge planting and groundcovers. Final tree species are yet to be decided however it is expected these will primarily consist of Australian native and West Australian native species.

4.3.1 NEIGHBOURHOOD PARK

The LSP provides for a neighbourhood park co-located with the proposed primary school. The neighbourhood park is proposed on the eastern side of the primary school and adjacent to the 30m pipeline utility corridor. The subject land is located within the City's *Development Contribution Plan (DCP) (DCA 1 – Brabham (Albion))* and the neighbourhood park is a DCP item which will be deducted from the gross subdivisible area.

Initially in the ADSP, the neighbourhood park was shown to the west of the primary school fronting Partridge Street, however this location was reviewed and it is now proposed to locate this to the east of the primary school to improve the interface with Partridge Street, maximise servicing opportunities and provide a more suitable land use adjacent to the pipeline utility corridor. It is proposed to gain primary access to the neighbourhood park via the construction of the new road link along the northern boundary of the site.

Discussions were held with the City on 28 May 2013 to discuss the facilities and layout and revised location of the neighbourhood park in order to meet community objectives and align with the City's DCP. Based on the positive feedback received, a preliminary neighbourhood park layout has been prepared as shown in **Figure 15 –Neighbourhood Park Indicative Layout**.

Principles underpinning the proposed design and intended outcomes for the Neighbourhood Park include:

- Applying best practice Water Sensitive Urban Design (WSUD) to drainage swales, creating additional native wetland type habitats;
- Providing informal active play areas outside of the dedicated sports oval/fields;
- Providing a large play facility which will cater for all age groups; and

- Providing passive amenity in form of shaded BBQ areas, seating and footpaths.

SPORTING FACILITIES DETAILED DESIGN

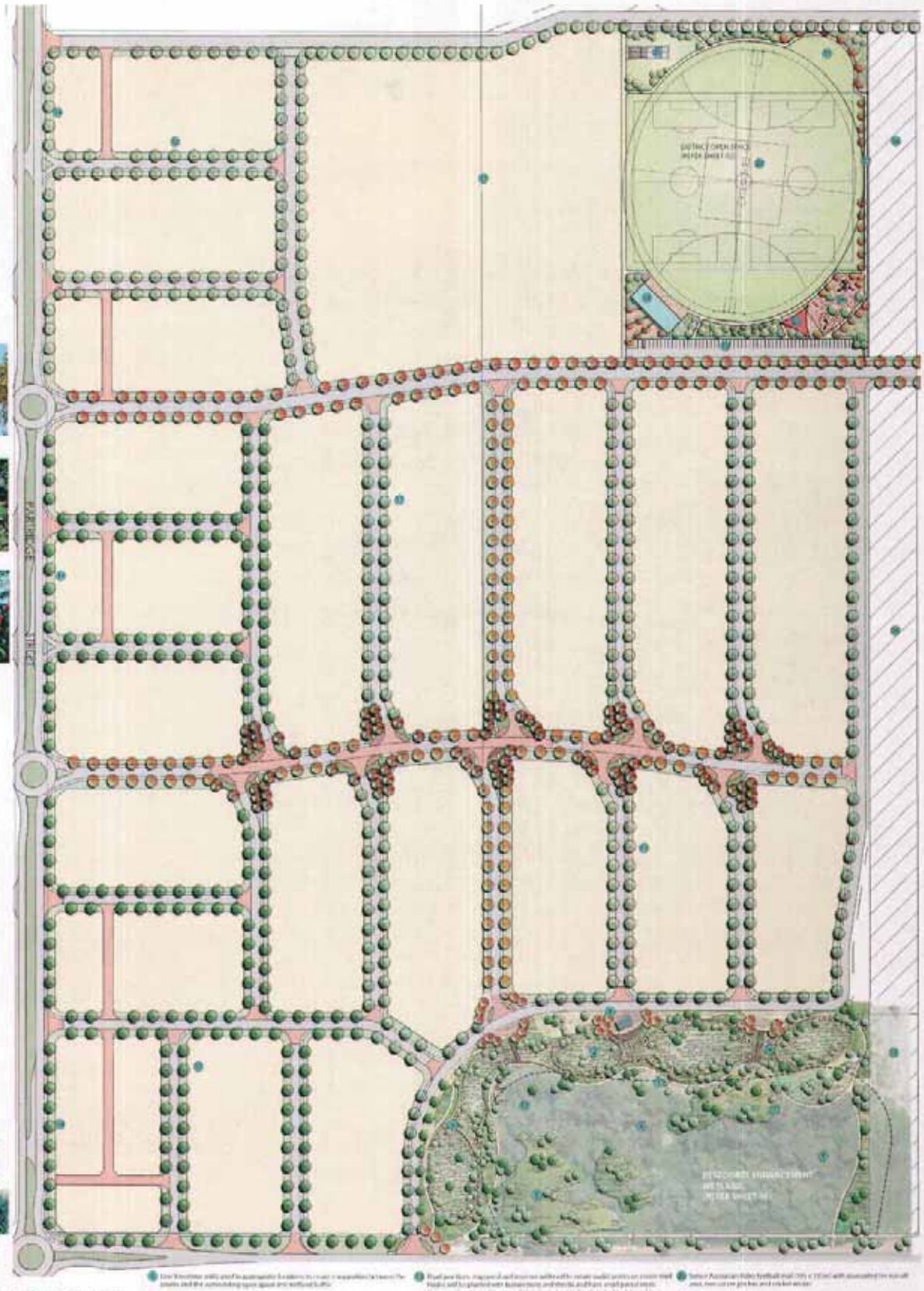
The neighbourhood park provides the entire range of desired facilities on site, minimising any potential overlap of facilities onto the adjoining primary school. This is the stated preference of both the City and the Department of Education, however the Department of Education have indicated they are prepared to allow the cricket practice nets and some car parking to be fully located on the primary school, subject to support being received from the City.

The dimensions of the sporting fields has been determined based on the Department of Sport and Recreation's *Sports dimensions guide for playing areas* guidelines that specify a range of acceptable dimensions for certain facilities. For the purposes of this LSP, the dimensions provided are larger than the minimum acceptable sized outlined. This is reflected in **Table 10**.

TABLE 10: PROPOSED SPORTSFIELD DIMENSIONS

Facility	Dimension Range Permitted	Indicative Dimensions Provided within LSP
Football Field – Australian Rules	Length: 135-185m Width: 110-155m	Length: 165m Width: 135m
Football Field – Soccer	Length: 90-120m Width: 45-90m	Length: 110m Width: 60m

The design and associated areas detailed above is indicative only and will be subject to confirmation and approval at the subdivision stage.



KEY OF INFORMATION

- Retention of mature trees and vegetation within the boundary and start of 20m buffer area
- Drainage swales (basins will be a series of interconnected basins, bubbler type with reticulated intake line to small swales. Larger swales will have overflow devices to other swale areas. Swales to be planted with native trees and littoral shrubs
- Proposed areas of the site and to be subject to a management plan. Areas will be cleared of weeds and rubbish and re-vegetated with appropriate species over and shrub species
- Boardwalk to be installed and adjacent to the existing open water area. This will provide a viewing area of the open water wetland habitat. Screening to be provided to create a view shed and capture the wetland feel
- Retention of bushland to be protected within the subject to provide informal recreation opportunities and to protect public access to the site
- Low level noise walls and/or appropriate fencing to create a separation between the streets and the surrounding open space and wetland buffer
- Existing wetland trees and vegetation to be retained
- Amenity area with BBQ, shade and picnic settings
- Seven shared 'American-style' crossing structures and footpaths in the swales
- Bridges across the swales to provide facilities for people over all development and footpaths within the open space area
- Culvert under existing driveway will provide continued free access into and out of the lot for the water into the wetland to agreed locations
- Grass berm planting (species will be agreed by a street tree inspector. Trees are planted by private structure, healthy and enhance the long term appearance of the streetscape
- Road perimeters, proposed and existing with soft verges swales and trees on street with footpaths and be planted with Australian trees and shrubs and basic small paved areas. Incorporate parking with the provision of planted areas. Roads to be kept paved to create a pedestrian friendly environment and reminders to the use of motorcars
- Two small shade and bus shelter for Parbridge Street road users
- Mini grassed recreation area for the residents
- Car parking for recreation complex
- Primary School Site
- Club house and change rooms
- Car parking
- Senior Australian Rules football oval (165 x 135m) with associated two sub-oval area, two cricket pitches and cricket nets
- Three grassed areas for passive recreation and sportsmen area
- Retaining wall against existing residential to achieve level difference between swales and level. Low wall and grass terraces used to provide informal seating for street level activity
- Paved BBQ area with associated picnic benches and seats. Area to be elevated above the swale to provide a view outlook and create separation between the activity zone and the road
- Informal play area. Equipment to provide play for all ages. Grassed to be provided for casual and informal recreation
- Two cricket practice nets located on primary school site

