WANDI SOUTH STRUCTURE PLAN

SPN/0352M-1

OUR REF: 7926 18/09/2017

ROWEGROUP

ENDORSEMENT PAGE

This structure plan is prepared under the provisions of the City of Kwinana
Town Planning Scheme No.2

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

01 JANUARY 2012

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

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TABLE OF AMENDMENTS

Amendment No.	Summary of Amendment	Amendment Type	Date Approved by WAPC
0	*Original Local Structure Plan*	-	*January 2012*
1	- Amend POS and street block configuration for rare flora (Caladenia huegelii) and vegetation retention.	Minor	September 2014 (CoK adoption)
2	- Amend southern boundary of LSP; and - Reconfigure zoning and street block layout – Lots 60 and 61 Kenby Chase.	Minor	January 2018

Part One
IMPLEMENTATION

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1. Structure Plan Area

This Structure Plan applies to the land contained within the inner edge of the line denoting the structure plan boundary on the Structure Plan Map (Refer Plan 1 situated at the end of Part 1 of this Structure Plan).

2. Operation

The Structure Plan comes into effect on the date it is approved by the Western Australian Planning Commission.

3. Subdivision and Development Requirements

3.1 Residential densities for the structure plan area are the residential densities shown on the Structure Plan Map.

3.2 Public open space is to be provided in accordance with the Structure Plan Map.

3.3 Land use permissibility within the structure plan area shall be in accordance with the corresponding land use classification in the City of Kwinana Town Planning Scheme No.2.

3.4 This structure plan is supported by two Bushfire Management Plans (BMP), (*Fire Management Plan – Wandi South* prepared by Fireplan), as amended and the *Bushfire Management Plan – Lots 60 and 61 Kenby Chase, Wandi* prepared by Strategen). Any land falling within 100 metres of a bushfire hazard identified in the BMP is designated as a Bushfire Prone Area for the purpose of the Building Code of Australia.

3.5 Notifications on Title

The Council shall recommend to the Western Australian Planning Commission that a condition be imposed on the grant of subdivision approval for a notification to be placed on the Certificate of Title to suitably respond to the following:

a) That a lot(s) with a bushfire attack level (BAL) rating of 12.5 or higher is within a designated bushfire prone area and subject to a *Bushfire Management Plan.*

b) Transport noise for lots having noise levels exceeding the noise target as per *State Planning Policy 5.4 – Road and Rail Transport and Freight Considerations in Land Use Planning.*

3.6 Management Plans

The Council shall recommend to the Western Australian Planning Commission that a condition be imposed on the grant of subdivision approval to respond to the following as identified by the structure plan:

a) A mosquito and midge management plan; and

b) Acoustic assessment and noise management plan in accordance with *State Planning Policy 5.4 Road and Rail Transport Noise and Freight Considerations in Land Use Planning*.

4. Local Development Plan(s)

Local Development Plan(s) are to be prepared for lots with one or more of the following attributes:

a) Rear–loaded vehicle access;

b) Having the potential for grouped and/or multiple dwellings;

c) With an area of 260m² or less;

d) Abutting public open space;

e) With a bushfire attack level rating of 12.5 or greater; and

f) With outdoor noise levels beyond the target prescribed in the *State Planning Policy 5.4 – Road and Rail Transport and Freight Considerations in Land Use Planning* and as identified spatially in an approved acoustic assessment and noise management plan.

5. Other Requirements

a) Development Contribution Arrangements

Under the City of Kwinana Town Planning Scheme No.2, the following development contribution arrangements apply and/or are contemplated:

i) Development Contribution Area 5 for the funding of traditional infrastructure; and

ii) Development Contribution Area 9 – for the funding of community infrastructure.

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All areas and dimensions are subject to survey.

Planning Design Delivery

LEGEND

METROPOLITAN REGION SCHEME
RESERVED LAND

- Primary Regional Road
- Other Regional Road

LOCAL SCHEME
LOCAL SCHEME RESERVES

- Parks Recreation & Drainage
- Public Purposes
  WSD Water Supply Sewerage & Drainage

ZONES

- Development
- Residential - R20
- Residential - R25
- Residential - R30
- Residential - R40
- Residential - R60

OTHER

- Structure Plan Boundary
- Neighbourhood Connector
- Access Street - Local Road
- Laneway
- Western Power Easement

0 50 100 150 200 250 Metres

REVISIONS

Rev	Date	Drawn
F	2017.03.07	M. Sullivan
G	2017.09.19	W. Clements
H	2017.11.06	W. Clements
I	2017.11.07	W. Clements

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Job Ref:	7926
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Client:	Satterley Property Group
Designer:	R. Cumming
Drawn:	K. Trenberth
Projection:	MGA50 GDA94
Plan ID:	7926-STR-02-I

Cadastre supplied by McMullen Nolan

Wandi South Local Structure Plan

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William Clements 7 November 2017

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Wandi South Local Structure Plan – Public Open Space Schedule

Site Area (Local Structure Plan boundary)			**58.2 ha**
Less			
Waste Water Pump Station	0.4 ha		
Western Power Easement	4.2 ha		
Lyon Road Landscape Buffer	0.2 ha		
Existing Darling Chase Reserve to be Retained	1.7 ha		
Existing Kenby Chase Reserve to be Retained	0.8 ha		
Total		**7.3 ha**	
Net Site Area			51.0 ha
Deductions			
High School	10.0 ha		
Gross Subdivisible Area			**41.0 ha**
POS @ 10%			4.1 ha
Public Open Space Contribution			
May comprise:			
- Min 80% unrestricted POS		3.3 ha	
- Min 20% restricted use POS		0.8 ha	
Total Required POS			**4.1 ha**
POS Reference Number		**Unrestricted POS sites (m²)**	**Restricted POS sites (m²)**
1 – 1,538 m²_Local Park		1,538	0
2 – 7,230 m²_Local Park		924	6,306
3 – 41,792 m²_Neighbourhood Park		9,195	32,597
4 – 3,625 m²_Local Park		3,625	0
5 – 7,032 m²_Local Park / Drainage		987	6,044
6 – 6,358 m²_Local Park		6,358	0
7 - 895 m²_Local Park		0	895
Total		**22,627 m² (2.3 ha)**	**45,843 m² (4.6 ha)**
		5.5 %	**11.2 %**
Additional Deductions			
Restricted Open Space Surplus		3.8 ha	
Revised Gross Subdivisible Area			37.2 ha
Revised POS @ 10%			3.7 ha
Revised Public Open Space Contribution			
May comprise:			
- Min 80% unrestricted POS (3 ha)		2.3 ha (6.1%)	
- Min 20% restricted use POS (0.7 ha)		0.7 ha (2%)	
Total Credited POS			**3.0 ha (8.1%)**
Additional POS for noting		**Unrestricted POS sites (m²)**	**Restricted POS sites (m²)**
High School Playing Fields		54,259	0
Wandi Local Playing Fields and POS within Water Protection Zone_District Park		64,217	0
Total for noting		**118,476 (11.8 ha)**	**0**
Total Combined POS Provision		**141,103 m² (14.1 ha)**	**45,843 m² (4.6 ha)**

Note 1: All calculations are subject to survey and reconciliation at the completion of the development.

Note 2: Any shortfall of POS will be compensated through cash in lieu payments by subdividing landowners.

Part Two

EXPLANATORY SECTION

(As per January 2012 Approval)

ROWEGROUP

Western Australian Planning Commission

Your Ref:
Our Ref: SPN/0352/1
Enquiries: Regan Douglas (Ph 6551 9289)

Chief Executive Officer
Town of Kwinana
PO Box 21
KWINANA WA 6966

Dear Sir/Madam,

PROPOSED STRUCTURE PLAN - WANDI SOUTH LOCAL STRUCTURE PLAN

The Western Australian Planning Commission resolves, pursuant to Clause 6.17.4.10 of the Town of Kwinana Town Planning Scheme No. 2, to approve the Wandi South Local Structure Plan (Lots 675, 674, 51, 52 Lyon Road and Lots 1, 53, 54, 55, 56, 57, 60, 61 Kenby Chase, Wandi), subject to the following modifications:

Wandi South Local Structure Plan (Plan)

Spatial plan

a) clearly denote and label the Peel Sub-Drain R;

b) remove the blue colour wash from the future Wandi District Centre and portray the aerial view with the 'Future Wandi District Centre' label, only;

c) modify the green colour tone in the areas intended to be reserved for Parks, Recreation and Drainage to more closely match the green colour tone in the legend;

Bar scale

d) divide into units of 50 for usability;

Legend

e) remove the 'Commercial' zone;

f) add 'Residential - R60';

Notes

g) include a full stop at the end of each note for consistency;

h) at note 8, delete and replace with 'Sewer pump station to be ceded to the Water Corporation.';

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Western Australian Planning Commission

Wandi South Local Structure Plan (Report Text)

i) renumber the references to each of the appendices correctly;

j) at '1.2 LSP Area', delete sentences four and five as they relate to the net POS site area;

k) at '2.5.6 Surface Hydrology', delete the second paragraph and replace with the following:

'The major surface water features are semi-permanent groundwater expressions located in the low lying parts of the site such as the central Multiple Use Wetland. Some drainage flows originate in the central portion of the site and drain west into the Peel R Sub-Drain via several artificial drains. The Peel R Sub-Drain flows north under the Kwinana Freeway and connects to the Peel Main Drain that flows into the Peel-Harvey estuary.

Much of the elevated land in the eastern and southern portion of the LSP area, however, has no existing flow path due to soakage. Any runoff from these areas will be intercepted, post-development, by the artificial drains, taking the flow west to the Peel R Sub-Drain. At the central wetland area, an existing drain will convey flows around the central wetlands whilst conserving its areas of 'excellent ' vegetation.';

l) at '3.2.1 Town of Kwinana Town Planning Scheme No. 2 Zoning', change DCA '8' to '9' for accuracy;

m) at 'OVERHEAD TRANSMISSION LINES' in section 4.1.2, delete the second sentence and replace with:

'The easement area will be an active space, with development fronting it and, while utilised for drainage, will serve as restricted use public open space including the provision of a pedestrian link between the Wandi District Centre and the LSP area. The easement area will be deducted from the LSP site area for the purposes of calculating the public open space contribution.';

n) at 'POTENTIAL NOISE IMPACTS' in section 4.1.2, delete 'address' in the first sentence and replace with 'investigate' for accuracy;

o) at 'POTENTIAL NOISE IMPACTS' in section 4.1.2, delete the second and third sentences and replace with:

'At the subdivision stage of planning, a Noise Management Strategy will be prepared and implemented.':

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p) at '4.1.3 Density':

- in the sentence starting with *'On the basis of the above...'*, delete the words '*minimum target*';
- delete '*ha*' following *'34.9'*;
- edit the discussions regarding the 'site hectare' measurement method so as to emphasize its use as the most reasonable measurement method of density in the LSP area;
- clearly state the areas excluded to arrive at the 'site hectare' measurement;
- include a reference to the 'Connected city' scenario in the WAPC's 'Outer Metropolitan Perth and Peel Sub-Regional Strategy' and compare its estimated dwelling yield of 1,780 for the Wandi Cell to that proposed;

q) at 'CONNECTIVITY' in section 4.2.2, modify text to reflect that there are only four local road connections to Lyon Road in the structure plan area, not five;

r) at 'CONNECTIVITY' in section 4.2.2, modify text to delete the second paragraph and integrate its contents into section '4.2.2 PEDESTRIANS AND CYCLISTS' for clarity;

s) modify section '4.4 Public Open Space' as follows:

- remove '2. Lyon Road Landscape Buffer' as an area of restricted use POS within this section and in all relevant areas of the LSP including Figure 21;
- change title of 'Other POS' to 'Western Power Easements';
- to acknowledge the 4505m2 shortfall in the provision of unrestricted POS and the requirement for cash-in-lieu of the shortfall throughout the section and in all relevant areas of the LSP including Figure 21;

t) modify 'Table 4 - Public Open Schedule' for clarity, accuracy and consistency with WAPC policy and practice as follows:

- the Site Area is to be the total LSP area of 57.89ha;
- the Darling Chase and Kenby Chase road reserves are to be shown as separate entries below 'Less';
- the Lyon Road Landscape Buffer (POS 2) is to be removed from the 'Restricted POS Sites', included below 'Less' and the POS areas modified accordingly;

u) at '4.7.1 District Centre' and '4.7.2 Type of Centre and Land Distribution', edit to remove the duplication of information;

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v) at '4.12.1 Wetland and Remnant Vegetation Management Plans' modify to include as part of the outline brief:

- the integration of fire management, including the provision of building protection zones, in both the wetland and remnant vegetation management plans.

Appendices

w) in Appendix 1 the following figures are to be modified:

- 'Figure 11 - Zoning plan' to show the sewage pump station site as Parks, Recreation and Drainage;
- 'Figure 15 - Pedestrian network plan' to be made consistent with the LSP text in the following manner:
  - by the provision of an additional label noting that a dual use pathway is to be provided on the western side of Lyon Road; and
  - by the modification of Label 5 (as counted from the top) to state 'Footpaths will be provided on both sides of streets that form pedestrian linkages within a walkable catchment of the Wandi High School, Wandi Primary School and the Wandi District Centre'.
- on 'Figure 21':
  - title 'Public Open Space Provision - Lot by Lot Basis';
  - indicate that the 'Total Site Area' includes the deduction of Kenby Chase and Darling Chase.

x) in Appendix 10, on the Landscape Masterplan, POS 'E' is to include the statement that 'Unrestricted POS in this area is to be comprised of cleared areas and those areas that detain stormwater following a greater than five year average occurrence.'

Advice to Applicant

The LSP documents require a thorough proofread to eliminate grammatical errors and typos.

Advice to Applicant and Town of Kwinana

In approving the LSP, the WAPC acknowledges that a minor change to the Wandi North LSP has been initiated to alter its boundary to ensure that it does not include land in the Wandi South LSP area.

Western Australian Planning Commission

Following completion of these modifications, please return three copies of the Structure Plan to the WAPC for its final approval.

Should you wish to discuss this matter further, please contact the assigned planning officer listed above.

Yours faithfully,

Neil Thomson
Secretary
Western Australian Planning Commission

27 January 2012

cc: Greg Rowe & Associates

Endorsed by an officer of the Department for Planning and Infrastructure and acting under delegated power from the Western Australian Planning Commission.

25 JAN 2012

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WANDI SOUTH LOCAL STRUCTURE PLAN

LOTS 51, 52, 674 AND 675 LYON ROAD, AND LOTS 1, 53, 54, 55, 56, 57, 59, 60, AND 61 KENBY CHASE, WANDI

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EXECUTIVE SUMMARY

This report has been prepared in support of a Local Structure Plan (LSP) for Lots 51, 52, 674 and 675 Lyon Road, and Lots 1, 53, 54, 55, 56, 57, 59, 60, and 61 Kenby Chase, Wandi. The purpose of this LSP is to refine the provisions under the district framework and ensure a comprehensive approach to planning and development is undertaken, with input from the local community, landowners, government agencies and other key stakeholders.

The subject site is currently zoned 'Urban' under the Metropolitan Region Scheme (MRS) and was the subject of an Urban Deferred Lifting Request endorsed by the Western Australian Planning Commission (WAPC) on 9 December 2008. Upon the *Gazettal* (January 2009) of lifting, the site was also concurrently rezoned to 'Development' under the Town of Kwinana Town Planning Scheme No. 2.

The LSP addresses the following opportunities and constraints:

CONSTRAINTS

- The adjacent rural residential community, and any impact which residential development would have upon the existing lifestyle and amenity of the locality;
- High groundwater levels across the western portion of the site;
- The protection and rehabilitation of remnant vegetation;
- The steep topography of the site within its eastern portions adjacent to Lyon Road; and
- The high voltage power lines which traverse the western and southern boundaries of the site.

OPPORTUNITIES

- The protection and enhancement of vegetation as community assets;
- The utilisation of the high voltage power easement for drainage purposes; and
- The proximity to the Wandi District Centre will provide opportunities for local employment.

The LSP presents a highly constrained urban cell with a limited developable area. To ensure efficient use of urban land, both higher densities and a range of lot sizes are proposed for areas of high amenity, in order to facilitate a diversity in housing product.

The LSP area predominantly consists of residential development, providing a variety of low and medium density housing opportunities.

The site is currently well serviced by the regional road network, being the Kwinana Freeway and Anketell Roads (via Lyon Road). Lyon Road will be downgraded to a local access road upon completion of the internal Honeywood Avenue extension, therefore minimising traffic volumes. The streetscape along Lyon Road will maintain the rural residential feel with the majority of development fronting Lyon Road comprising low density residential, a landscape buffer and the proposed Wandi Local Playing Fields.

The western half of the site contains a multiple use wetland. The low lying developable portions of the western part of the site will require fill to ensure suitable clearance to groundwater. The eastern half of the site rises from the wetland at a rate of 1:12 to a ridgeline along Lyon Road. The lowest point of the site near the Kwinana Freeway is at 14m AHD, which rises up to 35 m AHD along Lyon Road in the eastern part of the site. Bulk earthworks will be

undertaken to ensure adequate grades for roads, drainage and sewerage, as well as to ensure level building blocks for housing.

Much of the subject area and surrounding locality has been extensively cleared for farming and horticulture. Only remnant patches of native vegetation remain. Generally, vegetation within the LSP area ranges from 'Excellent' to 'Completely Degraded' condition.

The site is located within the Water Corporation's 'Thomsons Lake' Gravity water supply scheme. The site is located in the Water Corporation's 'Thomsons Lake' sewerage catchment.

Given the location of the site to the proposed Wandi District Centre, Kwinana Secondary Centre and Cockburn Central Secondary Centre, and its accessibility to the Perth City Centre, afforded by access to the Kwinana Freeway and the Perth to Mandurah train line, there are a number of employment opportunities available to future residents of the LSP area.

WANDI SOUTH LOCAL STRUCTURE PLAN » WANDI » 10 FEB 2012 » GRA REF 4385 » 4385_12JAN_LSP REPORT_FINAL APPROVAL_RT.DOCX

1.0 INTRODUCTION

1.1 Purpose of the Local Structure Plan

This Local Structure Plan (LSP) has been prepared as a precursor to subdivision for land zoned 'Development' under the provisions of the Town of Kwinana Town Planning Scheme No. 2.

The purpose of the LSP is to refine the provisions under the district framework and ensure a comprehensive approach to planning and development is undertaken, with input from the local community, landowners, government agencies and other key stakeholders.

The LSP is a statutory planning document that will guide future land use and development within the Wandi Cell and provide a framework for more detailed planning at subdivision.

1.2 LSP Area

The LSP Area includes Darling Chase in the north, the western boundary of Lyon Road in the east, and the Western Power easements to the south and west. This area is zoned Development Zone under the Town of Kwinana Town Planning Scheme No. 2 (TPS 2).

The LSP Area includes Darling Chase in the north and Kenby Chase towards the south of the LSP area. The total area inside the LSP boundary is 57.89ha.

Figure 1 depicts the LSP Area.

1.3 Structure of the Local Structure Plan Report

The LSP Report comprises two (2) parts:

Part A: Local Structure Plan Report
Part B: Technical Appendices

Part A contains a description of the LSP area and examines its environmental, heritage, accessibility and servicing characteristics. This component of the Report also explores the current regulatory and policy framework applicable to the LSP area – both in terms of land use planning and environmental considerations, and provides an overview of the LSP design.

Part B provides separate reports which have been prepared for specific areas of interest such as environment; servicing; hydrological etc. The information contained within these reports is summarised in Part A, however, it is recommended the reader consult the attached reports for more detailed information on specific matters.

Part B also contains a copy of each of the figures referred to in Part A of the LSP. These are included at Appendix 1.

WANDI SOUTH LOCAL STRUCTURE PLAN » WANDI » 10 FEB 2012 » GRA REF 4385 » 4385_12JAN_LSP REPORT_FINAL APPROVAL_RT.DOCX

1.4 The Project Team

Mammoth Nominees has established a consultant team comprising experts across a variety of disciplines. Members of the Project Team are listed below.

Discipline	Consultant
Civil Engineering	VDM
Contaminated Sites	ACE Environmental
Environmental	360 Environmental
Hydrological	JDA
Landscape Architecture	Emerge Associates
Survey	MAPS
Traffic	Transcore
Town Planning and Urban Design	Greg Rowe and Associates

Greg Rowe and Associates is the principal point of contact for all enquiries relating to the LSP.

2.0 SITE AND CONTEXT ANALYSIS

2.1 Regional Location

The site is located within the Perth metropolitan south west corridor, approximately 8 km inland from Kwinana Beach. The site is situated approximately 30 km south of the Perth City Centre, and is accessible via the Kwinana Freeway and the Perth to Mandurah Train Line. Refer to Figure 2 for Regional Location.

2.2 Local Location

The site is bound by Darling Chase to the north, Lyon Road to the east, and the Western Power easements to south and west. The site is located directly south of the Wandi North Cell, which received local structure planning and subdivision approvals in late 2009. Special rural development is located on the eastern side of Lyon Road. The Kwinana Town Centre is located approximately 6km to the south west and the Spectacles Regional Reserve approximately 1km to the south west. Refer to Figure 3 for Local Location.

2.3 Ownership and Cadastral Information

The subject site comprises thirteen (13) separate allotments. Refer to Appendix 2 for Certificates of Title. The following table provides the Title particulars of the lots contained within the subject site.

Table 1 – Title Particulars

Lot No.	Address	Volume/Folio	Proprietor/s
51	642 Lyon Road, Wandi	1934/51	Moshee Pty Ltd
52	Lyon Road, Wandi	1934/52	Guccee Holdings Pty Ltd
674	Lyon Road, Wandi	1233/518	Anketell Farms Pty Ltd
675	574 Lyon Road, Wandi	1905/92	Anketell Land Holding Co Pty Ltd
Part Lot 1	25 Kenby Chase, Wandi	2629/693	Tina Michelle Bazzo
53	6 Kenby Chase, Wandi	1934/53	Tina Michelle Bazzo
54	32 Kenby Chase, Wandi	1934/54	Newsonic Pty Ltd
55	40 Kenby Chase, Wandi	1934/55	AE and JE Flight
56	45 Kenby Chase, Wandi	1934/56	MA and PJ Parker
57	31 Kenby Chase, Wandi	1934/57	Moshee Pty LTd
Part Lot 59	21 Kenby Chase, Wandi	1934/59	A Lee
Part Lot 60	15 Kenby Chase, Wandi	1934/60	CR and C Tassone
Part Lot 61	3 Kenby Chase, Wandi	1934/61	GM and LC Hardy

Mammoth Nominees represents Lots 674 and 675 Lyon Road, and Lots 1, 51, 52, 53 and 57 Kenby Chase.

2.4 Existing Land Uses

The Wandi locality was historically utilised for rural and agricultural purposes, and whilst these activities have ceased, much of the land remains in a degraded state, which characterises the northern part of the LSP area containing the larger Lots 674 and 675. Some areas of native vegetation remain throughout the LSP area, including areas identified as being in 'excellent' condition. The southern part of the LSP area is characterised by smaller landholdings containing a mixture of paddocks, scattered vegetation and rural residences. Western Power high voltage power lines traverse the western and southern boundaries of the LSP area. A poultry farm was previously operational on Lot 2 Anketell

Road, which is directly south of the LSP area. However, this use is now decommissioned. Refer to Figure 4 for an aerial view of the subject site.

2.5 Environmental Assessment

360 Environmental has prepared an Environmental Assessment Report (EAR), which details the site characteristics and investigations undertaken to support the LSP. The following section provides a brief overview, however, please refer to Appendix 3 for further detail.

2.5.1 Soil and Topography

The subject site is situated at the interface of the Bassendean and Spearwood dune systems. The majority of the site is classified as 'Silty Sands,' which correspond to the low lying areas near the middle and north-western areas of the site. The higher areas near Lyon and Anketell Roads are classified as 'Bassendean Sands (S8)'.

The two geological units featured on the site are described below:

- Higher ridge along the eastern boundary – Bassendean Sands. Bassendean Sands are characterised as very light at surface, yellow at depth, fine to medium grained, sub rounded quartz, moderately well sorted of Aeolian origin. This area is likely to facilitate groundwater recharge.
- Wetland area north and west of the site – Silty Sands. Silty Sands are characterised as dark brownish grey sandy silt with disseminated fine-grained quartz sand throughout and firm, variable clay content. This area has a high water table and although prone to flooding is generally free draining.

The site generally slopes down to the west from 35m AHD along Lyon Road in the east, to 14m AHD at the lowest point in the west towards the Kwinana Freeway.

2.5.2 Acid Sulphate Soils

As prescribed by the WAPC Planning Bulletin No. 64: Acid Sulphate Soils (ASS), the western portion of the subject site is classified as having a high to moderate risk of ASS or Potential Acid Sulphate Soil (PASS) occurring within 3 metres of the natural soil surface. The remainder of the site generally has a medium risk of ASS occurring within 3 metres of the natural soil surface.

Dewatering, soil disturbance, compaction or lateral displacement in the ASS risk area will require a preliminary site assessment and investigation to determine whether or not ASS are present. A limited preliminary site investigation was carried out in July 2009. A full investigation has also been commissioned for the area. Depending on the results of the investigation, an ASS Management Plan may be required in accordance with DEC's *Acid Sulphate Soils Guidelines Series* (2008-2009), and to obtain a groundwater abstraction licence from the DoW.

2.5.3 Vegetation / Flora

A significant area of the subject site has been cleared for pasture or housing, with some degraded native vegetation remaining around houses on the smaller lots adjoining Kenby Chase. The site has been significantly disturbed over time to facilitate land uses such as grazing, agistment, farming and residential housing. There are, however, pockets of remnant vegetation remaining, such as in the central wetland area to the north and along Lyon Road. Various surveys undertaken in the past describe the vegetation in the Wandi area as being typically 'Eucalyptus Open Woodlands' and 'Banksia low Woodland with scattered Jarrah and Sheok'.

A Level 2 Spring Flora and Vegetation Survey was undertaken by 360 Environmental in 2009, which identified seven vegetation types. The recorded vegetation types found throughout the site included:

- Forest of *Eucalyptus rudis* subsp. *rudis* and *Melaleuca rhaphiophylla* over Thicket or Scrub of *Taxandria linearifolia* and *Astartea scoparia* over bracken;
- Forest of *Eucalyptus rudis* subsp. *rudis* and *Melaleuca rhaphiophylla* over *Pennisetum clandestinum*, *Zantedeschia aethiopica* and *Juncus microcephala*;
- Low Woodland of *Banksia menziesii*, *Eucalyptus marginata* subsp. *Marginata*, *Allocasuarina fraseriana* and *Banksia attenuate* over Low Shrubland of *Hibbertia hypericoides*, *Kunzea glaberescens* and *Jacksonia furcellata*;
- Thicket or Scrub of *Adenanthos cygnorum* subsp. *Cygnorum* and *Kunzea glabrescens* over Low Shrubland of *Scholtzia involucrate* and *Brachyloma preissii* subsp. *Obtusifolium* with emergent *Banksia menziessii* and *banksia attenuate*;
- Thicket or Scrub of *Kunzea glabrescens* over Open Low Shrubland of *Scholtzia involucrate* and *Brachyloma preissii* subsp. *Obtusifolium ms* over Grassland/Herbland of *Vulpia myuros forma myuros*, *Hypochaeris glabra* and *Briza Maxima*;
- Highly modified and degraded native vegetation; and
- Pasture, lawns, roads, and other cleared ground.

No Threatened Ecological Communities (TEC's) were recorded.

The Survey noted the condition of the site's vegetation ranged from 'excellent' to 'completely degraded'. The dense swamp vegetation in the central north of the survey area was mostly in excellent condition, though in places, gaps in the canopy and mid-storey have allowed exotic grasses to dominate.

The condition of the T1 vegetation in the east of the site near Lyon Road is mostly in 'very good' to 'excellent' condition.

FLORA

A total of 194 taxa from 52 families and 144 genera were recorded during the course of the survey, including 73 non-native taxa (weed). No Declared Rare Flora (DRF) or Priority Flora were recorded. Based on the 2009 survey and a survey carried out in 2004 by Weston, it is considered unlikely that DRF and Priority Flora species occur on site.

The site is not located in, or within close proximity to, a National Park or Nature Reserve.

To ensure appropriate management of retained remnant vegetation a Remnant Vegetation Management Plan will be prepared and implemented as a condition of subdivision approval, as detailed further in Section 4.12 of this report.

2.5.4 Fauna

The Level 1 Fauna investigation undertaken in April 2009 observed a total of 26 fauna species within the study area during the survey. The vertebrate species of conservation significance (listed on state or federal threatened species lists or DEC priority species) that were positively identified as utilising the study area for some purpose during the survey were:

- Carnaby's Cockatoo – Sighted flying across the site during the survey period, potentially a seasonal visitor to forage or roost. No potential nest hollows observed on site therefore unlikely to be breeding on site.
- Forest Red-tailed Black Cockatoo – Sighted roosting during day survey, potentially an infrequent visitor to the site to forage on Jarrah and Sheoak, may also roost on site over night on occasions. No potential nest hollows observed, therefore unlikely to be breeding on site.
- Southern Brown Bandicoot, Quenda – Presence confirmed during discussion with landowner. Confined to areas with dense ground cover.

Further site investigations are being carried out in accordance with the Australian Government's Environment Protection Biodiversity Conservation Act 1999 (EPBC Act) for Carnaby's Black Cockatoo and Graceful Sun Moth (GSM), with a significant tree survey and a GSM survey recently completed. The tree survey identified a number of significant trees (trunk diameter of more than 400mm) across the site, which are generally confined to public open space areas and the high school site. The results of the GSM survey concluded there was no evidence of GSM occurring across the LSP area.

Refer to Appendix 4 for GSM survey report.

Although a number of policies and approvals processes have been addressed during the preparation of the LSP, and will subsequently be managed through the State planning process, individual subdivision applications within the LSP area will still be required to address the need for assessment and approval under the EPBC Act. As an approved LSP is not an approval for development to occur, and as there are multiple landowners within the LSP area, the responsibility for federal assessment of potential impacts to Matters of National Environmental Significance (MNES) is most efficiently managed by individual landowners at the subdivision implementation stage.

Referral and assessment of projects under the EPBC Act is not necessarily constrained by any approvals granted through the State planning process, however development cannot commence within an approved subdivision application area if approval under the EPBC Act is required. Proponents are required to refer their own projects for assessment and approval prior to commencing any site works.

Therefore on the basis of the above, the following table provides a guide to appropriate timeframes for the referral process. For the LSP area, the first two steps have been undertaken and upon approval of the LSP, consultation with the Australian Government Department of Sustainability, Environment, Water, Population and Communities (SEWPAC) will commence with regard to Carnarby's Black Cockatoo, as this is the only MNES present on the site.