SOURCE: EPCAD

INDICATIVE OVERALL LANDSCAPING CONCEPT PLAN
Lots 346 & 347 Woollcott Avenue, Brabham
A Cedar Woods Project

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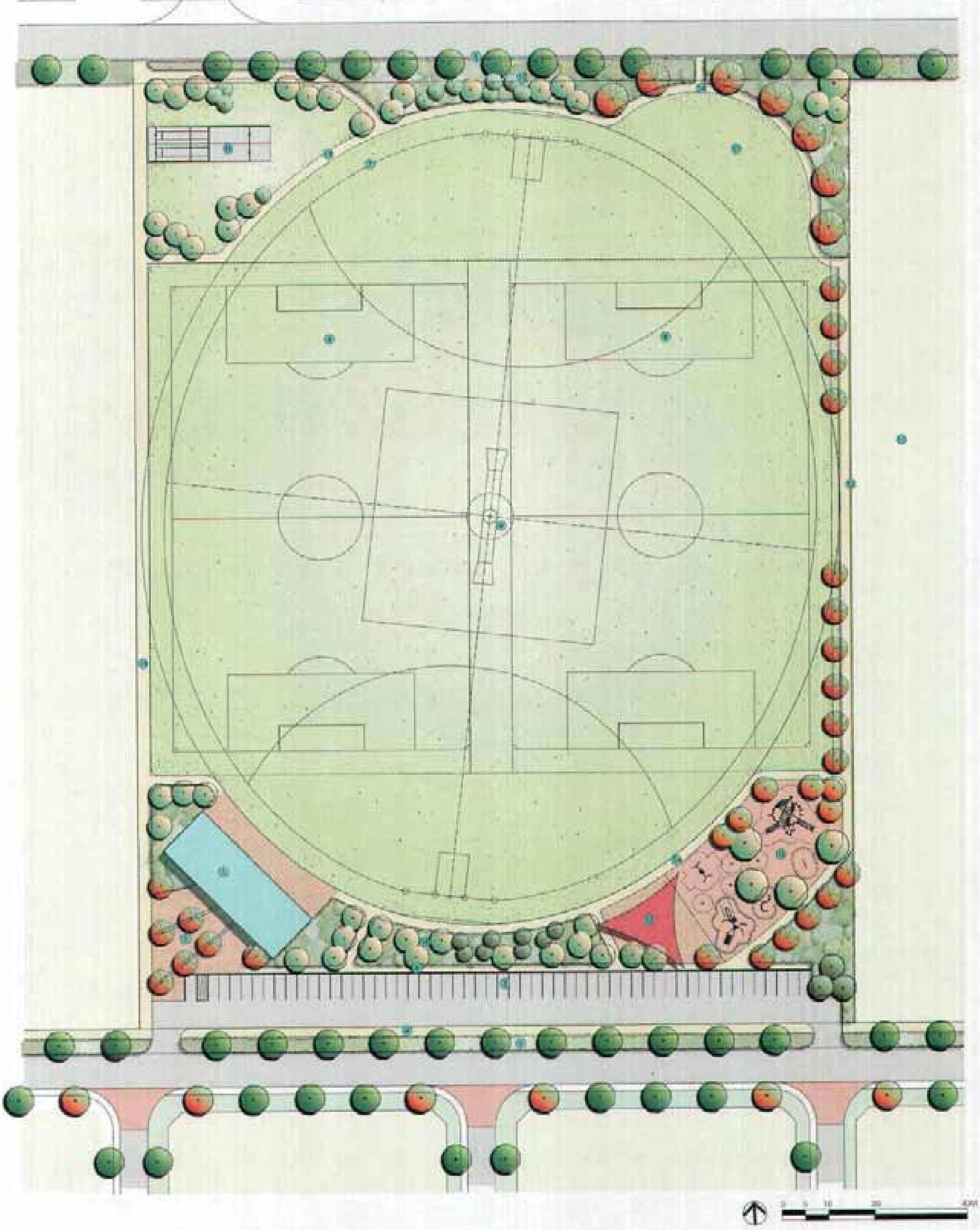
figure 14



KEY OF INFORMATION

- Club house and change rooms
- Paved courtyard entry to Club house
- Car Parking Bays and Drop off and service hardstand for Club Rooms
- Footpath connections to be provided between the open space and adjacent roads
- Street tree and shrub planting to road verges
- Shade trees to car parking
- Senior Australian Rules Football oval 150 x 135 with associated 5m runoff
- Two soccer pitches
- Cricket wicket and pitch
- Informal tree and shrub planting to provide shade and a green perimeter to the site
- Gas pipeline easement corridor
- Retaining wall against easement to achieve level difference between easement and oval. Low walls and grass terraces used to provide informal seating for viewing games.
- Paved BBQ area with convenient picnic benches and shade. Area to be elevated over the swale to provide a nice outlook and create separation between seating area and the oval
- Footpath access around the oval linking amenity areas. Footpath to be shaded with an avenue of trees. Occasional seating to be provided along the footpath for relaxation and match viewing
- Children's play area. Equipment to be provide play for all ages. Seating to be provided for parents and informal relaxation.
- Two cricket practice nets
- Open grassed area for passive recreation

SOURCE: EPCAD

NEIGHBOURHOOD PARK INDICATIVE LAYOUT

Lots 346 & 347 Woollcott Avenue, Brabham

A Cedar Woods Project

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d: 11 June 2014
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figure 15

4.3.2 OTHER PUBLIC OPEN SPACE

Initial discussions with the City indicated the desire for the provision of POS to accord with that shown on the ADSP, recognising that, whilst there is a desire for each development to contribute 10% of the net subdivisible area for POS purposes, as per WAPC policy, the City's preference is that only those areas shown on the ADSP be provided. As such, the POS provided for in the LSP is generally in accordance with those areas shown on the ADSP.

As the subject land is located within the Brabham (Albion) DCP, a pro-rata contribution to the three neighbourhood parks and the local community centre site identified within the DCP has been included in the POS calculation, refer **Table 11** below.

Whilst it is intended to integrate urban stormwater and drainage areas into the POS network to promote best practice water sensitive urban design, given the preliminary drainage calculations to date (and noting the relevant deductions and credits applicable) it is estimated the POS provision for the land is circa 4.9%, as per **Table 11.**

TABLE 11: PUBLIC OPEN SPACE SCHEDULE

	ha	ha
Lots 346 and 347 Woollcott Avenue	40.5394	
Woollcott Avenue Road Reserve	1.6203	
Gross Site Area		**42.1597**
Deductions		
Neighbourhood Park	3.12	
Resource Enhancement Wetland	2.3345	
Drainage 1:1	0.6050	
Primary School	4.5	
Utilites Corridor	2.2398	
Woollcott Avenue Road Reserve	1.6203	
Partridge Street Road Widening	0.3416	
Surplus Restricted POS (remaining REW buffer area in excess of 20%)	0.1328	
Total Deductions		**14.8940**
Gross Subdivisible Area	27.2657	
Required Public Open Space (10%)	2.7266	
Public Open Space Requirements		
Unrestricted Public Open Space – Minimum 80%	2.1813	
Restricted Public Open Space – Maximum 20%	0.5453	
Total Public Open Space Provision		
DCP Pro-Rata Contribution	0.7880	

	ha	ha
Wetland Buffer	0.5453	
Total Credited Public Open Space		**1.3333**
Percentage of Credited Public Open Space Provided		**4.9%***

* Subject to a detailed assessment of POS credits within the REW and REW buffer at the subdivision stage.

The LSP is able to obtain additional credit for areas of POS within the proposed 30-40m (averaged to 35m) wide REW buffer, which will provide a passive recreational function, with sufficient drainage capacity that enables the REW to self-replenish.