Table 2 – EPBC Act Referral Process

Process Step	Timeframe for Work
Desktop assessment to determine matters of MNES potentially present onsite	During LSP preparation and determination
Undertake studies/ collect data to determine the presence of MNES	During LSP preparation and determination
Begin consultation with SEWPAC	Approval of LSP by WAPC
Submit referral under EPBC Act	Lodgement of Subdivision Application
SEWPAC assesses referral	Subdivision Application Determination
Decision	Post Subdivision Approval

In addition to Federal matters, a Fauna Management Plan will be prepared that details the protection measures applicable to the site at the subdivision stage.

2.5.5 Wetlands

There are no *Ramsar wetlands* or *Directory of Important Wetlands* situated on the site. The nearest *Directory of Important Wetlands* site is located approximately 1 km to the south west on the other side of the Kwinana Freeway, and is known as 'Spectacles Swamp'.

A Multiple Use wetland (Mandogalup Swamp South geomorphic wetland (dampland)) is located over approximately half the site. Through the Structure Planning assessment process the DEC and the Town of Kwinana noted a central portion of the wetland may posses higher wetland values than the Multiple Use category it is currently classified under. As such, the DEC and Town of Kwinana have required that the central portion of the wetland, which contains vegetation in 'excellent' condition, be retained and managed via a Wetland Management Plan. The focus of the Wetland Management Plan will be to conserve and protect the 'excellent' vegetation through, amongst other things, the direction of stormwater drainage to the existing degraded areas of the wetland.

The extent of protection of the central portion of wetland, as shown on Figures 9 and 19, was agreed to by the DEC on the basis that a further area of upland vegetation (T1 Community) along Lyon Road be retained. A copy of the DEC's correspondence, dated 21 February 2011 is provided at Appendix 7. The retention of this portion of upland vegetation has been achieved in the LSP. The DEC's agreement to the extent of the central wetland to be protected was in recognition of the design requirements of the DoE for the Wandi High School site, and the connectivity and engineering design requirements of the extension of Honeywood Avenue through the site. The central portion of the wetland is to remain in the Multiple Use category.

A conservation category wetland (CCW) is located outside the LSP area on the northern side of Darling Chase, situated over Lots 2 – 7 Darling Chase, Wandi. At present, these lots are rural residential allotments of 2ha in area, however are identified within the Wandi North LSP for wetland conservation. The existing Darling Chase road reserve and the approved extension of Darling Chase (refer WAPC 142168) provide separation between the proposed High School site in the northern part of the site and the CCW on Lots 2 – 7 Darling Chase, Wandi. The buffer distances applied to the CCW were agreed with the developer of the Wandi North LSP in 2008, as confirmed by the DEC's letter dated 21 April 2009. As such, no further buffer to the south of Darling Chase is required from the CCW, as supported by the DEC in its letter of 2 December 2010.

To ensure appropriate management of the existing central wetland a separate Wetland Management Plan will be prepared and implemented as a condition of subdivision approval, as detailed further in Section 4.12 of this report.

2.5.6 Surface Hydrology

The major surface water features are semi-permanent groundwater expressions located in the low lying parts of the site and several artificial drains. As detailed above, the central portion of the Multiple Use wetland, which contains vegetation in 'excellent' condition, is being retained and managed via a separate Wetland Management Plan with drainage being located in degraded areas of the wetland.

The major surface water features are semi-permanent groundwater expressions located in the low lying parts of the site such as the central Multiple Use Wetland. Some drainage flows originate in the central portion of the site and drain west into the Peel R Sub-Drain via several artificial drains. The Peel R Sub-Drain flows north under the Kwinana Freeway and connects to the Peel Main Drain that flows into the Peel-Harvey estuary.

Much of the elevated land in the eastern and southern portion of the LSP area, however, has no existing flow path due to soakage. Any runoff from these areas will be intercepted, post-development, by the artificial drains, taking the flow west to the Peel R Sub-Drain. At the central wetland area, an existing drain will convey flows around the central wetlands whilst conserving its areas of 'excellent' vegetation.

Predevelopment monthly sampling of the Sub-R drain for the period between October 2004 to September 2006 was conducted by JDA (2007), with further monitoring being carried out in 2010/11. The Sub-R drain flowed throughout the year. The Peel Main Drain flow, upstream of where the Sub-R drain discharges, is generally seasonal and ceases during summer months (JDA, 2007). The Local Water Management Strategy ('LWMS'), included as Appendix 12, recommends a flow control structure with the Sub-R drain with designs to be detailed in the future Urban Water Management Plan.

2.5.7 Groundwater

Two major aquifers exist under the site. In descending order of depth from natural surface, they are:

- Superficial Aquifer (unconfined): 20m AHD to -18m AHD; and
- Leederville Aquifer (confined). ~ - 80m AHD to -350m AHD.

The water table represents the uppermost surface of the unconfined (Superficial) aquifer. Constructed drains are extensive in the low lying areas of the subject site, draining groundwater to the Peel Sub-R drain, providing base flow to the Peel Main Drain all year round. These drains provide some control to seasonal peak groundwater levels in the low lying areas.

Presented as Figure 3.1 of the JDWMP is a contour plan showing estimated maximum groundwater contours. The contours presented in Figure 3.1 indicate the maximum groundwater levels vary from 20 m AHD to 14m AHD in an east west direction. To refine the maximum groundwater (water table) levels to a local scale, groundwater investigations were conducted by JDA in 2009. The local groundwater contours are in general agreement with the contours shown in Figure 3.1 of the JDWMP. The seasonal variation in the water table between summer and winter is about 0.6 to 1.5 m.

A significant portion of land in the Anketell/Wandi area is subject to shallow groundwater and seasonal water logging. Consideration of drainage and fill requirements are therefore needed to ensure future developments occur in an environmentally sensitive manner.

2.5.8 Potential Contamination

A search of the DEC's records and Contaminated Sites Database indicate the site has not been registered as a contaminated site, or as a site suspected of being contaminated.

As previously noted, land within the Wandi locality has historically been utilised for rural pursuits, and as such a number of lots within the subject site have and are currently being utilised for grazing and horse agistment.

Further investigation will be undertaken to determine the extent of any contamination and, if required, the remedial measures required across the area. All investigations and potential remedial works required will be undertaken in accordance with the *Contaminated Sites Act 2003* and verified by an independent auditor prior to approval by the DEC.

A limited preliminary site investigation was carried out for the site in July 2009. A full Preliminary Site Investigation has been commissioned. The field work, including a soils and groundwater sampling and analysis plan, and the Detailed Site Investigation report, which presents these results, will be finalised to address conditions of subdivision approval.

2.6 Heritage Assessment

An Aboriginal Heritage Analysis was conducted by Rory O'Connor in January 2008 and identified that the project area was covered in part by Aboriginal Site Number 3427, Mandogalup Swamp / Spectacles. The site is classified as a mythological site previously used as a hunting place and water source. The Aboriginal Heritage Analysis concludes the site is likely to be classified as "Stored Data" when assessed by the Aboriginal Cultural Material Committee (ACMC) and recommends that a Section 18 application under the Aboriginal Heritage Act 1972 be made before ground disturbance takes place. The Analysis recommends that a thorough archaeological survey be undertaken of the Project Area and be submitted to the ACMC in support of the Section 18 application.

As recommended by the Aboriginal Heritage Analysis, an Archaeological Investigation was undertaken by Quartermaine Consultants in September 2008. The Archaeological Investigation noted four Aboriginal Sites within two kilometres of the study area, however, the survey failed to find any Aboriginal Sites on land within the LSP boundaries. As such, the Archaeological Investigation concludes that none of the registered sites are within the study area and that the project may proceed as it will not affect any archaeological sites.

A search of the Heritage Council of Western Australia Heritage Places Database identified no places of European heritage significance existing on site.

A search of the Town of Kwinana Municipal Heritage Inventory (2008) identified 'Leslie Property Mandogalup, Corner of Lyon Road and Darling Chase, Wandi' as a locally significant place. This site is located within the RWP Zone and is therefore outside of the LSP boundary. The Leslie Property is afforded the management category of "C" under the Town of Kwinana Municipal Heritage Inventory.

The Leslie Property is one of a number of places established in the Mandogalup area during the 1920s as part of the Peel Settlement Scheme, and consists of a number of sheds and landscape structures set within paddocks. The site is listed as a Management Category C place, meaning it is a place of some significance and should be considered for retention and conservation if possible. If not possible, detailed records, including photography, should be developed prior to demolition or substantial development. It is anticipated the remnant materials of the Leslie Property will be utilised within the community design across the LSP area, where possible as street art or landscaping. A detailed Heritage Assessment and Heritage Impact Statement may be required before approval is given for any major redevelopment or demolition.

In association with the Leslie Property, a historic drain has been identified in the central wetland area. Together with the remnant vegetation in this area, the historic drain has been retained in POS in accordance with the Town of Kwinana Municipal Heritage Inventory, which encourages retention.

2.7 Accessibility Assessment

The site is currently well serviced by the regional and local road network, including the Kwinana Freeway, Rowley Road, Anketell Road and Lyon Road.

2.7.1 Anketell Road

Anketell Road is classified as a District Distributor A Road in the Main Roads Functional Road Hierarchy and is constructed as a single lane two-way road to a rural standard. Current traffic data from Main Roads indicates 3,682vpd east of the Kwinana Freeway (2008).

Both Rowley Road and Anketell Roads, west of the Kwinana Freeway are identified as future designated freight routes, servicing the proposed Fremantle Outer Harbour. Main Roads Western Australia (MRWA) indicates that ultimately a dual divided carriageway standard is planned for Anketell Road. A realignment of this road slightly north is also proposed to remove the existing bend in Anketell Road at the southern end of the Wandi urban cell (i.e. outside of the LSP boundary). Design work is currently being undertaken by Transcore Pty Ltd in conjunction with MRWA and the Department of Planning (DoP) on behalf of the owners of the future Wandi District Centre site to determine the final road reserve width and drainage requirements.

2.7.2 Lyon Road

Lyon Road is classified as a District Distributor Type B Road in the Main Roads functional road hierarchy. It is currently constructed to a rural standard with a standard 7.0 metre wide carriageway. It provides a north-south link through the suburbs of Wandi, Aubin Grove and Atwell.

Existing daily traffic flows are not available and are somewhat academic as new development will quickly increase current volumes. Historical traffic data for the locality indicates an underlying traffic flow of about 800 vehicles per day (vpd) on Lyon Road. As would be expected of a road parallel to a freeway, Lyon Road is not attractive to through movements.

Local traffic management treatments along Lyon Road will be required to ensure Lyon Road remains as a less desirable route than the north-south distributor road through the Wandi cell. The Wandi South LSP will implement the same treatments to Lyon Road as approved for the Wandi North LSP and subdivision, such as kerbing, drainage, footpaths, lighting, resurfacing and undergrounding of power.

2.7.3 Public Transport

The Wandi Cell is currently not serviced by Transperth bus or train services. The closest bus and rail service is located approximately 3km west on Anketell Road and 5km south west at the Kwinana Railway Station, respectively.

The proposed road network of the LSP has been designed in accordance with Liveable Neighbourhoods, and as such, those roads intended to accommodate a bus route, as stipulated in the Traffic Management Plan, have been designed accordingly.

Under the draft JSP two rail station sites were proposed for the Perth to Mandurah Rail Line, being the Rowley Road North and the Anketell Road sites. In early 2007, however, under a Ministerial directive the then Department of Planning and Infrastructure (DPI) in conjunction with the Public Transport Authority (PTA) began a review of all proposed rail stations along the Perth to Mandurah Line, which included the Rowley Road North and the Anketell Road sites. This review was primarily concerned with reducing the number of stations along the Perth to Mandurah Line. Further to a series of forums with landowners and various authorities, the two sites were consolidated into one.

The Department of Transport draft Public Transport for Perth in 2031 was published in July 2011. By 2031, the report recommends a new train station be developed at Success / Mandogalup. Under the Public Transport for Perth in 2031 report, local bus services will act as feeders to the train network, which can be accommodated on the planned road network in the Structure Plan area. As identified in the Traffic Report in Appendix 6, Bus route 537 is proposed to service the Wandi and Anketell urban cells providing a good connection between the Success/Mandogalup future railway station and the existing Kwinana railway station. Bus route 537 is planned to provide north-south connection through Wandi along Honeywood Avenue, and connecting the residential areas to the Wandi District Centre and Wandi High School in the LSP area.

2.8 Servicing Assessment

The Water Corporation has advised servicing of the site for both sewer and water will occur from the north as an extension of the services in the Wandi North LSP area.

The Water Corporation has made provision for a reticulated sewerage scheme for the site in its planning for servicing the south west corridor. The site is situated within the Water Corporation's 'Thomsons Lake' sewerage catchment, which is connected to the Bibra Lake Main sewer, discharging into the Woodman Point Wastewater Treatment Plant. A Waste Water Pump Station (WWPS), which will serve both the Wandi north and south cells, is currently under construction in the north western corner of the LSP area. The WWPS will include a pressure main that will discharge to the north in the DN600 gravity sewer in Hammond Park. The anticipated completion date for the WWPS is late 2011.

The Water Corporation, in their planning for the south west corridor, has also made provision for water supply to the site. The site is located within the Water Corporation's 'Thomsons Gravity Scheme'. To service the site, a water supply will have to ultimately extend from the distribution mains required for the Wandi North cell, situated north of the subject site, which is currently under construction. The developer is currently in consultation with the Water Corporation on the staging of the prefunded distribution mains along Lyon Road and extension thereof.

Western Power services are readily available to the site. There are currently 330 kV overhead transmission lines throughout the site, as well as 22 kV high voltage aerials along Lyon Road.

There are existing Telstra service networks in the vicinity of the site. With the new National Broadband Network Rollout, it is anticipated this infrastructure will have sufficient capacity to provide telecommunications services to the site. The site has been registered on the NBNCo website for servicing late 2011. The adjacent developments to the north will also provide sufficient infrastructure for network expansion to the south to service the subject site.

2.9 Employment Assessment

Given the location of the site in relation to the Kwinana Town Centre, Cockburn Central, Fremantle, and its accessibility to the Perth City Centre (afforded by the proximity to the Kwinana Freeway and the Perth to Mandurah train line) there are a number of employment opportunities available to the future community.

Within the Town of Kwinana there are a number of existing and proposed district employment generators. The Kwinana Industrial Area provides approximately 26,000 employment positions and is located approximately 5.5km from the LSP area. The LSP area is also located approximately 3.5km from the Latitude 32 Industrial Areas (Hope Valley Wattleup Redevelopment Area), which are expected to ultimately provide for 10,000 additional jobs. The Town of Kwinana itself is a large employer within the municipality.

Local employment opportunities will also be generated from the two activity centres within the Wandi Cell, being those commercial and community activities proposed for the train station precinct and the future town centre on Anketell Road.

2.10 School Sites Assessment

There are currently no schools within Wandi. The closest existing schools to Wandi are:

Primary Schools

- Harmony Primary School: 6.6km to the north;
- Bertram Primary School: 7.3km to the south west;
- North Parmelia Primary School: 7.8km to the south west'
- Medina Primary School: 9.0km to the south west; and
- Jandakot Primary & Pre-Primary School: 9.5km to the north.

High Schools

- Gilmore College (Kwinana Senior High School): 8.4km to the south west;
- Atwell College: 8.6km to the north; and
- Lakeland Senior High School: 11.6km to the north.