OVER/UNDER PROVISION OF POS

The ADSP states that the location for provision of POS and identification of landowners providing under or above the 10% POS requirement will be determined at local structure planning stage. Where a local structure plan cannot or does not provide the required 10% POS, the City has options available to it such as requesting cash-in-lieu contributions to make up any shortfall in accordance with *Clause 3.6.2* of *Development Control Policy No. 2.3*. The POS shortfall within Table 11 (or otherwise determined and agreed at the subdivision stage) shall be provided as cash-in-lieu.

It is understood the City has received cash-in-lieu contributions from surrounding developers where their developments have failed to provide 10% POS on site.

4.3.3 RESOURCE ENHANCEMENT WETLAND (REW)

The Department of Parks and Wildlife's (DPaW) geomorphic wetland mapping shows the boundaries and locations of the REW (Wetland 127 – Resource Enhancement Sumpland as referred to in the ADSP or UFI 8805 as identified in the geomorphic wetland dataset) with the mapping showing the northern portion of the site being located on the Multiple Use Palusplain (UFI 13396).

A site assessment by Aurora Environmental confirmed that the assigned management category for the Multiple Use Palusplain is appropriate given that most of the wetland that falls within the site is Completely Degraded. This wetland does not represent a constraint to future development of the site.

Aurora Environmental considers that the management category for the REW (UFI 8805) is unlikely to be changed by DPaW despite the high proportion of introduced flora and the limited ecological value. It is not intended to seek a reclassification of the REW and therefore the LSP remains consistent with the ADSP, indicating that this REW will be retained in POS.

A *Wetland Strategy,* as outlined in the Albion LWMS determined that the southern portion of the REW, on the southern side of Woollcott Avenue, has been filled or drained through agricultural use and is no longer recognisable. Therefore, only the northern portion of the REW (on Lot 346) will be retained and rehabilitated. The southern portion of the REW is not on site and therefore is not considered as part of this LSP, nor is it included in the *Wetland Management Plan* that has been prepared for the REW.

The REW will be restored and managed in accordance with the *Wetland Management Plan.* The rehabilitation of degraded areas within the REW will provide an improved ecological function, noting the REW will continue to receive drainage from the development which is consistent with the pre-development conditions. This is an important requirement of maintaining the pre-development hydrological regime of the REW, noting the original source of constant water supply (from Lot 310 to the west) has been redirected as a result of current subdivision works.

Principles underpinning the proposed design and intended outcomes for the REW include:

- The REW will be subject to an overall management regime to improve the REW's biodiversity and enhance its value as a natural asset to the development;
- Controlling public access will allow the REW to regenerate and be preserved whilst providing amenity and educational value to residents;
- Best practice WSUD will be applied in the REW buffer with the drainage swales and retention basins creating additional native wetland type habitats whilst providing functional service to development; and
- Passive amenity, in form of shaded BBQ areas, seating, footpaths and small play areas will be provided.

4.3.4 WETLAND BUFFER

The ADSP shows an interim 50 metre buffer to guide the preparation of the LSP, notwithstanding the extent of the buffer will be determined by the City in accordance with the *Draft Guidance Statement 33 Environmental Guidance for Planning and Development (EPA, 2005)* and the *Draft Guideline for Determination of Wetland Buffer Requirements (WAPC, 2005)*. The ADSP states the existing buffers associated with the REW is significantly degraded and has been used for grazing purposes for many years.

PROPOSED REDUCTION OF THE 50M REW BUFFER

The Albion LWMS states that a vegetated buffer of 50m surrounding the REW is provided, but may be revised through the preparation and subsequent recommendations of a *Wetland Management Plan*. A *Wetland Management Plan* for the REW has been prepared and is included as **Appendix D**. It proposes a reduced buffer of approximately 30-40m (average of 35m), which, when factoring in a 13m road reserve, achieves a separation of approximately 45 to 54m to the lot boundaries. The developer commits to the rehabilitation of the REW and areas within the buffer, and this is indicatively shown in **Figure 16 – Indicative Wetland Concept Plan**.

The extent of the REW buffer has been determined having regard to the REW's current condition and the stated objectives for the future management of the REW. The REW has been subject to on-going degradation since the 1950s primarily due to agricultural activities along with some sand mining. This has resulted in a loss of native species and proliferation of exotic species, particularly grasses. As a consequence the habitat values have been diminished and only support a depleted fauna assemblage.

The WAPC's *Draft Guidelines for the Determination of Wetland Buffer Requirements (2005)* notes that multiple use wetlands are generally quite degraded and may be weed infested due to the existing use and/or lack of management. While the current condition of the REW reflects this description, it unlikely that DPaW would support a reclassification of the REW.

Under a developed scenario, the primary threats to the wetland include the following:

- Alteration to the hydrological regime;
- Continued degradation of remnant native vegetation;
- Inappropriate recreational use; and
- Diminished water quality.

The management of these threats are addressed in the *Wetland Management Plan*. Having regard to the above threats, along with the proposed management arrangements outlined in the *Wetland Management Plan*, the functions, values and attributes of the REW will be protected and in fact improved through rehabilitation, access management and the implementation of water sensitive urban design principles to the extent that there is a net improvement in the ecological values and functions. On this basis, it is considered that a reduced buffer is appropriate.

DRAINAGE FUNCTION WITHIN WETLAND BUFFER

The ADSP states that *"Wetland buffers (width to be determined) will be rehabilitated and serve a passive recreation function with paths and seating areas, as well as perform a drainage function."*

The Albion LWMS submitted as part of the ADSP seeks to ensure *"post development end of winter operating levels at significant wetlands maintained at pre-development levels."* The Albion LWMS goes on to state that the southern portion of the REW *"has been filled or possibly drained for grazing and is no longer recognisable as a wetland."*

The REW currently receives drainage from Woollcott Avenue as well as surrounding land. It is intended that this REW will be enhanced and form a part of a drainage swale system with the outer extremities of the REW buffer providing a hard edge interface (i.e. a road) whilst additional proposed vegetated swales will be incorporated in the buffer, receiving up to the 5 year ARI event. Larger storm events (i.e. up to the 100 year event) are intended to overflow the swales and enter the REW. It is intended that this REW will be enhanced and form a part of a drainage swale system.

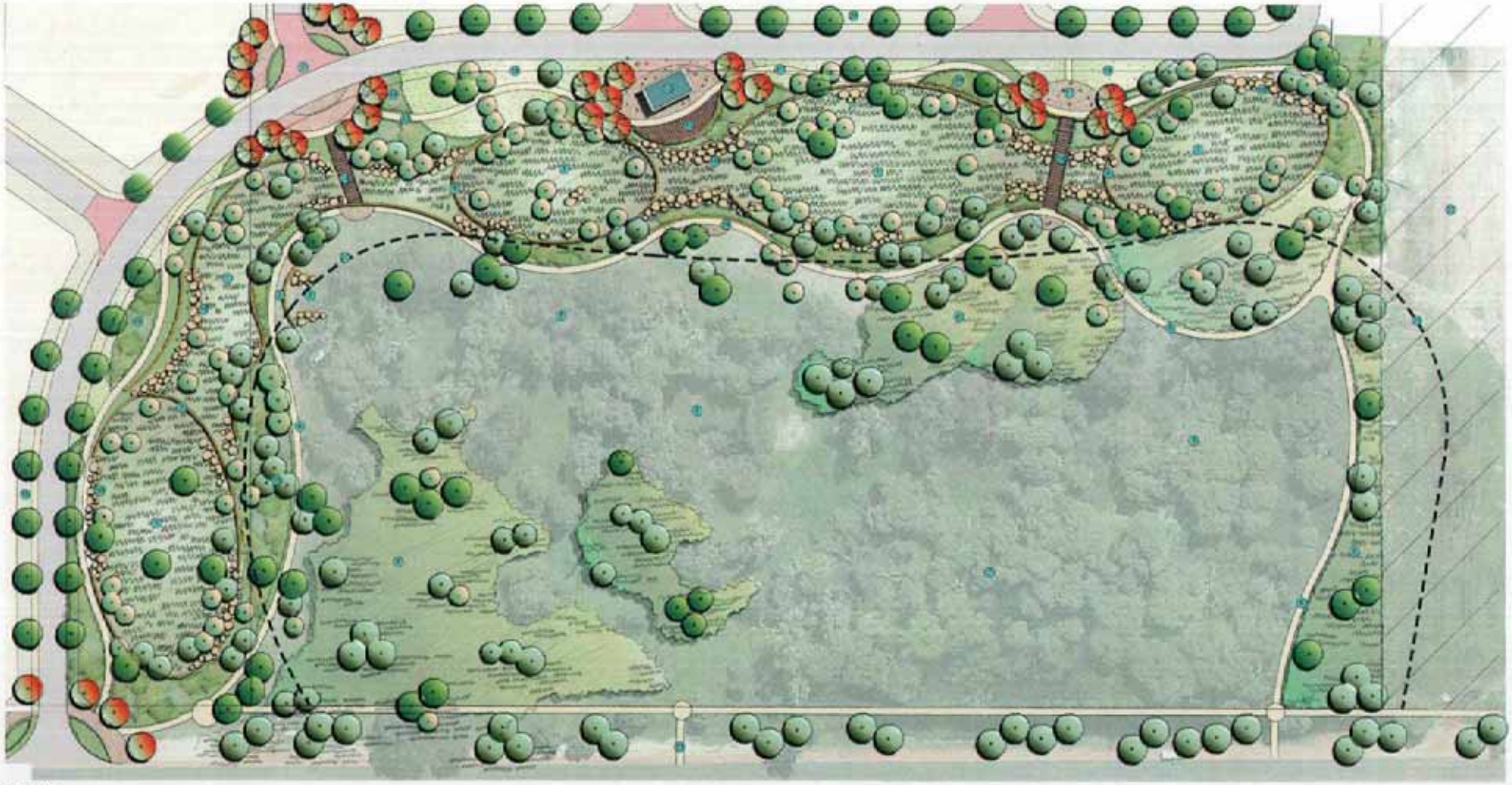
Stormwater controls will be in placed throughout the LSP (likely to include bottomless side entry pits, GPTs etc.) to provide some pollutant control and given the REW's buffer will be rehabilitated, it is intended this will perform not only a drainage function, but also serve a passive recreation function with paths and seating areas. The vegetated swales will treat the stormwater prior to infiltration.

Preliminary discussions with the DPaW have been undertaken, with comment to date indicating that the DPaW generally prefers a 50m buffer is provided to REWs and that all infrastructure is placed outside of the buffer area. The proposed approach for the management of the REW is at odds with this advice. However, having regard to the degraded condition of the REW and the proposed management measures contained in the *Wetland Management Plan*, the developer is confident that a net environmental improvement will be achieved whilst providing a valuable community asset.

PASSIVE RECREATIONAL USES WITHIN THE WETLAND BUFFER

The vision for the REW is to retain and enhance the existing natural values while providing a natural asset that is valued and used by the local community. This will be achieved by creating a POS that preserves the REW's remaining ecological values and builds upon these values by enhancing existing degraded areas.

The provision of a connected path network through the REW will provide access in a controlled manner. At strategic locations, appropriate infrastructure will be installed to enhance visitor experience, with such infrastructure expected to include signage, park furniture, viewing platforms, shade structure and barbecue areas.



SOURCE: EPCAD

INDICATIVE WETLAND CONCEPT PLAN
Lots 346 & 347 Woollcott Avenue, Brabham
A Cedar Woods Project

s: NTS@A3
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figure
16

4.4 UTILITY CORRIDOR

There are two existing major high pressure gas lines running in a north/south along the eastern boundary of the site. The western line is the *Dampier to Bunbury Natural Gas Pipeline* (DBNGP) which is located within a 30m easement on site, immediately adjacent this is the Parmelia Gas Pipeline (PGP) also contained within a 20m easement but within the adjacent Lot 345.

Any works within the utility corridor easement cannot commence until an application made and approval received from the asset managers and the RDL.

4.5 MOVEMENT NETWORK

4.5.1 EXISTING MOVEMENT NETWORK

Existing roads adjacent the site are vested and maintained by the City, designed in accordance with both the City and the *Metropolitan Redevelopment Authority* (MRA) guidelines.

Under the ADSP, Partridge Street to the west is proposed as an 'Integrator Arterial B', with Woollcott Avenue to the south identified as a 'Neighbourhood Connector A'. Both roads provide a mechanism to connect the proposed LSP road network into the wider existing movement network.

Woollcott Avenue is currently sealed, however Partridge Street is only partially sealed through the Whiteman Edge development to the north. It should be noted that Woollcott Avenue is currently not constructed between Partridge Street and Lord Street. Both road reserves provide adequate means of access for site vehicles and machinery during the future construction stages. Construction vehicles will need to be managed in accordance with the City's guidelines, likely in accordance with a *Traffic Management Plan*, or *Construction Management Plan,* subject to confirmation and approval at the subdivision stage.

In the wider movement context, Lord Street further to the west has an 80km/h speed limit, with West Swan Road to the east and Gnangara Road to the north being 70km/h.

4.5.2 PROPOSED MOVEMENT NETWORK

The primary access into the LSP will be via Partridge Street, as opposed to from Woollcott Avenue. Noting Partridge Street is identified as an 'Integrator Arterial B' in the ADSP, it is proposed to provide a main entry access road into the LSP approximately mid-point along the western boundary of the site. This main entry access road has been specifically designed to allow for an increased road reserve width to allow verge plantings and off-set north/south connections with improved pedestrian safety at designated crossing points.

As shown the north/south connections are offset by a minimum distance of 20m, consistent with the requirements of *Liveable Neighbourhoods* for local access roads, noting by providing such an intersection design multiple benefits can be achieved, including:

- A significant reduction in the number of three and four way intersections internally within the LSP;
- Partridge Street is promoted as the primary north/south movement connection consistent with the intention of the ADSP;
- Widened road reserves will provide the opportunity to create character zones/precincts within the development;
- The use of traffic calming in form of alternative paving treatments and raised tables will assist in creating a safe pedestrian environment;
- The LSP avoids being used as a 'rat-run' for future urban areas to the south of Woollcott Avenue to access to primary school site and the neighbourhood park; and

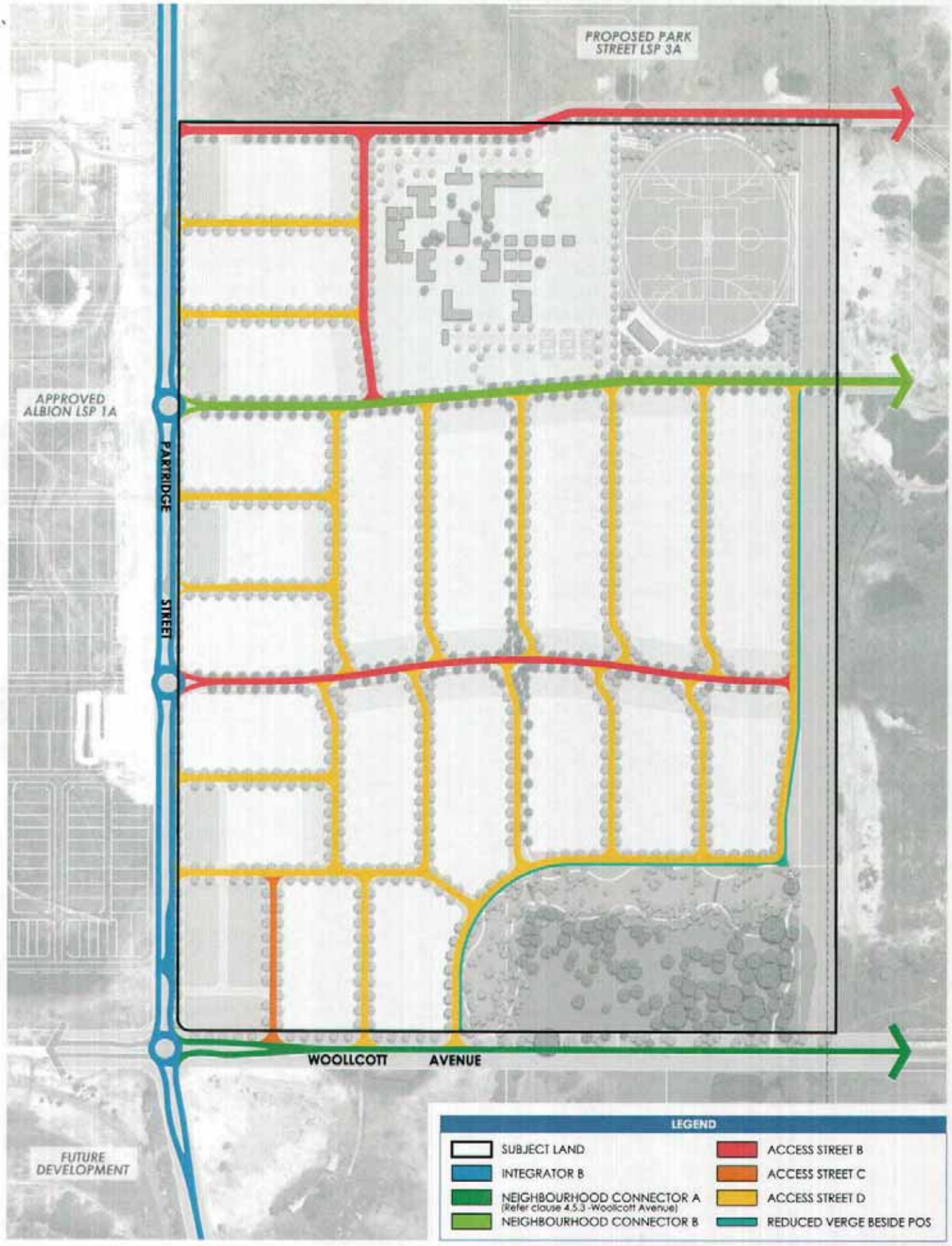
- Street planting can be provided along key entry streets into the development and at all north/south offset intersections given the increased road reserves at these points.