Under the Wandi North LSP, the Wandi Primary School site is located centrally within the Wandi Cell. This site directly abuts the Wandi South LSP on its northern boundary.

The Wandi High School site is proposed in the northern part of the LSP area on Lots 674 and 675, with frontage to both the existing Darling Chase and proposed Honeywood Avenue extension. The proposed High School site is 10.014ha in area, with the eastern part of the site containing the schools building zone and the western part containing the school playing fields. DoE and the Town of Kwinana have reached agreement to share the High School playing fields, providing high accessibility to the local community to active open space after school hours. The High School size, dimensions and surrounding road layout has been accepted by the DoE, as detailed in its correspondence of 28 July 2011.

3.0 TOWN PLANNING FRAMEWORK

3.1 Regional Planning

3.1.1 Metropolitan Region Scheme Zoning

The majority of the Wandi Cell is zoned 'Urban' under the provisions of the Metropolitan Region Scheme (MRS).

The Kwinana Freeway to the west of the site is a 'Primary Regional Road', under the MRS. Under the MRS, land to the immediate north and south of the site is zoned 'Urban'. A 100m strip of land adjacent to Anketell Road remains in the 'Urban Deferred' zone to facilitate planning for future freight traffic, which will enable the final road reserve width to be determined. Lyon Road, as well as the western part of the rural residential allotments located on the eastern side of Lyon Road, remain in the Urban Deferred Zone, with the balance of these lots zoned 'Rural - Water Protection'.

Figure 5 depicts the MRS Zoning.

3.1.2 Jandakot Structure Plan

In 1993, the Legislative Assembly of the Parliament of Western Australia resolved to appoint a Select Committee to inquire and report on development over groundwater resources, with specific regard to the protection of underground water supplies while maximising potential urban development.

One of the key recommendations of the Select Committee was the amendment of the Water Resources Policy (Development Control Policy No. 6.3) to strengthen groundwater protection mechanisms and to ensure compatibility with the Environmental Protection Policy controls. As a result of the key recommendations of the Select Committee, the then Department for Planning and Infrastructure published the Jandakot Land Use and Water Management Strategy in 1995.

The Jandakot Land Use and Water Management Strategy acknowledged one of the Select Committee's, recommendations proposing the review of the groundwater area boundaries. A groundwater review was undertaken and subsequently the Statement of Planning Policy No. 6 (now Statement of Planning Policy No. 2.3) – Jandakot Groundwater Protection Policy was gazetted in 1998.

The aforementioned investigations and documents proposed a decrease in the Jandakot Underground Water Pollution Control Area ('UWPCA'), leaving the remaining area without strategic direction. The Jandakot Structure Plan (JSP) was prepared to provide direction to the subsidiary area resulting from the UWPCA boundary reduction.

The JSP was finalised in August 2007, and provides strategic direction to this subsidiary area seeking to coordinate the development of the region while ensuring environmental, social, and economic objectives are met.

> *"The Structure Plan provides a guide to the future development of the area and management of key environmental issues. It includes potential development areas, road networks, major community facilities, conservation and Bush Forever areas, and a neighbourhood structure. It also provides proposals for the implementation of the plan such as zoning mechanisms, staging, and financial and management arrangements."*

The JSP area forms a 'U' shape around the Jandakot UWPCA, with Rowley Road being the most northern point of both the western and eastern sides, through to Millar Road and Jackson Road to the south.

The JSP is depicted as Figure 6.

Previously, the major constraint to urban development within this corridor has been in relation to groundwater and storm water management. With the preparation of the JDWMP however, these issues have now being resolved and accommodated in current planning for the Cell. Under the provisions of the JSP, the Local Structure Plan is to incorporate a Local Water Management Strategy (LWMS) consistent with the findings of the Jandakot Water Resources Management Strategy (JWRMS).

District level requirements of the JSP such as the identification and preservation of natural areas, the allocation of public open space and public purpose areas, road network and hierarchy, the allocation of school sites, and the allocation of commercial activities have been further refined through the preparation of this LSP.

3.2 Local Planning

3.2.1 Town of Kwinana Town Planning Scheme No. 2 Zoning

The site is currently zoned 'Development' under the provisions of the Town of Kwinana Town Planning Scheme No. 2 (TPS 2). Figure 7 depicts the TPS 2 zoning.

The purpose of the Development zone is to provide a flexible planning mechanism for the development of larger areas. The Development zone requires the preparation of comprehensive structure planning in order to coordinate development and to provide adequate planning control within the specified area.

The objectives of the Development zone, as stated under TPS 2 are as follows:

- *"Designate land for future development;*
- *Provide a planning mechanism for the identification and protection of areas of conservation value whilst facilitating the growth of the Town;*
- *Provide for the orderly planning of large areas of land for residential, commercial, industrial and associated purposes through a comprehensive structure planning process;*
- *Enable planning to be flexible and responsive to changing circumstances throughout the developmental stages of the area; and*
- *Provide sufficient certainty for demand forecasting by service providers."*

The proposed LSP is consistent with the above objectives and allocates land uses, conservation reserves, provides a flexible mechanism of planning, and identifies the provision of service infrastructure within the subject site. These will be dealt with in greater detail throughout the contents of this report.

The Wandi South cell forms part of a Development Contribution Area (DCA 5 and 9) identified under the Developer Contributions TPS Amendment No. 100 and No. 115 respectively. The amendments introduce Development Contribution Plans (DCP's) and Areas (DCA's) to correspond with the 'Development' zoning under the Fifth Schedule of the Scheme. The two proposed amendments address both 'hard' (Amendment 100) and 'soft' (Amendment 115) contributions for the urban corridor. Both amendments were advertised in 2009 with Amendment 115 currently being considered by the DoP. Amendment 115 is anticipated to be presented to the WAPC in the coming months. The submissions received for Amendment 100 are currently being considered by the Town of Kwinana.

3.2.2 Eastern Residential Intensification Concept (ERIC)

ERIC was prepared by the Town of Kwinana in 2005, to provide strategic direction and refinement of the future urban areas identified within the JSP. ERIC comprises the Cells of Mandogalup, Wandi, Anketell, Casuarina and Wellard (east), and defines a framework by which urban subdivision and development is able to occur in an orderly and coordinated manner. ERIC is intended to be used as a guide in the preparation of more detailed Local Structure Plans.

ERIC predominantly deals with district level issues which are not dealt with by the JSP such as:

- The coordination of development;
- Provision of community infrastructure;
- District and local open space distribution;
- Treatment of the district and local road network;
- Pedestrian cyclist movement;
- Hierarchy of centres;
- Remnant vegetation protection;
- Adverse landscape impact minimisation; and
- The framework for development contributions to district and local infrastructure and facilities, the need for which will be generated by subdivision and development within the structure plan area.

ERIC is depicted in Figure 8.

ERIC was advertised for public comment in 2006, and is currently being revised by the Town of Kwinana.

4.0 LOCAL STRUCTURE PLAN

The Local Structure Plan sets out land use, residential densities, public open space, public and private transport provision, environmental considerations and servicing requirements.

The following section has been prepared in support of the Local Structure Plan and addresses the relevant elements of *Liveable Neighbourhoods*.

The Local Structure Plan is depicted in Figure 9, with a copy to scale provided in Appendix 5.

4.1 Community Design

4.1.1 Design Objectives

Given the natural and man-made site characteristics of the site, the following objectives were identified through the design process:

- To provide for a residential community with high accessibility and strong street network connections to the Wandi District Centre;
- To protect and enhance environmental features providing a community asset;
- To maintain the amenity of the existing community; and
- To develop a sense of place informed by the local characteristics.

4.1.2 Design Response to Site and Context Analysis

REMNANT VEGETATION

An area of upland vegetation (T1 Community) has been retained in the POS along Lyon Road in accordance with the recommendations / agreements reached with the DEC and Town of Kwinana on the LSP. As identified in the Environmental Assessment Report in Appendix 3, the vegetation type T1 showed an affinity to the Priority 3 Priority Ecological Community (PEC) '*Low lying Banksia attenuata* woodlands or shrublands or Floristic Community Type 21c. A Remnant Vegetation Management Plan will be prepared and implemented at subdivision stage for this area of POS.

CENTRAL WETLAND

Through the LSP assessment process the DEC and the Town of Kwinana noted the central portion of the wetland may posses higher wetland values than the Multiple Use category it is currently classified under. As such, the central portion of the wetland which contains vegetation in 'excellent' condition, has been retained in POS and will be managed via a Wetland Management Plan with drainage to be located in degraded areas. The wetland will remain in the Multiple Use category.

EXISTING RURAL RESIDENTIAL COMMUNITY

The potential impact on the existing Wandi residents, particularly those located on Lyon Road (notwithstanding the Urban Deferred status of this land), was identified as an important consideration during the design process. The design response has been to minimise the amount of urban development at this interface through the provision of a landscape buffer, the location of POS, and through minimisation of crossovers and intersections along Lyon Road.

MAJOR ROAD NETWORK TREATMENTS

The site's proximity to Anketell and Lyon Roads has been considered within the proposed road network design. Urban traffic is proposed to be redirected through the urban cell via a new intersection on Anketell Road (i.e. Honeywood Avenue) to provide access to the future Wandi District Centre. Limited east/west connections from Lyon Road and prioritisation of Honeywood Avenue will assist to minimise the traffic movements on Lyon Road and assist in directing urban traffic through the Wandi Cell.

Local traffic management treatments along Lyon Road will be implemented to ensure Lyon Road remains as a less desirable route than the Honeywood Avenue extension through the Wandi Cell. The Wandi South LSP will implement the same treatments to Lyon Road as approved for the Wandi North LSP and subdivision, such as kerbing, drainage, footpaths, lighting, resurfacing and undergrounding of power.

OVERHEAD TRANSMISSION LINES

Western Power high voltage overhead transmission lines traverse the site on its western and southern boundary and are contained within a 60 metre wide easement. The easement area will be an active space, with development fronting it and, while utilised for drainage, will serve as restricted use public open space including the provision of a pedestrian link between the Wandi District Centre and the LSP area. The easement area will be deducted from the LSP site area for the purposes of calculating the public open space contribution. The Western Power easements are allocated as 'Parks, Recreation and Drainage' under the LSP. This area is to be ceded to the Town of Kwinana free of cost as a condition of subdivision approval.

COMMUNITY DESIGN

The remnant materials of the 'Leslie Property', as identified under the Town's Municipal Heritage Inventory, will be utilised within the community design, where possible as street art or landscaping.

Furthermore, fencing design, street lighting and general materials used within the streetscape will be to a high standard, to the satisfaction of the Town of Kwinana. Such features will be appropriately maintained by the developer until such time as agreed for handover by the Town.

POTENTIAL NOISE IMPACTS

A Traffic Noise Impact Assessment (Appendix 8) was prepared to investigate the potential noise impacts on the LSP area from the Anketell Road future freight route, the Kwinana Freeway, and the Perth to Mandurah railway line. A Noise Management Strategy will be prepared and implemented at the subdivision stage.

4.1.3 Density

Liveable Neighbourhoods states that urban densities of at least 15 dwellings per urban hectare and an average of 22 dwellings per site hectare should be provided in new urban areas. Similarly, Directions 2031 sets a target of 15 dwellings per gross urban zoned hectare in new urban areas. Furthermore, as a guide, Liveable Neighbourhoods suggests the following minimum residential densities:

- 12 to 20 dwellings per site hectare is required for standard lot layouts, distributed to achieve any required urban density of dwelling yield;
- 20 to 30 dwellings per site hectare in 400 m of neighbourhood centres and in 250m of main bus routes; and

» 30 to 40 dwellings per site hectare for areas in 400 m of town centres.

In addition to the above, under State Planning Policy 4.2: Activity Centres for Perth and Peel (SPP 4.2), a minimum residential density target per gross urban hectare of 20 dwellings is stipulated, with a desirable target of 30 dwellings encouraged within a 400m walkable catchment of a District Centre.

On the basis of the above, the LSP proposes the following densities as demonstrated in Figure 10:

» Overall LSP Area 22 dwellings/ site hectare;

» 400m of town centre 30 to 40 dwellings/ site hectare;

» 800m of town centre 12 to 20 dwellings/ site hectare.

In order to achieve the density targets depicted in Figure 10, the proposed residential densities shown on the Zoning Plan at Figure 11 have been applied. An R20/25 density is generally applicable to the eastern portion of the LSP area, with areas of R30, R40 and R60 allocated within the southern and western portions of the site, correlating to areas in close proximity to the District Centre, High School and POS. On the basis of Figure 11, the LSP Area has the potential for 772 dwellings, with the following breakdown:

» R20 25 dwellings;

» R25 288 dwellings;

» R30 154 dwellings;

» R40 162 dwellings; and

» R60 143 dwellings.

On an urban hectare basis, the LSP achieves a density of 13.3 dwellings per zoned urban hectare (i.e. 772 dwellings / 57.89 ha = 13.3). Notwithstanding, significant portions of the LSP area, such as the Wandi High School Site (10.1 ha), the Western Power Easement (4.5 ha), the central wetland area (4.2 ha) and the retained road reserves of Darling Chase and Kenby Chase (1.9 ha) are not capable of development. These non developable areas represent 36% of the urban zoned portion of the LSP area, and are the reason why the urban hectare density target of 15 has not been met. In this regard, to provide a more realistic representation of the development potential of the subject site, density has been calculated on a dwellings per site hectare basis.

For the purposes of local structure planning and subdivision, the WAPC defines residential density as dwellings per site hectare. Dwellings per site hectare is defined under Liveable Neighbourhoods as the number of dwellings per hectare of a development site or an aggregation of sites. The site hectare, by Liveable Neighbourhoods definition, is calculated as the density per hectare of land to be developed for residential purposes only and excludes non-residential uses such as streets, laneways, open space and centres. The residential density must be specified on street blocks or aggregated sites to indicate the target dwellings per site hectare.

The LSP area has a site hectare of 22.09 ha, being the area zoned residential on the Zoning Plan at Figure 11.

Across the LSP area a residential density of 34.9 dwellings per site hectare is achieved (i.e. 772 dwellings / 22.09 ha = 34.9 ha), which is well in excess of the 22 dwellings per site hectare general target of Liveable Neighbourhoods. The achievement of the site hectare target demonstrates the LSP includes appropriate residential densities for a new urban area.

Only a portion (i.e. 30.0ha) of the subject site is within a 400m walkable catchment of the Wandi District Centre, with Liveable Neighbourhoods and SPP 4.2 targeting a minimum of 30 to 40 dwellings per site hectare in this area. Figure 10 indicates the 400m walkable catchment to the Wandi District Centre. Within a 400m walkable catchment of the Wandi District Centre there is the potential for 420 dwellings. Based on this potential yield, the LSP achieves a residential density of 14 dwellings per gross urban hectare (i.e. 420 dwellings / 30.0ha = 14) and 38.2ha dwellings per site hectare (i.e. 420 dwellings / 10.99ha = 38.2). Again, the gross urban hectare target is not achieved because of the non-developable portions of the land within this area (i.e. Western Power easements, High School Site, Central Wetland), however, the achievement of the site hectare target demonstrates the LSP includes appropriate residential densities for a new urban area

With regard to the overall Wandi urban cell, it is anticipated that a total of 2,125 dwellings will be delivered in this area, as indicated by the estimates/approvals noted in Table 3 below. The anticipated dwelling yield for the Wandi urban cell is generally in accordance with the Outer Metropolitan Perth and Peel Sub Regional Strategy ('OMPPSRS') connected city scenario, which estimates an approximate yield of 1,780 dwellings. The ultimate delivery of lots will be market driven and is subject to detailed design.

Table 3 – Dwelling Yield

Wandi Cell Precincts	Total Site Area (Zoned Urban or Urban Deferred under MRS)	65% Residential Area – As per Urban Density Definition in LN	Dwelling Yield
Wandi North LSP (Approved)	N/A	N/A	679
Wandi North TOD	12ha	7.8ha	312 (at 40 dwgs per site ha)
Wandi South LSP Area	N/A	N/A	772 (proposed)
Urban Deferred (east of Lyon Road)	8ha	5.2ha	78 (at 15 dwgs per site ha)
Wandi District Centre	11ha	7.12	284 (at 40 dwgs per site ha)
Total			2,125 dwellings

Figure 12 depicts the indicative staging of subdivision construction development in the LSP area, which generally shows subdivision construction occurring in a north to south pattern on the basis of service extensions from the Wandi North development, currently under construction.

4.2 Movement Network

The following section provides an overview of traffic management matters for the LSP. For further detail, please refer to Appendix 6 for the full Transcore Traffic Report.

Please note, minor modifications have been undertaken to the LSP layout since the preparation of the Transcore Traffic Report provided at Appendix 6. Should the need arise, an update to the Traffic Report should be undertaken at detailed engineering design phase.

4.2.1 Traffic Volumes and Street Hierarchy

DESCRIPTION OF ROAD NETWORK

The proposed street network comprises one Neighbourhood Integrator B road reserve with a general north-south orientation in accordance with Liveable Neighbourhoods and ERIC. This road continues the Neighbourhood Integrator B Honeywood Avenue, which redirects urban traffic movements through the Wandi North LSP area from Rowley Road, at the existing Figg Rise and Darling Chase intersection. This road traverses the Wandi South LSP area to connect through to the proposed Treeby and Anketell Road intersection. This intersection has been identified under the Anketell Road design study currently being undertaken by Transcore and BGE with MRWA and the DoP, as a full movement signalised intersection.

The redirection of urban vehicle movements centrally through the LSP area is to minimise the usage of Lyon Road and to maintain the rural character along this road. Lyon Road will be a less desirable route than the central Honeywood Avenue, as:

- traffic will be redirected down Honeywood Avenue via the layout and intersection treatments in the Wandi North LSP area;
- as Lyon Road will include traffic calming devises, including round-a-bouts along its length;
- as the fully signalised intersection of Honeywood Avenue and Anketell Road will be the first entrance to the LSP area for vehicles leaving the Kwinana Freeway along Anketell Road;
- as right turn movements out of Lyon Road onto Anketell Road will not be signalised, and therefore it is expected traffic will utilise the controlled right turn movements onto Anketell Road from Honeywood Avenue, particularly when freight traffic increases along Anketell Road; and
- as Lyon Road is a "T" intersection and not directly accessible from the Anketell North LSP area, which will have a direct and through connection from the south onto Honeywood Avenue;

Lyon Road will be upgraded to include features such as kerbing, drainage, footpaths, lighting, undergrounding of power, and resurfacing. Further detailed design of Lyon Road treatments will be agreed with the Town of Kwinana at subdivision implementation stage.

Three new east/ west road connections have been provided from Lyon Road, with two functioning as Access Street B, designed in accordance with the requirements of Liveable Neighbourhoods street cross sections. These provide a direct east/west connection for the residents to the east of the Wandi Cell to the future Town Centre and the proposed High School site, reinforcing local traffic movements to these activities whilst minimising the use of Lyon Road for north/south movements. Kenby Chase, currently a constructed road reserve, is also proposed to be utilised for east/west movements.

The remainder of the local road network consists of a range of access streets and laneways designed in accordance with the requirements of Liveable Neighbourhoods.

Refer to Figure 13 for Street Network Plan.

NEIGHBOURHOOD INTEGRATOR B

As noted, ERIC proposes to internalise all urban traffic movements within the urban corridor, therefore an extension to Honeywood Avenue is proposed for the length of the Wandi South Cell, comprising a deviated alignment from

Rowley Road (proposed under the Wandi North LSP) through to the proposed Treeby and Anketell Roads signalised intersection abutting the proposed Town Centre.

The alignment of the Integrator B generally reflects the alignment proposed under ERIC, however is refined as a result of preliminary earthworks designs undertaken for the site, as well as ensuring the retention of the central wetland area.

The Integrator B road has been designed to reflect the 25.2m cross section provided in the Wandi North LSP, allowing for the provision of buses, parking and cycling lanes, as per Liveable Neighbourhoods. This width was considered appropriate on the basis of the following:

- The width represents a continuation of the Honeywood Avenue treatment as constructed to the north. The continuation of this treatment will assist in creating a seamless transition between LSP areas, ensuring a cohesive urban cell.
- Residential lots abutting the extension of Honeywood Avenue are serviced by alternate access provided on Access C streets.
- Along the length of the extension within the LSP area there are limited lengths in which residential abuts both sides of the road. For the great majority of its length other uses such as open space areas, drainage or the high school site comprise one side of the road. This enables further flexibility in the design of the road.
- The estimated traffic volumes discussed below.

ACCESS STREET B

Two of the east/ west road connections from Lyon Road, in addition to the road network proposed around the High School site (utilising Darling Chase), are designed to an Access Street B standard in accordance with the provisions of Liveable Neighbourhoods.

Access Street B is a wider undivided street for situation with increased parking and/ or traffic demand. This road cross section is considered appropriate to meet the higher traffic volumes of these roads as well as higher parking demand around the high school site.

TRAFFIC VOLUMES

The traffic modelling undertaken by Transcore for the LSP indicates that traffic volumes of 9,500 vehicles per day (vpd) within the Wandi South LSP area up to 12,500 vpd at the intersection of Treeby and Anketell Roads will be applicable to the central Integrator B. Under Liveable Neighbourhoods Integrator B – centre (two lanes) reserves are to be 25.2m and can carry indicatively 15,000 vpd.

The main east/ west connection from Lyon Road in the southern portion of the LSP area has been identified to carry 2,500 vpd and the northern access from Lyon Road to facilitate access to the High School site 1,000vpd. As described above, these roads are to be Access Street B routes, which under Liveable Neighbourhoods can indicatively carry 3000 vpd.

Transcore has prepared a Traffic Management Plan which further details the volumes expected under the proposed LSP. This technical report is included within Part B of this report.

LANEWAYS

Laneways have been provided for rear access to narrow lots and, given the traffic volumes anticipated on the Honeywood Avenue extension, to limit lot access from this road.

Laneways have been designed with 6m widths ranging between 60m to 150m. This design provides for sufficient surveillance by providing openings at short intervals. Laneways have been designed as straight lanes and T-lanes to discourage crime and antisocial behaviour.

Where laneways are not provided as a 'T' or a straight alignment, suitable truncations in excess of the typical laneway truncations may be required to ensure appropriate vehicle access for servicing and safety for users. These lots would likely also require the preparation of a DAP to ensure safe access and garaging for residents.

CONNECTIVITY

The local road network has been designed with a high level of connectivity to facilitate walking and cycling, and enable relatively direct local vehicle trips in between neighbourhoods, and the proposed District Centre. The LSP proposes four (4) east/ west road connections to Lyon Road to provide connectivity between the adjoining rural residential areas and the LSP area. These connections will facilitate access to services provided within the proposed town centre and the proposed high school. Figure 14 demonstrates the relationship of the LSP Area to the District Centre.

PEDESTRIAN AND CYCLISTS

As detailed in the Traffic Report at Appendix 6, a shared pathway network for pedestrians and cyclists is proposed along the extension of Honeywood Avenue through the LSP area, and surrounding the High School site and connecting with Lyon Road in the north east of the LSP area.

As encouraged by Liveable Neighbourhoods, footpaths will be provided on both side of streets that form pedestrian linkages within a walkable catchment of the Wandi High School, Wandi Primary School and Wandi District Centre.

The shared pathway network will connect the LSP area to the Wandi District Centre to the south and the proposed commercial and community facilities on the south side of Anketell Road in the Anketell North LSP area, as well as bushland areas to the south-west. To the north, the shared pathway network will connect to the Wandi Primary School site, the wetland conservation area on the northern side of Darling Chase, and the Wandi Local Playing Fields. Figure 15 demonstrates the pedestrian / cyclist network of the LSP area. Figure 15 should be looked at in conjunction with Figure 14, which demonstrates the relationship of the LSP Area to the District Centre.

The public open space links through the site and the proposed shared paths will also provide strong connectivity within the LSP area to recreation, community and other services. Footpaths will be provided on at least one side of all streets and, where appropriate, the shared path network will be routed through areas of public open space. The footpath network will be connected to the regional path network and north to the proposed train station and community facility site.

4.3 Lot Layout

4.3.1 Lot Size and Variety

In accordance with Liveable Neighbourhoods, a range of lot sizes are proposed in the LSP area. In particular, areas of higher density are focused around:

- the extension of Honeywood Avenue through the LSP area, which will be a bus route;
- the Wandi High School site;
- the Wandi Primary School site;
- areas of public open space and, in particular, the central wetland area; and
- within 400m of the Wandi District Centre.

4.3.2 Land Use Description

The LSP area predominantly consists of residential development, providing a range of low to medium density housing opportunities.

In addition to residential land uses, the LSP also proposes the retention and enhancement of existing vegetation and drainage areas within public open space, serving both a conservation and recreation purpose to the community. The majority of these areas proposed for retention are connected via strong road based pedestrian connections.

A High School site is proposed in the north western portion of the site adjacent to the district drainage area and the sewer pump station, with construction of the pump station expected to be completed in late 2011.

The area zoned Rural Water Resource under TPS 2, which forms part of Lot 675, is not included in the LSP area. This area is to form part of the Wandi Local Playing Fields, which extends into the Wandi North LSP area.

4.3.3 Retention of Existing Vegetation

As previously discussed, the LSP area has historically been utilised for agricultural purposes, and has therefore been predominantly cleared with the exception of some areas of remnant vegetation, ranging from 'Degraded' to 'Excellent' condition.

Through the advertising period, the DEC raised two areas of concern with the LSP, being the central vegetation/ wetland area and the retention of upland vegetation within the cell, specifically those areas of 'very good' to 'excellent' vegetation. Further to assessment and discussions on site with both authorities, the following options were presented by the DEC (correspondence dated 15 February, 2011) in response to the LSP.

'On discussion with DEC staff a few options were suggested in order to address some of our concerns. DEC is happy to discuss these options with you in order to progress the LSP process.

1. *Retain the northern portion of wetland which links the wetland areas to the north and south. In addition to providing a vegetated link between wetlands this areas also has important hydrological functions. Removal of this portion of wetland will cause impacts to the whole wetland system. DEC is happy to remove the 1.53ha POS reserve within the upland vegetation to facilitate protection of this additional wetland area. It is also requested that a buffer be allocated to the entire wetland.*

2. *If retention of an additional wetland area is not possible then the DEC requests serious consideration is given to relocating the upland POS area to be situated within the possible Priority Ecological Community (PEC) area to the west of Lyon Road. The vegetation in the area is relatively undisturbed, in very good condition and contains a possible occurrence of a PEC. Limited management works will be required to maintain this POS area and it will have the best values as fauna habitat. On site retention of quality fauna habitat is important in mitigation impacts to threatened species such as Carnaby's Cockatoos and the Graceful Sun Moth. While recognising the engineering issues with POS location at this site, the DEC's position remains that it supports the best outcome from an environmental perspective...'*

Option one presented was considered problematic given the retention and integration of Darling Chase (currently constructed to a rural standard), the need to extend Honeywood Avenue to provide a north/ south link through the LSP area, and the provision of the high school site in its particular elongated configuration, which had been reviewed and negotiated with the DoE for an extended period of time.

Option two, however, could be appropriately integrated in the design whilst still allowing for the delivery of planning outcomes. Through further discussions with the DEC and the Town of Kwinana, the final boundaries of the central POS area were refined to appropriately accommodate the upland vegetation area adjacent to Lyon Road and the central wetland area.

Whilst the central area is currently mapped as a Multiple Use wetland, the DEC and the Town of Kwinana noted it may possess higher wetland values. In this regard Mammoth Nominees Pty Ltd has agreed to implement a management plan for this area reflecting a higher wetland classification. The treatment of this area is to retain the excellent vegetation and any drainage requirements being contained within the existing degraded areas, as per Council's resolution dated 9 February, 2011. The wetland is to retain its Multiple Use category.

Appendix 7 provides the complete DEC correspondence.

The upland area also assists in realising the Town of Kwinana's desire for upland vegetation to be retained in accordance with the Town of Kwinana's Biodiversity Policy, released in early 2008 for public comment.

Proposed management actions have been developed in consultation with the Town of Kwinana and DEC, and are discussed further in Section 4.12 of this Report.

A significant tree survey has also been undertaken across the LSP area. The tree survey identified a number of significant trees (trunk diameter of more than 400mm) across the site. These are generally confined to public open space areas and the high school site, where appropriate.

4.3.4 Minimise Effects on Local and Nearby Amenity

Through consultation with the Wandi Progress Association Group on the Wandi North LSP, one of the concerns raised by nearby residents was the amenity impacts in which the urban cell would have upon existing rural residents. Whilst the majority of houses within the rural residential area adjacent to Lyon Road are set back some 50 – 60m from the road and comprise heavily vegetated setbacks, a 10m landscape buffer is proposed along a portion of Lyon Road in order to minimise impacts of urban development on these existing residents.

Figure 16 conceptually depicts this landscape buffer.

Urban traffic and increased volumes along Lyon Road were also noted as a concern by residents. In this respect, Lyon Road will be downgraded to a local access road upon completion of the internal local distributor, therefore

minimising traffic volumes and maintaining the rural residential feel of the locality. Local traffic management treatments along Lyon Road will be implemented to ensure Lyon Road remains as a less desirable route than I loneywood Avenue, the north-south distributor road through the Wandi cell. The Wandi South LSP will implement the same treatments to Lyon Road as approved for the Wandi North LSP and subdivision, such as kerbing, drainage, footpaths, lighting, resurfacing and undergrounding of power.

The headlight glare from vehicles utilising the east/ west road network within the LSP area via Lyon Road was also raised as a concern during the advertising period. A headlight glare plan has been prepared (Figure 17) which illustrates the 50m – 87m front setbacks of rural residential homes which provide adequate distance to shield any impact which headlight glare may have from vehicles. The majority of these lots are also protected by vegetation within the front setback.

The east/ west road connections proposed have also been designed to utilise the existing road network, where possible (Kenby Chase), to minimise impacts on adjoining residents, and where road connections are proposed which are within proximity to crossovers, appropriate traffic management treatments will be undertaken to minimise impacts on access and egress for these lots. The area east of Lyon Road is also partly identified for urban development and retains an 'Urban Deferred' zoning under the MRS. The access implications in this location are relatively 'short term' until further planning has progressed for this area.

In accordance with the SPP 5.4 Road Rail Transport Noise and Freight Considerations in Land Use Planning, a Traffic Noise Impact Assessment has been prepared by an acoustic consultant, provided in Appendix 8 of this Report. The Traffic Noise Impact Assessment does not recommend any design changes to the Structure Plan layout and, instead, recommends Quiet House Design Principles: deemed to comply noise insulation measures – Package A be applied for some lots in the LSP area. Refer to Appendix D of the Traffic Noise Impact Assessment in Appendix 8 for those lots identified for Package A measures. The recommendations of the Assessment will be implemented via Noise Management Strategy.