4.5.3 STREET HIERARCHY AND DESIGN

The LSP movement network facilitates innovative street design, supported by safe walking conditions and a hierarchy of conventional residential road types that will promote both efficient and alternative modes of movement. Transcore have undertaken a review of the LSP movement network, street hierarchy and intersection design, and their conclusions are included within **Appendix H.** The hierarchy of roads within the LSP is reflected in **Figure 17 – Proposed Road Hierarchy** and within **Table 12.**

TABLE 12: PROPOSED ROAD HIERARCHY

Road Classification	Indicative upper volume (vpd)	Indicative road reserve width (m)	Indicative road pavement width (m)
Integrator B – outside centres *(LN Figure 15)*	15,000	29.2	2 x 7.5m (incl. on-street parking and cycle lanes), 6m median
Integrator B – centres *(LN Figure 16)*	15,000	25.2	2 x 7.5m (incl. on-street parking and cycle lanes),2m median
Neighbourhood Connector A *(LN Figure 17)*	7,000	24.4	2 x 7.1m (incl. on-street parking and cycle lanes), 2m median
Neighbourhood Connector B *(LN Figure 18)*	3,000	18.0 – 19.4	11.2m (incl. embayed or on-street parking)
Access Street B *(LN Figure 20)*	3,000	16.5 – 18.0	9.7m (incl. embayed or on-street parking)
Access Street C *(LN Figure 21)*	3,000	15.4 – 16.0	7.2m
Access Street D *(LN Figure 22)*	1,000	14.2 – 15.0	6m typical
Laneway *(LN Figure 24)*	300	6.0 – 6.4	6m typical



ROAD HIERARCHY

Lots 346 & 347 Woollcott Avenue, Brabham

A Cedar Woods Project

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figure 17

PARTRIDGE STREET

Partridge Street is anticipated to function as an Integrator B road as part of an activity corridor linking through Albion, West Swan and Caversham. The section north of Woollcott Avenue adjoining the site is planned according to the "Integrator B outside centres" cross section as per Figure 15 of *Liveable Neighbourhoods*. This is also reflected in the indicative cross section for Partridge Street from the *Albion District Structure Plan Transport and Access* report (2008).

WOOLLCOTT AVENUE

Woollcott Avenue east of Partridge Street is planned as a Neighbourhood Connector road in the ADSP. As detailed within **Appendix H**, the section of Woollcott Avenue adjacent to the site is anticipated to carry less than 3,000 vehicles per day (vpd), but may carry greater than 3,000 vpd. Accordingly, Woollcott Avenue is proposed to be classified as a Neighbourhood Connector A, unless it can be determined that a Neighbourhood Connector B is acceptable taking into consideration agreed forecast traffic volumes, median and cycle lane requirements to the satisfaction of the City of Swan/Western Australian Planning Commission.

The existing 30m road reserve is sufficient to accommodate a Neighbourhood Connector A.

OTHER NEIGHBOURHOOD CONNECTOR ROADS

One other east/west road through the site (immediately south of the proposed primary school site) is also indicated as a Neighbourhood Connector road in the ADSP. This will also carry less than 3,000vpd and is planned as a Neighbourhood Connector B with an 18m road reserve width, as per the expectations of *Liveable Neighbourhoods*.

ACCESS STREETS

All other planned roads within the LSP area will be classed as Access Streets.

The *Access Street B* classification (typical reservation of 18m) is appropriate for streets adjacent to more intensive residential development and the primary school. On-street parking will be highly utilised in these areas.

The *Access Street C* (typical reservation of 16m) is appropriate for streets adjacent to medium-density development (R40) and other access streets with volumes likely to exceed 1,000 vpd. This is only proposed to be used on one access street in this LSP area, on the east side of the southeast corner block, where all lots are proposed to be served by rear laneways.

The *Access Street D* (typical reservation of 15m) is appropriate for low volume (less than 1,000 vpd) streets adjacent to typical suburban residential development and is the predominant road type within the LSP area. The standard Access Street D width in *Liveable Neighbourhoods* is 14.2m although the City of Swan prefers 15m road reserve width. The City of Swan has previously advised that it would consider a 13m road reserve, as proposed, on access streets that abut POS provided that they have no services (including street lights) on the verge of the POS, otherwise these streets have to be 15m unless previously approved.

LANEWAYS

Several areas of laneway lots have been shown on the LSP. In relation to the minimum requirements for the proposed rear laneways within the LSP, a minimum width of 6.0 metres (in accordance with *Liveable Neighbourhoods*) is acceptable to accommodate two-way movement and rubbish collection.

Whilst the LSP has been designed to minimise laneway product where possible, in order to meet density and diversity objectives a certain amount of this product type is required. All of the R40 lots are currently proposed to be supported by laneways, which will allow lot frontages to be reduced and avoid the streetscapes being dominated by garages and crossovers. This, in-turn, creates a more pleasant and safer pedestrian environment.

It is acknowledged that visitor parking needs to be accommodated for laneway lots, and there is scope for on street and embayment parking near laneway lots. Visitor car parking (in a ratio of 1 bay per 2 lots) is to be constructed in the road reserve adjacent to proposed lots serviced by laneways.

4.5.4 INTEGRATION WITH ADJOINING DEVELOPMENTS

Future integration with adjoining developments has been provided via the provision of conventional road connections and the orientation of street blocks, noting specific consideration has been given to the location of the Whiteman's Edge intersection points onto Partridge Street. Connections to the east are consistent with those shown on the ADSP.

The proposed road network and alignment closely follows the road alignment associated with the ADSP with the primary east/west connection running parallel to the southern boundary of the primary school and neighbourhood park, with a roundabout proposed at the intersection with Partridge Street. Minimising the east/west connections across the pipeline utility corridor is preferred, noting the potential cost and risk implication of providing multiple crossing points over these infrastructure items.

A second east/west connection is proposed to the north of the primary school. This alignment is consistent with the *Park Street LSP 3A Report (November 2012)* currently being assessed by the City. In order to provide access to the proposed primary school, the alignment of this proposed road connection deviates onto Lot 347 before connecting with Partridge Street. This deviation is necessary to ensure the proposed roundabout alignment is consistent with the westerly connection into the Whiteman's Edge development.

PARTRIDGE STREET ACCESS

In establishing the proposed intersection controls with Partridge Street, consideration was given to the road network layout, road hierarchy and estimated traffic volumes, as well as the level of access already approved for the Whiteman's Edge development on the western side of Partridge Street. The road network, as a result of the existing intersection locations, has resulted in several left in/left out access for all side Access Street D roads on the eastern side of Partridge Street. Three 4-way intersections are proposed as single-lane roundabouts, which will be used for primary access into the LSP and for access into the primary school and neighbourhood park.

4.5.5 PEDESTRIANS AND CYCLISTS

WALKABLE STREETS

The LSP promotes high levels of pedestrian and cycle access, through the provision of a pathway network located within the road reserves and public open space areas, which will provide for direct access to destinations such as the future town centre to the south, the primary school, the neighbourhood park and the activity corridor to the west.