4.3.5 Provision of School Sites

The Wandi High School Site is identified under ERIC adjacent to Darling Chase and the Western Power Easement.

The site characteristics of the Wandi South Cell, however, posed considerable limitations on the design of the High School site, these included:

- the location of the Western Power Easement adjacent to the western boundary of the site;
- the existing drainage lines through the site to be maintained;
- the good/ excellent existing vegetation to be retained;
- the location of the Honeywood Avenue extension, and
- the topography of the site and the limitations of earthwork requirements.

The key design consideration from the DoE's perspective was risk minimisation, specifically maximising the separation distance for the school building zone from the high voltage power lines. This is facilitated under the LSP by way of a long rectangular High School site, to ensure school buildings can be appropriately accommodated in the eastern portion of the site and the oval and sporting facilities to be located closest to the power lines with a landscape bund likely to be developed by DoE to screen the power lines from view.

Correspondence received from the DoE confirming their support of the proposed High School site location and configuration is included as Appendix 9.

The street network is proposed to abut all boundaries of the site in accordance with the provisions of Liveable Neighbourhoods. The streets surrounding the High School site are designed to accommodate on street parking and access to the site. The street network proposed has been discussed with the DoE and the Town, and is considered to provide adequate vehicle movement/ circulation around the site.

4.3.6 Climate Responsive Design

Under the provisions of Liveable Neighbourhoods, lots should be oriented to facilitate siting of dwellings and private open space to optimise solar access. Given the site characteristics and limitations to the proposed design, maximising the number of lots which have their long axes within the range of N20^{0}W to N30^{0}E or E20N to E30S is problematic. The LSP however achieves a substantial proportion of lots within the desired ranges. The solar access breakdown is presented in Figure 18.

Through the design process, medium density lots were identified as presenting the most challenges in achieving climate responsive design. Whilst the built form for larger, low density lots can appropriately address any disadvantages regarding lot position and orientation, smaller, medium density lots are more constrained. Therefore medium density housing product will need to be mindful of housing orientation, specifically in relation to the provision solar access for indoor and outdoor habitable areas. Given the majority of lots will require the preparation of DAP's, these built form outcomes can be further explored post subdivision.

As noted above, further climate responsive design can be facilitated through the built form, and where appropriate can be included within DAP's or Design Guidelines which can accompany contracts of sale.

4.3.7 Detailed Area Plans

As discussed, in order to achieve a range of lot sizes to facilitate a variety of housing choice and to address built form outcomes stipulated in the LSP, Detailed Area Plans (DAP) are required to guide further development. DAP's can also assist in realising density targets by way of modifying standard R Code provisions to deliver more efficient use of urban area by way of reduced setbacks and site coverage.

DAP's also present the opportunity to achieve better residential outcomes, especially in relation to smaller lot sizes for those areas proposed in and around activity nodes. DAP's will be prepared for:

- lots abutting public open space areas;
- laneway lots;
- lots under 350m^2; and
- Grouped Housing sites.

Detailed Area Plans will address, but are not limited to, design aspects such as access, dwelling orientation, fencing, landscaping, visitor parking, location of outdoor living areas, storage areas, and bin storage.

4.4 Public Open Space

Under the provisions of Liveable Neighbourhoods, a range of site responsive urban parkland is required which appropriately addresses district, neighbourhood and local needs of residents, comprising a mixture of unrestricted and restricted open space.

As previously discussed, the LSP area is highly constrained by environmental and topographical features. The provision of public open space (POS) within the LSP area encompasses the retention of historical drainage features, the central wetland area and remnant vegetation, as well as local and neighbourhood parks to provide for unrestricted open space requirements. These local and neighbourhood parks also retain areas of natural vegetation in very good and excellent condition.

The Landscape Master Plan provided to support this LSP, however, identifies various facilities and treatments of the POS areas. This design is provided as a guide only and will be further refined and informed by detailed engineering design, the significant tree survey results and discussions with the Town of Kwinana at subdivision. Notwithstanding, specific management/ treatments of areas has been noted by the Town of Kwinana in their review of the LSP. In this regard Section 4.12 Implementation identifies management plan requirements.

Figures 19 and 20 identify the POS distribution across the site. A Landscape Master Plan is also provided at Appendix 10. Please note, the Landscape Master Plan in Appendix 10 is indicative only and a final detailed version will be submitted for approval at subdivision implementation stage. The following addresses each of the POS areas indicated on Figures 19 and 20:

1. LOCAL PARK

This local park is located in the north of the LSP area and comprises an area of 0.1564ha, being entirely unrestricted POS. The park will be partially derived from the closure of a portion of Darling Chase road reserve and partially from Lot 675. The Landscape Master Plan at Appendix 10 indicates the park for soft and hard landscape treatment.

2. UPLAND VEGETATION

As described in previous sections, an area of upland vegetation (T1 Community) along Lyon Road is to be retained as local bushland with conservation fencing. Hard landscape treatments such as footpaths for pedestrian linkages, shade structures, BBQ and furniture will be incorporated into this POS area.

The Upland Vegetation POS area comprises 0.6907ha and is allocated entirely as restricted POS.

3. CENTRAL WETLAND

As described in previous sections an area of 'excellent' vegetation associated with the central Multiple Use wetland has been retained in POS together with the historic drain that traverses the area. The area conserved has been agreed with the DEC and represents the protection of vegetation and a non vegetated area surrounding it. The central vegetated portions will be protected through conservation fencing and the cleared areas will provide the opportunity for recreational POS with footpath, BBQ facilities, shade shelters and the inclusion of historic materials. Selected cleared areas of the central wetland area will be utilised for stormwater treatment in accordance with the LWMS.

The Central Wetland area comprises 4.2393ha, which is made up of 2.9159ha of restricted POS and 1.3234ha of unrestricted POS. The restricted POS area comprises the vegetated portion of the wetland, the areas of swale drain

and the 1yr ARI areas of stormwater treatment, with the areas of unrestricted POS comprising the cleared areas for recreation and those stormwater basins during and greater than 5yr ARI events.

4. NEIGHBOURHOOD PARK

The Neighbourhood Park located in the south of the LSP area is 0.3420ha of unrestricted POS. This Neighbourhood Park will include active space and playground and recreational facilities such as shade shelters, BBQ's and footpaths.

5. STORMWATER TREATMENT AREA

In the western part of the LSP area adjacent to the Western Power easements is a water detention basin comprising 0.7990ha of restricted POS. Whilst the majority of the area will be impacted by 1yr ARI storm events and is therefore classified as restricted POS, it will be developed for active open space use in drier periods.

6. WESTERN POS

Located outside of the Western Power easements and on the western periphery of the LSP area is a portion of land allocated for POS. Whilst this portion of POS is to be utilised for 100 yr ARI and 5 yr ARI it is not impacted by 1 yr ARI drainage making it classifiable as unrestricted POS. The POS area is 0.6879 ha in area and is 26m wide and over 280m in length making it suitable for a range of POS opportunities. This area of POS will be developed in conjunction with the Western Power easement and the adjacent drain ensuring it is a useable and high amenity area of POS. Further opportunities for the enlargement of this POS area could be undertaken in the Wandi District Centre LSP. This POS area is allocated entirely as unrestricted POS.

7. POS TRIANGLE

In the southern extremity of the LSP area is a small triangle portion of POS that is located adjacent to the Western Power easements. Whilst this area is outside of the Western Power easements it has been classified as restricted POS due to its small size and restricted nature.

OTHER POS

The Western Power easements which run along the western and southern boundaries of the LSP area are to be transferred to the Town of Kwinana free of cost. Whilst the Western Power easements are a deduction for the purpose of calculating Gross Subdividable Area, they have been shown as restricted POS for the purposes of Figure 19. The Western Power easements will be developed for POS and be utilised for drainage purposes, as indicated in the LWMS and Landscape Master Plan. The development of the easement for POS will focus on hard and soft landscaping and incorporation with adjoining areas of POS. The easements will provide pedestrian linkages between the LSP area and the future Wandi District Centre LSP.

A landscaped buffer is provided along Lyon Road, which will provide a direct connection to the pedestrian network within the Wandi North LSP along Lyon Road and the Wandi Local Playing Fields. This buffer also provides a visual relief for the rural residential residents to the east and in this regard specific management of this interface, including requirements for fencing and landscaping, will need to be further explored with the Town through Landscape Management Plans.

ACTIVE OPEN SPACE

Residents within the LSP area will have high accessibility to areas of active open space, with the Neighbourhood Park in the southern portion of the LSP area providing opportunities for informal activities and the Wandi High School site (5.4 ha) and the Wandi Local Playing Fields (6.4 ha) providing sporting facilities for both formal and informal activities.

Whilst outside of the LSP boundary, the Wandi Local Playing Fields are adjacent to the northern perimeter of the site. The Wandi Local Playing Fields are expected to comprise:

- 1x Australian Rules Football / Cricket Oval;
- 3x Basketball/Netball courts;
- 1x Hockey field;
- 1x Soccer field; and
- A Pavilion.

Whilst not indicated as POS on the plan at Figure 19, the playing fields for the Wandi High School site will be available to the local community after school hours, as per the agreement reached between the DoE and Town of Kwinana. The High School playing facilities are expected to comprise, at the least, the following:

- 1 x senior football oval
- 1 x cricket pitch;
- 2 x cricket practice nets;
- 1 x sports hall of 600m^2 comprising 1 basketball court;
- 2 x basketball / netball courts overlain at right angles with 2 x tennis courts; and
- 4 x tennis courts.

Figure 20 demonstrates that all residents (with the exception of one or two R20 lots along Lyon Road) within the LSP area will be within a 400m distance of an area of active open space.

As can be seen from Table 4 below, the LSP area does not provide for the required 10% POS requirement, which under Liveable Neighbourhoods is able to be provided by way of 8% unrestricted POS and 2% restricted POS. As per Table 4, the LSP area will provide 6.17% of unrestricted POS and 10.99% restricted POS. The substantial oversupply of restricted open space is generally attributed to meeting the ToK and DEC's desires and objectives. These desires and objectives have been met by way of providing for the protection of a multiple use wetland that would otherwise be developed; the protection of a drain that has some heritage significance; the protection of an area of upland vegetation; and through the provision of a buffer / pedestrian linkage to protect the amenity of rural residential allotments that are likely to be urbanised in the future.

Under Liveable Neighbourhoods, the WAPC, subject to the support of the local government may accept a POS contribution of a minimum of 5% unrestricted POS provided a range of criteria are met, being:

- the POS is designed, developed and located for the widest possible use of the community. The LSP has responded to the desires of the community and will be developed in accordance with a Landscape Master Plan to be approved by the Town of Kwinana to respond to community needs;
- the POS is developed to a minimum standard, which it will be as per the requirements of the Town of Kwinana;

- adequate areas are provided for flooding and drainage, which has been addressed in the attached LWMS;
- POS is readily available that can be used at all times, which is confirmed by the location of the Wandi Local Playing fields abutting the site, as discussed below; and
- no portion of the minimum 5% amount is made up of restricted POS. As mentioned, 6.17% of unrestricted POS is provided.

Notwithstanding the above, a cash in lieu contribution will be required to be paid by subdividing landowners for any shortfall in POS provision.

Table 4 provides a summary of the POS provision in accordance with Liveable Neighbourhoods. For the purposes of this calculation the LSP does not consider the area within the WP easement as a restricted open space contribution rather considers this area as a deduction from the gross subdivisible area.

As can be seen from Figure 19, due to the site responsive distribution of POS across the LSP area, not all existing lots comprise an equal provision of POS. A lot-by-lot breakdown of POS across the LSP area is provided as Figure 21 of this report. This breakdown will be used to determine the contribution requirements across the LSP area under the DCP.

4.4.1 Cash in Lieu

Across the LSP area there is a total requirement for approximately 3.7002 ha of land to be credited as POS. However, the LSP only provides approximately 3.2497 ha of land to be credited as POS. This equates to a POS shortfall of approximately 0.4505 ha across the LSP area. In this regard, pro-rata cash in lieu payments for the shortfall of POS will be required to be paid by each subdividing landowner.

Landowners providing an 'oversupply' of POS will be reimbursed through the Development Contributions Scheme.

Please refer to Table 4 and Figure 21 for calculations relating to POS.

Table 4 - Public Open Space Schedule

Public Open Space Schedule (all areas are in hectares)		
Site Area		57.8992
Less		
Waste Water Pump Station	0.3893	
Western Power Easement	4.5853	
Lyon Road Landscape Buffer	0.3524	
Existing Darling Chase reserve to be retained	1.2264	
Existing Kenby Chase reserve to be retained	0.6750	
Total	7.2284	
Net Site Area		50.6708
Deductions		
High School	10.0143	
Gross Subdivisible Area		40.6565
POS @ 10%		4.0657
Public Open Space Requirement		
May Comprise: » Min 8% unrestricted POS » Max 2% restricted POS	 3.2525 0.8131	
TOTAL POS REQUIRED		4.0657
Public Open Space Provided – Reference Number	**Unrestricted POS Sites**	**Restricted POS Sites**
1	0.1564	
2		0.6907
3	1.3234	2.9159
4	0.3420	
5		0.7990
6	0.6879	
7		0.0617
TOTAL	**2.5097**	**4.4673**
		6.9770
	6.17%	**10.99%**
Additional Deductions		
Restricted Open Space Surplus	3.6542	
Revised Gross Subdivisible Area		37.0023
Revised POS @10%		3.7002
Revised Public Open Space Contribution		
May comprise:		
» Min 8% unrestricted POS (2.9602ha)	(6.78%) 2.5097	
» Max 2% restricted POS (0.7400 ha)	(2%) 0.7400	
Total POS Provided		**(8.78%) 3.2497**
Additional Active Public Open Space (for noting)	**Unrestricted POS Sites**	
High School Shared Playing Fields	5.4101	
Wandi Local Playing Fields	6.4266	11.8367
Actual total unrestricted POS provided		14.3464

Note 1: All calculations are subject to survey

Note 2: There is an approximate POS shortfall of 0.4505 ha across the LSP area. This will be compensated through cash in lieu payments by subdividing landowners.

4.5 Community Purpose Sites

Under the provisions of ERIC, a number of community sites are proposed within the future Wandi District Centre.. The sites identified for the future Wandi District n Centre include:

- District Community Centre
- Emergency Accommodation and Group Homes
- Home and Community Centre
- Recreation Centre (Indoor Sports)
- Public Library
- Police Station
- Retirement Accommodation

The design of the Wandi District Centre and remaining land in the south of the Wandi Cell will be the subject of a separate LSP and will address the location of the above identified community facilities.

4.6 Fire Management

A Fire Management Plan has been prepared by FirePlan WA for the LSP area and is included in Appendix 11. Given the site is predominantly cleared and is utilised for rural uses, the bush fire hazard is considered as a 'low' risk within cleared areas, with the exception of areas directly adjacent to the bushland, which are rated as 'extreme'.

The key recommendations for fire management are as follows:

- The separation of open space areas by the road network. This is not applicable for landscaped POS that consists of reticulated lawns and shade trees;
- Where a separation of open space containing bushland and development is not proposed to occur via road interface a 30m building protection zone is to be established between the housing area and open space;
- Public open space management to detail fire and bush loads within the open space areas;
- Fire hydrants to be installed every 200m apart in roads that interface with public open space.

Additionally, strategic firebreaks are proposed in those areas of public open space with significant vegetation retention, comprising a 6m low fuel area with a 4.1m trafficable surface for fire fighting appliances. In some places, road based material will be required. It is proposed these strategic firebreaks are to be provided as pedestrian/ cycle paths within the POS areas, however utilised for emergency access in the event of fire.

4.7 Activity Centres and Employment

Whilst there are no activity centres located within the Wandi South LSP area, two activity centres are proposed within the Wandi Urban Cell, being the proposed Wandi District Centre to the south of the Wandi South LSP area and the approved local activity centre within the Wandi North LSP area.

As identified above SPP 4.2, requires that a minimum residential density target per gross urban hectare of 20 dwellings is stipulated with a desirable target of 30 dwellings encouraged within a 400m walkable catchment of the Wandi

District Centre. As confirmed above, this has been achieved for the portion of the LSP within the 400m walkable catchment. The Honeywood Avenue extension through the LSP area connects the residential community to the District Centre and further pedestrian connections will be achieved through the Western Power easement area.

Given the sites proximity to the proposed District Centre the following provides and overview of the work undertaken to date for the Town Centre.

4.7.1 District Centre

Under SPP 4.2, the Wandi District Centre is identified under Statement of Planning Policy 4.2 Activity Centres for Perth and Peel as a 'district centre' and as such is required to meet the following design criteria:

- Focal point for bus network;
- To include a range of retail and office floorspace;
- To address residential density targets within 400m of the centre, comprising a minimum of 20 Dwellings per gross hectare and a desirable density of 30 dwellings per gross hectare;
- A base 20% mixture of land uses for centres above 10,000m^2 of shop retail floorspace, or 30% for centres above 20,000m^2 of retail floorspace.

In addition, key design aspects to be reflected in the built form outcome include:

- Small walkable blocks that improve accessibility within the centre.
- Ensuring buildings address streets and public spaces for vitality and surveillance.
- The provision of a mix of uses along street frontages.
- The 'sleeving' of large scale retail and car parks with more externally orientated or 'active' building frontages.
- The inclusion of 'town squares', pubic and civic spaces which are well located providing quality meeting places for the community.

Under the provisions of ERIC, the District Centre is proposed to accommodate 15,000m^2 of retail NLA and generally encompasses the landholdings between the Kwinana Freeway and the Wandi South LSP area.

4.7.2 Type of Centre and Land Use Distribution

The Wandi District Centre is proposed under ERIC to accommodate 15,000m^2 of retail NLA.

Land use distribution is categorised into retail, commercial, community and medium density residential areas. The departure from the Anketell Rail Station site, and the configuration of the proposed District Centre, as identified under ERIC, has also been reviewed, with concept planning generally reflective of the principles of Liveable Neighbourhoods which include:

- The focus of the quality of the public realm with the street being the main organising element for centre design (not the land use).
- All centres are to be planned as activity centres not just shopping centres. The role of retail in this context is to create a public domain environment that attracts employment from the non-retail sector. Providing a mixed-use centre delivers improved environmental, economic and social outcomes.
- Centres having an appropriate range of higher density housing both in and immediately around them.

- Community infrastructure/ sites should be designed to be integrated within rather stand alone precincts.
- Centres capitalise on, relate to, and address arterial roads rather just using them for access.

Whilst the District Centre LSP has yet to be refined through formal approvals, a number of critical design elements have been addressed with relevant authorities, to identify critical district outcomes, these include:

- The creation of Treeby Road as a four way signalised intersection – from work undertaken for Anketell Road, the location of this intersection provides sufficient separation distance from the Kwinana Freeway, whilst minimising impacts for future freight traffic movements.
- The creation of an internalised pedestrian based main street parallel to Anketell Road – the traffic volumes forecasted for this road, in addition to the limited access arrangements have limited its opportunity to operate as a main street. Furthermore, the topography of the site (significant slope from Anketell Road to the WP easement) informs the built form outcome, with appropriate 'steps' in the built form required to minimise the fall across the site and provide a suitable grade for pedestrian and disable access.
- The requirement for a non-sensitive land use buffer to Anketell Road – given the location of the proposed Town Centre on Anketell Road, a noise attenuation wall was not considered an appropriate interface for the Town Centre or Anketell North Cell areas.

Additionally, through the design process a 'centre framework' has been considered for the District Centre which equates to roughly 28 ha. The extent of the centre has been defined by topographical and site limitations (existing road network, consolidated landownership and the high voltage power line corridor), infrastructure requirements (drainage and access), walkable catchments and appropriate land area to ensure a mixture of land uses and density.

The Wandi South LSP has therefore given due consideration to the integration with, and the relationship to, the District Centre, and as such the following design elements are incorporated within the Wandi South LSP:

- Consideration to district and neighbourhood traffic movements within the Wandi Cell to the Centre, by way of intersection opportunities with (the extension to) Honeywood Avenue and circulation of traffic within the District Centre site from Anketell Road.
- Pedestrian and cycling connections.
- Appropriate densities within 400m of the centre, however noting the limitations imposed by the high school site, the high voltage power line corridor, drainage requirements and areas of public open space.
- The delineation of those community purpose sites, to be included within the District Centre.
- The inclusion of appropriate residential development within the District Centre site.

Refer to Figure 14 - Relationship of LSP to the future District Centre.

4.8 Urban Water Management

This section addresses the proposed urban water management network, maintenance of this network, groundwater recharge, runoff water quality, environmental values and physical characteristics of receiving domains/watercourses, protection from stormwater and flooding, cost contribution arrangements, and ongoing management arrangements.

4.8.1 Water Management Strategies and Planning

4.8.1.1 Regional Water Management Strategy

An overarching Drainage Water Management Plan, being the Jandakot Structure Plan Drainage and Water Management Plan (JDWMP) was released by the Department of Water in December 2009. The JDWMP provides district scale flood modelling, a surface water management strategy and a groundwater management strategy which specify post-development levels and flows to address The Town's District structure plan (ERIC).

4.8.1.2 District Water Management Strategy

A District Water Management Strategy, being the Wandi District Water Management Strategy 2009 (DWMS) has been prepared for the Wandi Cell in support of the region scheme amendment report requesting the land be rezoned from 'Urban Deferred' to 'Urban' under the MRS. The strategy addresses the LSP area located outside of the UWPCA boundary (P2 public drinking water supply protection area).

The DWMS provides a summary of the key design concepts provided in the Department of Water draft JDWMP for the Wandi Cell and relevant to the LSP area.

4.8.1.3 Local Water Management Strategy

A Local Water Management Strategy (LWMS) has been prepared in support of this LSP and is provided as Appendix 12.

The LWMS addresses the area which is the subject of this LSP and provides a refinement of the flood modelling, surface water management strategy and groundwater management strategy presented in the JDWMP/DWMS to a local scale. The LWMS is consistent with the JDWMP, the DWMS and water sensitive urban design practices as described in the Stormwater Management Manual of WA.

4.8.2 Groundwater Management

MANAGING GROUNDWATER LEVELS TO PROTECT INFRASTRUCTURE

To protect infrastructure from high seasonal groundwater levels, the average maximum annual watertable level has been calculated by measurement of the watertable by JDA and recommendations made for the installation of subsoil pipes as per Figure 15 of the LWMS. Subsoil locations will be specified in the UWMP.

MAINTAINING BASEFLOW

The existing Peel Sub-R drain end of winter base flow of 14 L/s is generated from low lying areas and existing drains intercepting groundwater and running off. This baseflow is to be maintained post-development by adopting a range of criteria specificed in the LWMS.

MANAGING CHANGES TO GROUNDWATER LEVELS

Groundwater in the area is currently used for domestic, commercial and public water supply purposes. The estimated water balance for the site presented in the LWMS indicates that as a result of urban development of the site recharge to the Superficial Aquifer will increase. Generally an increase in recharge would result in an increase in groundwater levels, however with the significant volume of groundwater abstraction occurring in this area, combined with the impacts of Perth's drying climate, the groundwater levels in this area have declined on average by 0.5 to 1m in the past 15 years, with levels still steadily declining.

It is therefore more likely that the increased recharge from the urban catchment will not cause an increase in groundwater levels but assist in buffering the rate and extent of further drops in groundwater levels.

4.8.3 Protection of Wetlands

The low lying portion of the study area is classified as Multiple Use dampland. The existing vegetation is predominantly degraded, with pockets of good to excellent condition vegetation. A portion of the vegetation is located in the regional flood detention reserve area and 4ha of the good to excellent condition vegetation will be retained in the POS area.

The adjacent CCW to the north of the LSP area and the Multiple Use dampland area is groundwater fed and its hydrological regime will be maintained post-development by the measures indicating in the LWMS.

4.8.4 Stormwater Management Strategy

The Local Stormwater Management system has been designed with the following constraints:

- Outflow to the Peel sub-drain is to be maintained (including baseflow, 1yr critical, 5yr and 100yr);
- The lower lying areas of the degraded multiple use wetland intercepts groundwater and continuously flows out of the Peel Sub-R drain all year round. This provides base flow to the Peel Main drain which is to be maintained;
- No ground disturbing activity is to occur under the powerline easement areas, unless authorised by Western Power (WP). An agreement to allow flood storage to 15m AHD within an extent of the low lying areas under the powerline easement as included within Part B of this Report;
- Areas reserved for the sewer pump station and the high school have set location constraints, and
- No drainage is stored within the adjacent UWMPCA area.

The stormwater drainage system will be designed using a major/ minor approach. The major drainage system is defined as the arrangement of roads, drainage reserves, detention or infiltration areas and open space planned to provide safe passage of stormwater runoff from extreme events which exceed the capacity of the minor system.

4.8.4.1 Minor Drainage System (up to 5 yr ARI)

The design elements proposed for the minor drainage system are as follows:

- Soakwells with a minimum capacity of the 12mm rainfall for residential lots where separation to watertable of 1.5m is achieved or where site geotechnical classification permits.
- The road runoff from elevated catchments with permeable soils is to be captured and infiltrated by utilising infiltrations storages within the road reserve where possible. E.g. StormTech or Eco-Aid sized for a 5yr capacity can be installed within the road reserve in place of the tradition pipe network.

Alternatively detention/ infiltration can be achieved along road swales shown for the local connector road;

- For the remaining catchments the roadside pipe network will be sized to convey the 5yr ARI flow to the minor system treatment train. These catchments are either low lying, with less permeable soils present, or have limited depth to groundwater. The minor treatment train systems should have minimum capacity to treat the 1yr 1hr ARI events, with detention storage provided for up to the 5yr ARI events.
- All outflow from pipe network outlets will be treated by Gross pollutant traps (GPT) prior to discharge into detention storages. GPT have greater importance in high litter generation areas.
- The minor event discharge at the control point on the Sub R Drain from the development plus upstream catchments.
- All minor storages to have an overflow or bypass structure to convey flow from flood event to the major detention storage.

4.8.4.2 Major Drainage System (Flood Management >5 yr to 100 yr ARI)

Due to the topography over the site, the major drainage system mimics the existing system with a single 100yr detention storage in the low-lying area by the Peel sub-R drain to control major runoff events to outflows consistent with pre-development flow rates. The design elements proposed for the major drainage system are as follows:

- Discharge rates from detention basins controlled to retain existing outflow discharge rates from Sub R drain.
- Detention basins designed with control pipe at basin to allow for maximum detention and controlled flow through the site.
- Drain flowing through Catchment G, connected to 100yr storage by pipe passing beneath detention basin in Catchment I.
- Roads graded to direct flow to the lowest point in the catchment. Swales or spillways utilised in key locations to convey >5yr flow from minor detention storages to the single 100yr flood detention storage.
- Retention of heritage listed drain.
- Restoration for a portion of the existing open drain to an open swale connecting the heritage drain to Sub R drain.
- 100yr flood detention storage to be provided in the lowest point of the catchment with controlled outflow from the catchment. The lowest point in the catchment extends under the powerline easement and the sub-drain easement, which have been incorporated in the design.
- Control Structure placed on the sub-R drain easement at the upstream point of the sewer pump station. The control structure will be constructed in the drain, reducing flow through the drain to the pipe culvert in this location. The pipe will be sized to control flows to the pro-rate rates for the catchment contributing, and set low enough to allow baseflow to continue from the site unimpeded.
- At least 0.5m clearance above the estimated 100yr ARI flood level in the 100yr detention storage area will be provided that is, > 15.5m AHD. The sewer pump station surface level design is consistent with this.

The design strategy is consistent with the objectives provided in the JDWMP.

4.8.5 Monitoring

Predevelopment monitoring of two paired groundwater sites and one surface water site has previously been completed.

The developer is committed to and responsible for three years of post-development monitoring of the pre-development bores (two in total) in Wandi (south), and baseflow and peak outflows to the Peel sub-R drain.

Groundwater levels are to be monitored monthly, groundwater quality quarterly; surface site levels by data logger and surface quality sampled monthly when flowing. Monitoring will also include potable water monitoring of the external impact on existing/ adjacent Special Rural properties that rely on rain water and wells for potable water supply.

4.8.6 Ongoing Management and Responsibilities

The ongoing water management and responsibilities are summarised in the table below.

Table 5 – Ongoing Water Management and Responsibilities

Management Issue	Responsibility and Funding
Preparation of UWMP for subdivisions application areas*	Developer
Construction of drainage structures (street drainage infiltration storage, bio-retention areas and detention storages) and Irrigation systems.	Developer
Maintenance of drainage structures (street drainage, infiltration storage, bio-retention and detention storage). 12 months defects period following construction: Ongoing:	Developer Town of Kwinana
Irrigation system management. 2 years following development: Ongoing:	Developer Town of Kwinana
Post-development monitoring. 3 years following development: Ongoing (if required)	Developer Town of Kwinana
Prepare and submit a water quality monitoring report for post-development monitoring:	Developer

* The layout of the LSP modelled in the LWMS contains minor variations to the final road layout of the LSP, which is to be addressed at UWMP stage.

4.9 Servicing / Utilities

A Servicing Report has been prepared by Ewing VDM Pty Ltd, Consulting Engineers and details requirements for siteworks, roads, drainage, sewerage, water supply and public utility services regarding the LSP area. The following presents a summary of the servicing report which can be found in Appendix 13 of this Report.

4.9.1 Site Works

The majority of the site is undeveloped and is moderately covered with vegetation.

Preparatory earthworks are expected to include the following:

- Demolition of selected existing structures, slab structures and remnant ground improvements;
- Removal of walls, fencing and other improvements as necessary, however retaining as many existing and significant trees and vegetation as possible;
- Stripping and grubbing of areas to be earth worked with due regard to vegetation preservation in selected areas such as those defined as public open space;
- Stripping and storing of topsoil for re-use as required, and
- Cut to fill earthworks on site, utilising imported soils for fill as required.

Earthworks will be required to achieve suitable grades between lots throughout the development, particularly to address the overall vertical separation between Lyon Road (RL 28 – 35m AHD) and Kwinana Freeway (RL 14 – 23m AHD). Final cut to fill levels will be controlled by desirable grades and lots and may need retaining.

Import of clean fill is anticipated to be required in some areas to allow for gravity piped drainage cover, infiltration and clearance to maximum groundwater levels to achieve appropriate site classification under Australian Standards AS2870 for residential purposes. The extent of fill will be determined by the overall earthwork design and any further geotechnical or environmental requirements for the site.

To ensure minimal impacts to existing residents during construction, monitoring of potable water sources adjacent to the development area will be conducted to discern and minimise the impact of development activities on the potable water supply of neighbouring Special Rural properties. Such impacts may include disturbance of hydrogeological systems or through airborne dust impacting on rainwater harvested from roofs. This monitoring will be included as part of the Dust and Construction Management Plan to be prepared for the site.