The reasonably flat topography of the site and the proposed permeable grid of the road network within the LSP will provide an excellent opportunity for the provision of good pedestrian and cyclist facilities to maximise non-motorised transport modes.

It is proposed to provide shared paths on the *Integrator Arterial* and *Neighbourhood Connector* roads. These roads would also have a footpath on the opposite side as required in *Liveable Neighbourhoods*. On Partridge Street north of this site the LSP 1A development has already created some sections of 2m wide shared path on the western side of Partridge Street.

It is also proposed to provide shared paths on some of the *Access Street B* roads where a demand is anticipated such as next to the primary school. Footpaths would be provided on at least one side of all roads. There would be paths on both sides of the roads adjacent to the primary school.

On-street cycle lanes will be included on roads carrying more than 3,000 vpd. On-street cycles lanes are anticipated along Partridge Street.

Laneway lots are to have footpath access to the visitor parking bays provided for them in the road reserve. The exact location of the future pathway network will be subject to confirmation and approval at the subdivision stage.

4.5.6 PUBLIC TRANSPORT

The future activity corridor along Partridge Street would ultimately offer a high-frequency bus service through the Albion, West Swan and Caversham areas.

The *Albion District Structure Plan Transport and Access* report also showed two potential future bus routes from Partridge Street to Henley Brook Avenue. This plan shows that one of these routes is the future east/west Neighbourhood Connector through the immediately south of the proposed primary school site.

It should be noted that the City of Swan requires that roads for bus routes have a minimum two-way 7.4m carriageway width or 3.7m for a one-way carriageway.

4.6 EDUCATION FACILITIES

4.6.1 PRIMARY SCHOOL

The ADSP proposes a primary school fronting the proposed northern road link running east/west long the site, co-located adjacent to the neighbourhood park.

PROPOSED PRIMARY SCHOOL SIZE

The size of the primary school was identified during the development of the ADSP, whereby it was expected to cater for some 2,070 dwellings, which is larger than the typical 1,500-1,800 catchment size associated with a standard 4.0 ha primary school as detailed within *Development Control Policy 2.4 – School Sites* (DC2.4). In this regard it is noted *Clause 3.3.4* of *DC2.4* states:

"Where a school site is co-located with public open space, that open space is fully utilised by the school and arrangements are in place to the satisfaction of the local government to provide long-term contributions from the education provider for the management of the open space, the land requirement for the school may be reduced. In these circumstances a primary school site of 3.5 ha in size may be acceptable."

Preliminary discussions with the Department of Education on the likelihood of reducing the primary school to 4.0 ha, has resulted in the Department of Education stating they may be prepared to consider a reduction in the size of the primary school subject to further detailed design and updated catchment figures being provided for consideration. A reduction in the size of the proposed primary school, from 4.5 ha to 4.0 ha will be subject to further review by the Department of Education and will necessitate an amendment to this LSP.

The Department of Education have also indicated they will prepare a preliminary design of the primary school to ensure that if a reduced area is to be supported, the site can continue to meet the future educational needs and expansion requirements of the Department of Education and the wider catchment.

4.7 ACTIVITY CENTRES AND EMPLOYMENT

There are no proposed activity centres on the site, thus the employment opportunities for the local residents are likely to be found in existing commercial and industrial area in the broader City context. In regard to nearby local and district centres, these will be provided on adjoining development sites in accordance with the ADSP.

4.8 SERVICE INFRASTRUCTURE

A detailed *Servicing Report* has been provided within **Appendix I.** A summary of the various networks required for the development of the LSP is provided below.

4.8.1 SEWER

The Water Corporation owns and maintains all sewerage reticulation systems in the area. Any sewer connection point provided to the site will need to be designed and constructed in accordance with Water Corporation requirements.

Information obtained from the Water Corporation indicates that the site is located in the current catchment for the future Pump Station 'A' (PSA) proposed to the north of Harrow Road, which is designed to catch and pump all flows from the West Swan area to existing stations to the north. PSA is not currently assigned to the Water Corporation's capital works program, and is therefore not expected to be constructed within the next five years.

The expected design flows resulting from the development of the site are in the order of 5L/s based on the current yield projections. These flows can be sufficiently managed by a DN150 sewer network. There is existing DN225 & DN300 gravity mains located within the Partridge Street road reserve that gravitates to the south into an existing temporary pump station (902-66) located on Lot 310 to the west. This pump station currently accepts and conveys flows from existing developments towards the 'Barrambie Way Pump Station' adjacent to Gnangara Road. It is proposed to service the site with a DN150 gravity network that connects into the existing DN225 & DN300 mains.

Preliminary planning advice from the Water Corporation indicate only the northern half of the site can currently discharge into the existing temporary pump station, before ultimately being distributed south to the PSA. The southern half of the site is planned to also ultimately discharge into the existing Partridge Street gravity mains, for distribution to PSA, however due to the current planning restrictions, will have to be managed by alternate means in the interim.

In terms of interim solutions, a number of options were presented to the Water Corporation for consideration including:

- The inclusion of the full development flows for the site given the current rollout of development in the area may not see the Partridge Street pump station at capacity for a number of years, or deferment of adjacent contributing development catchments until after this site is developed;
- Reallocation of the catchment such that the southern portion and initial stages of development can be served without additional pump station infrastructure, that would not be required until development of the northern portion of the site;
- Upgrade of the existing Partridge Street pump station to cater for the additional flows; and
- Installing a temporary pump station and associated rising mains for connection into the existing pressure main.

In more recent discussions with the Water Corporation the considered preferred course of action is to upgrade the existing pumps and accessories from a Type 10 to a Type 40 set. This has been proposed formally to the Water Corporation for acceptance, and is subject to confirmation. Ultimately it is expected all proposed lots will be able to connect via gravity extension to the existing DN225/300 in Partridge Street.

4.8.2 WATER

The Water Corporation owns and maintains an existing water reticulation system adjacent to the site. This consists of a DN200 & DN250 PVC water mains located in the Partridge Street road reserve.

Information obtained from the Water Corporation indicates that the development can be supplied without further distribution mains, by way of extension from existing water mains in the area.

PUBLIC DRINKING WATER SOURCE AREA

The presence of a Water Corporation production well at the corner of the Woollcott Avenue and Partridge Street and its associated Well Head Protection Zone (WHPZ), along with the mapping of most of the subject site as a Priority 3 (P3) Underground Water Pollution Control Area (UWPCA) restricts certain land uses within the development. Residential development, including grouped housing, is permitted within a P3 area where the land is already zoned urban in the MRS, as is the case for the ADSP. Activities that typically involve the storage of potentially contaminating substances (e.g. fuel stations) are not permitted. No uses that require the storage of potentially contaminating materials are expected within the LSP. The management of the neighbourhood park will require consideration of nutrient application on the oval and special consideration of chemical application.

4.8.3 ELECTRICITY

Western Power own and operate the electrical supply network within the area and therefore all electrical supply equipment and cables will need to be installed in accordance with Western Power specifications.

There is an existing 22kV overhead power line along the eastern side of Partridge Street, which would be the proposed high voltage connection point for the LSP. The existing high voltage 22kV feeder is supplied from the Henley Brook Zone Sub-Station located near Gnangara Road and Lord Street. There is also existing overhead 132kV high voltage infrastructure located on the south side of Woollcott Avenue. This line is not viewed as a concern, and is not expected to require any easements on the development site.

It should be noted that future subdivision conditions will likely require that any existing overhead power lines adjacent to and on the development side within the road reserve will be undergrounded. Recent advice from the Cossill & Webley indicates the 22kV power line along Partridge Street will be undergrounded as part of the adjacent Whiteman's Edge development.

The estimated power demand for the proposed development is 2,900kVA based on 4.7kVA per lot for residential standard and 200kVA per ha for commercial/primary school sites. It is expected the site can be serviced with five 630kVA padmount transformers and associated switchgear located in areas of POS. It should be noted that locating the transformer in the POS will be subject to detailed design of the drainage system and calculation of the 100 year flood level.

As the development can potentially be supplied from the existing surrounding infrastructure it is foreseen that the supply of electrical power is not a hindrance. There is currently a *Western Power Feasibility Study* underway which will clarify the design requirements for the site, with the results of this study incorporated into future preliminary design documentation.

4.8.4 GAS

Reticulated gas is not considered to be an essential service and as such is not subject to confirmation and approval at the subdivision stage. It is usual practice to install gas reticulation network for the subdivision within a common civil trench at no cost to the developer.

If there is an extension required to connect to the nearest high pressure gas main, the developer will be required to pay for the trenching to the gas main as a headworks cost. Information obtained from Alinta Gas indicates there is existing gas infrastructure located in the Partridge Street road reserve at the north west of the site should a connection be required.

4.8.5 TELECOMMUNICATIONS

As a result of the Australian Government's decision to roll out a *National Broadband Network* (NBN) the ownership issues of delivering the wholesale fibre to the home system have been transferred to the Government with a number of retail service providers likely to offer services over the network.

NBN Communications (NBN Co) will not comment on whether the development is in their fibre footprint until an application is made for reticulation. However information obtained from Telstra indicates the development site is earmarked for NBN infrastructure, with the implication that the existing developments in the area have also been approved for NBN reticulation.

General communication services for the development will consist of the installation of a standard pit and pipe network in accordance with NBN Co guidelines and standards. The current design practice for road reserves, pavement and verge provisions will make adequate allowance for services including broadband in accordance with the agreed *Utilities Service Providers* handbook. There will be some local land requirements for equipment sites, similar to current provisions which will be subject to confirmation and approval at the subdivision stage.

Developers will be required to cover the costs of trenching and ducting for the infrastructure, however NBN Co will cover the other costs of installing fibre infrastructure, including backhaul. Post construction and due to the possible NBN Co delays in rollout programming, negotiations with Telstra may be required for an interim mobile service, and access to the internet will only be available through wireless broadband services.

All communication assets within the development will remain in the ownership of the provider and easements will need to be granted in favour of the service provider.

4.9 WATER MANAGEMENT

4.9.1 LOCAL WATER MANAGEMENT

EXISTING CATCHMENT BOUNDARIES

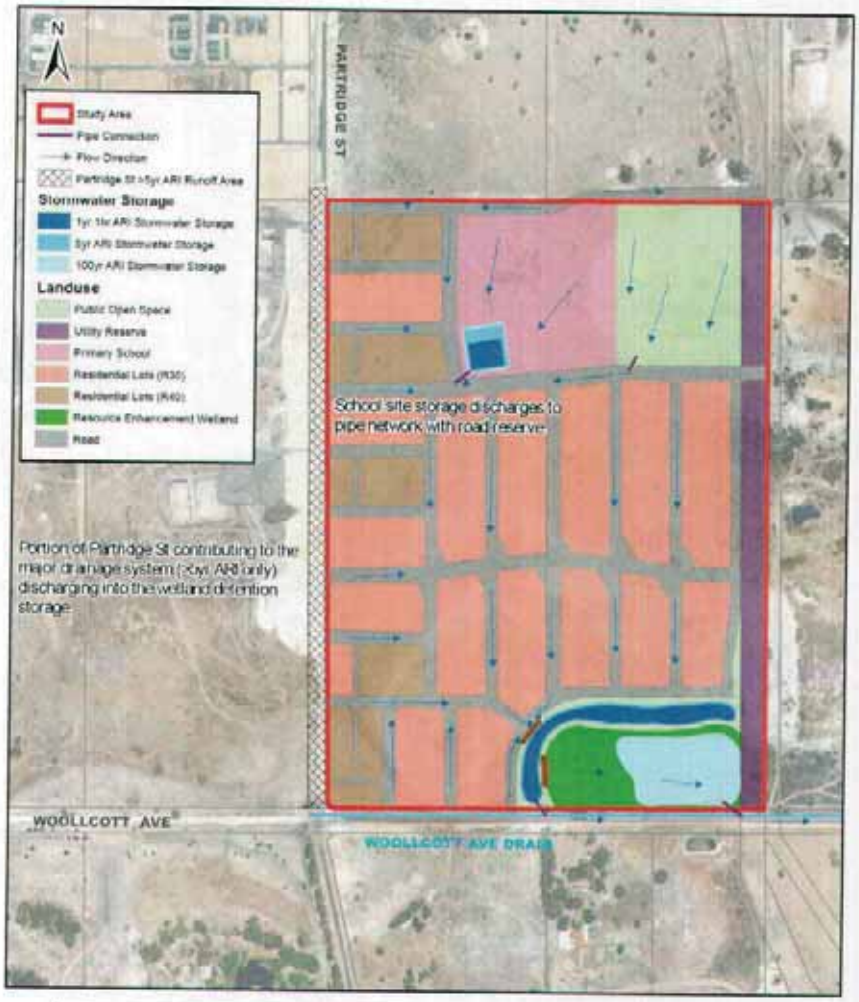
The boundary of the site forms the post-development catchment boundary. A portion of Lot 348 Park Street to the north is also included in the sites post development catchment area, with the remainder of Lot 348 and the whole of Lot 349 directly north of the site draining in a south easterly direction to St Leonards Creek.

Landholdings to the west, including Whiteman's Edge, drain in a westerly direction and will not impact on the drainage system of the site. Similarly landholdings directly east of the site will drain in an easterly direction and will not impact the proposed drainage system.

WETLAND MANAGEMENT

The following key measures will be implemented to ensure the REW will not be negatively impacted by future construction works:

- The groundwater design level has been determined over the site to allow the water table to fluctuate up to the average annual maximum level. Any potential increases above the Average Annual Maximum Groundwater Level (AAMGL) will be controlled by a subsoil pipe system, maintaining the water balance of the site (refer **Section 4.2** of **Appendix F**);
- The REW is preserved in the adjacent reserve, with the surface area for rainfall recharge directly onto the REW remaining unchanged;
- Only storm events greater than the 5 year ARI will be directed to the REW;
- The level of the outlet pipe to Woollcott Avenue drain will be set to maintain existing standing water levels;
- An appropriate monitoring program will be implemented to assess the hydrological regime of the REW. The monitoring will include on-going measurements of groundwater and surface water levels in the REW;
- Minor storm events (up to the 5 year ARI) will be stored outside of the REW, preventing frequent runoff events and first flush storm event from entering the REW; and
- Subsoil pipes will be installed at the base of the REW buffer swale discharging to the Woollcott Ave drain. The subsoil pipes will allow retention of the 1yr 1hr ARI within the swale, controlled groundwater levels beneath the amended soil profile to ensure it does not become saturated and prevent any rise in groundwater levels caused by infiltration of the 1yr 1hr ARI runoff, which could potentially increase the standing water level within the REW.



Stormwater Storage Details:

Catchment	Wetland 100yr ARI Detention Sotrage		REW Buffer		School Site		
	REW	REW Buffer					
	100yr ARI	100yr ARI	5yr ARI	1yr 1hr ARI	100yr ARI	5yr ARI	1yr 1hr ARI
Ponding Depth (m)	0.75	0.7	0.7	0.3	0.9	0.5	0.3
Top Water Level (mAHD)	25.85	28	28	27.6	30.2	29.8	29.6
Top Water Level Surface Area (m^2)	11,710	7,800	7,800	6,050	3,050	2,580	1,130
Top Water Level Volume (m^3)	4,262	4,390	4,390	1,690	1,860	730	310
Peak Outflow (m^3/s)	0.1	0.09	0.09	0	0.02	0.01	0

SOURCE: JDA PTY LTD, Fig 7 Proposed Stormwater Management Systems 2013.

STORMWATER MANAGEMENT SYSTEMS

Lots 346 & 347 Woollcott Avenue, Brabham

A Cedar Woods Project

s: NTS@A4
d: 19 Dec 2013
p: 13/014/027A

figure **18**

GROUNDWATER MANAGEMENT

To protect infrastructure from high seasonal groundwater levels, the groundwater design level has been calculated by measurement of the water table as described in the Albion LWMS. A Controlled Groundwater Level (CGL) has been adopted, reaching a maximum 0.5m below the Average Annual Maximum Groundwater Level (AAMGL) contours as shown on Figure 3 of **Appendix F**. Due to the shallow groundwater over the site subsoil pipes will be required to protect infrastructure from rising groundwater levels in above average rainfall years. The criteria for the installation of subsoil pipes will be as follows:

- Subsoil drainage will be provided where the separation of lot finished level from groundwater design level (CGL) is less than 2.0m to protect infrastructure from groundwater mounding.
- Where soakwells are utilised a minimum 1.5m of separation between lot finished level and groundwater design level is required.
- Subsoil pipes will be placed at or above the groundwater design level.
- Subsoil pipes will be laid in the road network where appropriate and discharge into the bioretention swales in the REW buffer. Subsoil pipes will also be laid beneath the swale in the REW buffer.
- Subsoil pipe systems must be designed with free draining outlets, except in major storms.
- Groundwater levels will be managed by a subsoil pipe system. Within 200m of the wetland and St Leonards creek subsoil pipes will be set at or above the AAMGL. Elsewhere subsoils will be laid below AAMGL up to 0.5m.

WATER QUALITY MANAGEMENT

The effective implementation and management of water quality on the site will be managed through both structural and non-structural controls as part of the urban development. This approach will enhance water quality as a result of the land use change.

Non-structural source controls seek to reduce the nutrient export from the site and focus on reducing the need for nutrient inputs into the landscape. The following strategies are proposed:

- Local native plants make up a minimum 50% of the planted areas and streetscape treatments. Any non-local species will be selected for drought tolerance, deep root system and low fertiliser requirements. Plants selected should have a root system that can reach the groundwater table, thereby requiring very little irrigation water to supplement growth;
- Street sweeping and the installation of Gross Pollutant Trap's (GPT) which will be subject to eduction cleaning. The UWMP, subject to confirmation and approval at the subdivision stage, will outline the schedule and cleaning requirements for both streets (sweeping) and GPT, which will be co-ordinated with the City; and
- Promotion of local native plants and drought tolerant gardens to lot purchasers via a landscape package.

Structural source controls are proposed to compliment the non-structural source controls and provide a complete treatment train for stormwater movement through the development. The following structural controls are considered appropriate for the site:

- The use of bio-retention storages with capacity to treat up to the 1yr 1hr ARI storm event;
- A GPT will be installed on the primary school site, with the GPT sized to treat the 3 month ARI (with capacity to bypass the 5yr ARI); and
- Finish levels of the neighbourhood park will be determined at detailed design stage. Nutrient management measures will need to be considered to ensure excess nutrients do not leach to the subsoil pipe system. Measures to manage nutrients will include use of amended soils (sands that are blended with clay and organic matter to improve its nutrient and moisture retention) under the turf and preparation of a fertiliser management schedule which includes slow release fertilisers, and soil and plant tissue testing to ensure the correct fertiliser application rates.

4.9.2 IMPLEMENTATION

Specific issues raised in the LWMS (**Appendix F**) that need to be addressed include:

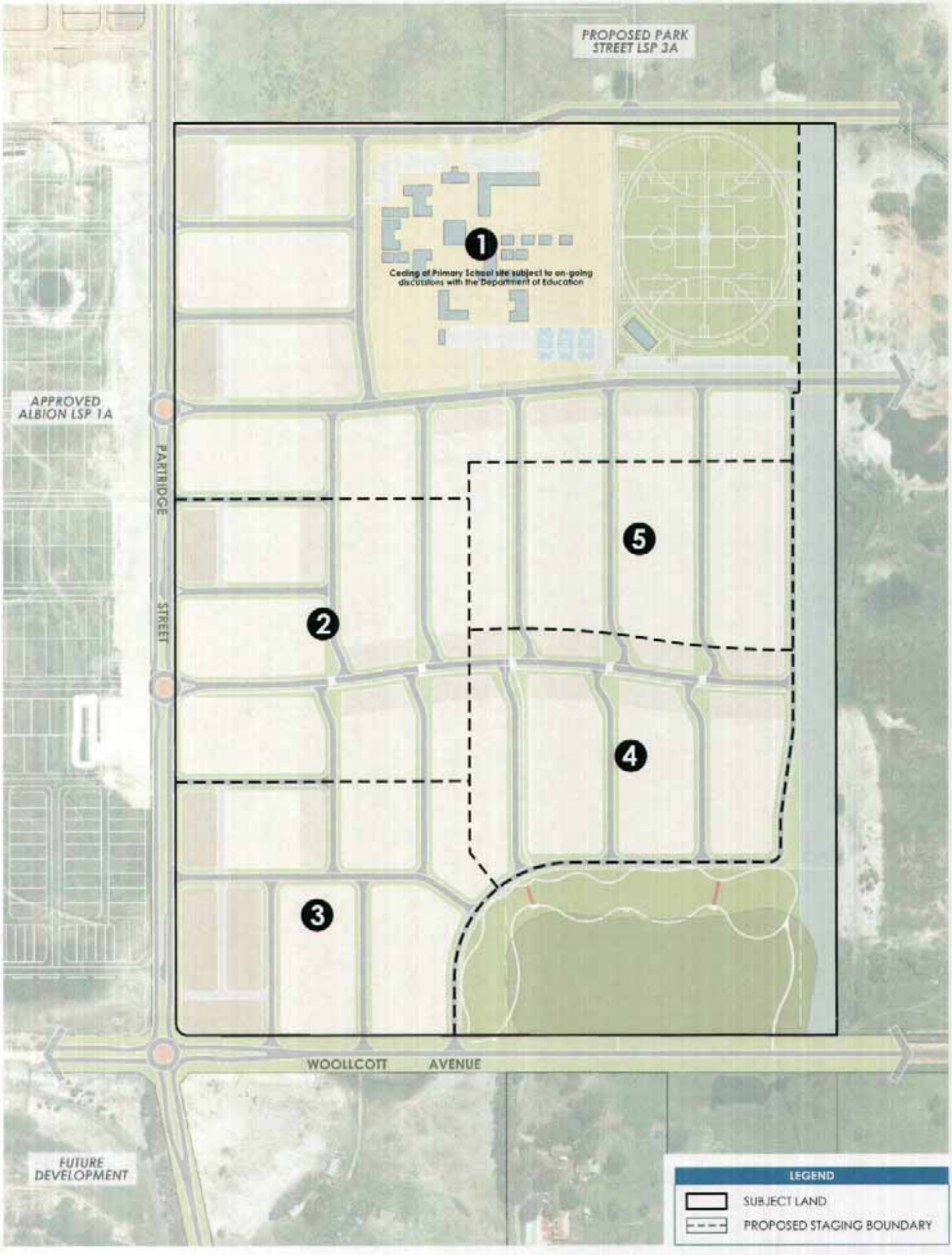
- Details of 1yr 1hr ARI water quality treatment designs;
- Confirmation of groundwater levels and geology within the REW; and
- Monitoring of specific best management practice structures performance to be included as part of the post-development monitoring programme within the relevant UWMP.

The implementation of the above processes requires an *Urban Water Management Plan* (UWMP) to be provided subject to confirmation and approval at the subdivision stage, prior to any ground disturbing activities.

4.10 STAGING

The developer will commence development of the subject land as soon as all necessary approvals have been obtained. In relation to the staging of the development, it is envisaged that the residential allotments to the north of the site, adjacent to the primary school, the neighbourhood park and the adjoining Neighbourhood Connector B road (to provide access to the neighbourhood park) will form part of the initial Stage 1 release given the availability and access to existing services. **Figure 19 – Proposed Staging Plan** shows the proposed development stages, which will be further refined given future economic conditions and developer preference in the future.

Upon completion of Stage 1, it is expected that the land along the western boundary fronting Partridge Street will commence, before areas to the east of the site are developed. The indicative staging arrangement proposed will ensure road connections with the surrounding landholdings are established early in the project. It should be noted that the staging of development described above is indicative only and is subject to further refinement during the detailed subdivision design process.



PROPOSED STAGING PLAN

Lots 346 & 347 Woollcott Avenue, Brabham

A Cedar Woods Project

0m 20 40 80m

s: 1:4000@A4
d: 12 June 2014
p: 13/014/025D

figure 19

4.11 DEVELOPER CONTRIBUTION ARRANGEMENTS

The City's *Development Contribution Plan (DCA 1 – Brabham (Albion))* has been prepared to facilitate orderly development in the DCP area, and provides a mechanism to ensure infrastructure is delivered in an equitable manner. The DCP identifies a range of financial contributions across various future contribution networks, subject to financial contributions by the various landowners within the area at time of development.

The statutory provisions relevant to the DCP are contained within Schedule 13 of the Scheme, and it is noted the City have recently (Sept 2012) undertaken a review of the costs attributed to the various networks, based on updated information. As of January 2014, a financial contribution of $143,697 is required for each Cost Contribution Area (CCA) within the DCP area (set at June 2010 values). The cost contribution area is essentially the area of land available for urban purposes, and is consistent with the net subdivisible area used within POS calculations.