4.9.2 Sewerage

The Water Corporation (WC) is licensed to provide sewerage service in the areas and has included the LSP area in its overall planning. Sewer reticulation will be designed with respect to the overall catchment boundaries for the area. Current WC planning identifies the provision of a sewerage outfall via the future Thompson's Lake mains pump station west of the freeway (Mandoglaup Cell).

Preliminary investigations with the Water Corporation have confirmed the establishment of four (4) prefunded pump stations subject to final Water Corporation design checks. The four pump stations are as follows:

- Type 90 Pump Station East of the Kwinana Freeway;
- Type 90 Pump Station West of the Kwinana Freeway;
- Type 10 Pump Station East of the Kwinana Freeway, southern area, and
- Type 10 Pump Station East of the Kwinana Freeway, south of Anketell Road.

The entire Wandi South Cell is proposed to be serviced through a gravity sewerage system to pump station 'A'.

The preferred sewer pressure main route option from pump station 'A' is along Darling Chase up the main spine road and across the Freeway into the Mandoglaup Cell, up along Barfield Road to Macquarie Boulevard via Jackadder Avenue.

Subject to the status of the development front north of the site and the WC's Capital Works Program, the development of the Wandi South Cell may require the prefunding of sewerage infrastructure or alternative arrangements being agreed with the WC.

The sewer pump station site has also been endorsed by the WP and the DoW given its proposed to be located adjacent to a sub-drain of the Peel Main Drain and within a proposed 1:100 yr drainage area. The pump station site is currently under construction, with expected completion in October 2011. This site will be created as a freehold title to be ceded to the WC under WAPC application reference number 142168.

Acid sulphate soil treatment may be required during sewer installation, as may dewatering, however no further difficulties are anticipated.

Standard WC headwork fees are expected to apply to urban development of the site.

4.9.3 Water Supply

The subject land is within an area licensed to the WC for the supply of water and is included in its area of planning. Internal water reticulation will be designed and constructed in accordance with standard WC requirements.

Further preliminary planning investigations with the WC have resulted in a review of the current WC scheme planning. To service the Wandi South Cell a water supply will have to ultimately extend from the distribution mains (diameter 600mm) required for the Wandi North Cell.

In addition to this, an injection via an additional distribution main (diameter 700mm) from the west side of the Kwinana Freeway may be required pending WC final design checks. Preliminary investigations suggest this distribution main would cross under the Kwinana Freeway near the existing Peel Main Drain crossing. MRWA have confirmed a crossing at Rowley Road is not feasible and WC preference is for the crossing south of Rowley Road. Ultimately, the actual crossing location is to be determined by the WC. Preliminary advice to date from the WC suggests this main is not required to service the Wandi South Cell.

Subject to the status of the WC Capital Works Program, the development of the site may require the prefunding of water supply distribution mains,

Standard WC headworks fees are expected to apply to urban development of the site.

4.9.4 Electricity

As previously noted 330kV overhead transmission lines traverse the LSP areas western boundary. Planning for the site needs to recognise the constraints of these power lines as they are significant in size and should be retained. The lines are within pre-existing easements of some 60m in width, which is to be clear of all construction activities.

22kV high voltage aerials along Lyon Road also exist on the eastern side of Lyon Road. The developer may be required to relay High Voltage lines on the western side of Lyon Road, in preparation for future removal of the overhead lines by WP. WP may offer a cost contribution for these activities depending on the ultimate planning for the area.

WP services are therefore readily available to the site. The costs of these works will be met by the developer in accordance with standard WP requirements, recognising the current WP policy in regard to contributions towards the cost of high voltage installations.

Street lighting will be installed in accordance with the relevant Australian Standards, and in accordance with approved Western Power and Town of Kwinana designs. The theme is to be determined at subdivision in consultation with the Town of Kwinana.

4.9.5 Natural Gas

Preliminary advice from Westnet Energy indicates a possible connection from the south near the vicinity of Thomas Road. Connection from this source would require a significant capital works contribution and headwork fess from the developer for a pressure reducing station and Gas Main extension. This supply is expected to service the nearby development cells between Thomas and Anketell Road to the south suggesting possible cost sharing arrangements between developers.

The alternative extension of gas reticulation from the adjacent northern developments is considered likely and more appropriate.

4.9.6 Communications

Preliminary information from Telstra shows existing service networks in the vicinity of the development. It is anticipated this infrastructure will have sufficient capacity to provide Telecommunication services to this development. The adjacent developments north of the site will also provide sufficient infrastructure for network expansion to the south to service the proposed development.

Telstra will install new network facilities to all proposed lots subject to the developer providing, at his cost, trenching for the laying of Telstra services. Alternatively, where cable routes match WP underground power supplies, Telstra will, where possible utilise WP trenches in lieu of additional trenching by the developer.

No headworks charges for Telstra services are expected.

4.10 Development Contributions

The LSP forms part of two Development Contribution Areas (DCA 5 and 9) identified under the Development Contributions TPS Amendment No. 100 and No. 115 respectively, currently being considered by the Town of Kwinana and the Western Australian Planning Commission. The amendments introduce Development Contribution Plans (DCP) and DCA to correspond with the 'Development' zoning under the Fifth Schedule of the Scheme.

The two proposed amendments deal with both 'hard' and 'soft' contributions for the urban corridor.

Given both amendments are yet to be finalised, an interim development contribution agreement with the Town of Kwinana is likely to be required as a condition of subdivision approval, until such a time as the DCP are finalised for the Wandi Cell.

Further to the DCP's, subdividing landowners will also be required to pay a per lot cost contribution towards the management of mosquito's, as required under the Town of Kwinana Mosquito Management policy.

4.11 Operation of Structure Plan

The Structure Plan is to operate in accordance with the provisions of 6.17.7 of the Town of Kwinana Town Planning Scheme No.2.

The LSP identifies reserves and zones, including residential densities. Use and development within the LSP area is to be in accordance with the provisions of Town Planning Scheme No. 2 as if the reserves and zones as depicted on Figure 11 were actual reserves and zones.

Detailed Area Plans will be required, prior to the clearance of subdivision, in accordance with the provisions of the LSP.

Otherwise residential development is to be in accordance with the approved Detailed Area Plans (if applicable), the Residential Design Codes, Town Planning Scheme No.2 and any relevant Planning Policy.

Upon completion of development within the Structure Plan, the Town of Kwinana will initiate an amendment to the Scheme to reflect the final zonings.

4.12 Implementation

The following table provide an implementation programme for works associated with the LSP.

Table 6 – Management Strategies Programme

Task	Local Structure Plan	Condition of Subdivision Approval
Noise Management Strategy	Noise Impact Assessment prepared to guide implementation of the Strategy.	Preparation and implementation of Noise Management Strategy
Fauna Management Plan		Preparation and implementation of Fauna Management Plan(s.)
Mosquito and Midge Management Plan		Preparation and implementation of Mosquito and Midge Management Plan(s).
Tree Survey	Prepared and submitted with LSP	Implementation through Wetland Management Plan, Remnant Vegetation Management Plan and Landscape Master Plan.
Acid Sulphate Management Plan		Preparation and implementation of .Acid Sulphate Solis Management Plan
Fire Management Plan	Prepared and submitted with LSP	Implementation of recommendations as a condition of subdivision approval.
Wetland Management Plan		Preparation of Wetland Management Plan as condition of subdivision approval.
Remnant Vegetation Management Plan		Preparation of Wetland Management Plan as condition of subdivision approval.
Construction Management Plan		Preparation of Wetland Management Plan as condition of subdivision approval.

The following outlines the general minimum requirements for the Environmental Management Strategies required for the site.

4.12.1 Wetland and Remnant Vegetation Management Plans

A stand alone Wetland Management Plan to be developed for the central wetland area to recognise the values of the wetland, commensurate with a CCW, and will include management strategies that would normally be included for the management of a CCW. The Wetland Management Plans will be developed in accordance with DEC *Guidelines Checklist for Preparing a Wetland Management Plan*, December 2008, for wetlands and associated buffer vegetation.

A stand alone Remnant Vegetation Management Plan is to be prepared for the areas of remnant vegetation retained in POS.

Both the Wetland Management Plan and the Remnant Vegetation Management Plan should address the following issues (as applicable), in addition to the DEC Guidelines required to be addressed by the Wetland Management Plan:

- Identify improvements proposed to be undertaken by the developer (landscaping and design intent), estimated costs and ongoing costs of maintenance of such sites for the Town over the longer term;

- Identify landowner maintenance responsibilities during the development cycle specifying minimum developer maintenance responsibilities once the sites are developed;
- The integration of fire management (including the provision of building protection zones), access control (vehicle, pedestrian and emergency vehicle), reserve fencing, weed management, revegetation (species selection, species composition, species density, revegetation rates and survival rates), feral species control and fauna management;
- Management Plans for reserves that include wetland and non-wetland remnant vegetation shall include specific management objectives and strategies for all vegetation communities within the reserve;
- Management Plans for reserves that include active public open space and conservation reserves will also address the interaction between public open space and conservation objectives; and
- Approximate yearly costs for reserve management expected during the developer management period shall be indicated for each reserve. Approximate costs of infrastructure installed within reserves and it's life expectancy and replacement cost shall also be provided.
- Management Plans shall include a formalised handover arrangement to be outlined and endorsed by the Town of Kwinana.

4.12.2 Fire Management Plan

The Fire Management Plan for the site shall include, but not be limited to, the following:

- Bush fire hazard assessment, including map;
- Road network (access/egress) assessment;
- Dwelling construction requirements;
- Hazard separation assessment/requirements;
- Fuel management;
- Water supply;
- Developer responsibilities (eg. notices on titles if required, maintenance timeframes of wetland and remnant vegetation areas etc);
- Land owner responsibilities (eg. dwelling construction); and
- Local Government responsibilities (eg. long term maintenance).

4.12.3 Noise Management Strategy

The Noise Management Strategy for the site shall include, but not be limited to, the following:

- Identification of Australian Standards and local policies/regulations;
- Consideration of the recently released National Ports Strategy (Anketell Road as a future freight route);
- Identification of the noise sources/activities that will impact on future residents;
- Procedures to ensure that all reasonable noise mitigation measures are applied;

- Details of overall management methods and procedures that will be implemented to limit noise impacts (acoustic controls/noise attenuation);
- Noise monitoring, reporting and response procedures;
- Procedures for notifying residents of potential impacts likely to affect their amenity.

4.12.4 Mosquito and Midge Management Plan

The Mosquito and Midge Management Plan for the site shall include, but not be limited to, the following:

- Mosquito monitoring, surveys and reports (larval, adult, timing) requirements;
- Provision of geographical survey – identify breeding habitats;
- Identify land ownership and responsibilities;
- Identify applicable environmental legislation;
- Identify key stakeholders;
- Determine and identify management options;
- Develop a control program;
- Determine potential operational resources (operational timeframes, funding requirements and contributions, community awareness); and
- Ongoing assessment and review of timeframes.

4.12.5 Acid Sulphate Soil Management Plan

The Acid Sulphate Soil Management Plan for the site shall include, but not be limited to, the following:

- Identify potential issues associated with Acid Sulphate Soils and what measures may be necessary to prevent these issues from arising.
- The Management Plan shall include the location of services and cut to fill processes.
- Engineering drawings are to be finalised prior to approval of the Management Plan.

The Management Plan will be prepared in accordance with the relevant legislation relating to Acid Sulphate Soil management.

4.12.6 Fauna Management Plans and Fauna Surveys

Fauna Management Plans and Surveys will be undertaken in accordance with the requirements set out under the *Environment Protection and Biodiversity Conservation Act 1999* ('EPBC Act').

Previous environmental work has indicated Black Cockatoo and Graceful Sun Moth habitat is present at the site. A Significant Tree survey was undertaken in December 2010 which identified a number of significant trees (trunk diameter of more than 400mm) across the site, which are generally confined to public open space areas and the high school site. As such, a referral to the Department of Environment, Water, Heritage and the Arts ('DEWHA') is required to address the potential Balck Cockatoo habitat.

A Graceful Sun Moth survey was carried out in March 2011 and he results of the GSM survey concluded there was no evidence of GSM occurring across the LSP area. As such, a referral for GSM is not required.

4.12.7 Construction Management Plan

Further to the above Environmental Management Plans, a Construction Management Plan will also be required to be prepared and implemented under the *Health Act* as part of subdivision. In addition to the requirements under the Health Act, the Construction Management should outline the processes for notifying nearby residents of works to be carried out, including timeframes, and how dust, noise and vibration will be managed. The Construction Management Plan should also detail the methods of communication for notifying residents, such as telephone, face to face contact, letter, and meetings.

Dust and Noise management practices shall be a key component of the Construction Management Plan in order to minimise impacts on existing residents. This will include potable water monitoring of the external impact on existing/ adjacent Special Rural properties that rely on rain water and wells for potable water supply.

4.12.8 Landscape Development and Maintenance Programme

Landscaping treatments have been identified through the Landscape Master Plan which accompanies this LSP report as well as the indicative cross sections for drainage basins and swales. Whilst the plan and cross sections are provided to illustrate potential development outcomes, further discussion and detail design is required through the preparation of Landscape Management Plans to finalise proposed treatments.

Notwithstanding Landscape Management Plans will give due consideration to the following design criteria:

- Security, safety and surveillance matters, particularly with lots which abutting public open space.
- Minimising the amount of irrigated and turfed areas, without limiting the ability to provide for a suitable range of open space areas for different groups in the community.
- Fire management considerations, specifically with relation to interface treatments and fuel loads.
- Ensure the proposed streetscape, landscaping and fencing design meets the standards of the Town and is maintained to an appropriate standard by the developer until such a time as agreed for handover by the Town.
- Management Plans shall include a formalised handover arrangement to be outlined and endorsed by the Town of Kwinana.

The following table provides an outline of the anticipated maintenance schedule for open space areas.

Table 7 – Public Open Space Maintenance Schedule

Open Space	Construction	Maintenance
POS unrestricted	Design and Construction cost to be met by the developer. Design to be to the satisfaction of the Town of Kwinana.	Prior to subdivision approval, an agreement is to be entered into with The Town to provide for the ongoing management of public open space.
POS restricted drainage basin	Design and Construction cost to be met by the developer. Design to be to the satisfaction of the Town of Kwinana and Department of Water or water Corporation for drainage issues.	Prior to subdivision approval, an agreement is to be entered into with the The Townto provide for the ongoing management of public open space.
Temporary Estate Entry Statements	Design and Construction cost to be met	Maintenance to be met by the developer

	by the developer.	for the entire period the entry statement is used.
Road Verge and Roundabout Treatments	Design and Construction cost to be met by the developer. Design to be to the satisfaction of the Town of Kwinana.	Prior to subdivision approval, an agreement is to be entered into with The Townto provide for the ongoing management and maintenance of road verge and roundabout treatments.
Peel Sub Drain	Design and Construction cost to be met by the developer. Design to be to the satisfaction of the Town of Kwinana and Water Corporation	Maintenance to be met by the developer for a period of 2 years from practical completion. Town of Kwinana and Water Corporation to meet to determine ongoing maintenance responsibility.
Wandi Local Playing Fields*	Bulk earthworks design and construction to be pre-funded by the developer.	Maintenance to be the responsibility of the Town of Kwinana.

* Potential refund of costs to be determined subject to finalisation of Contribution Amendment 100 and proposed Community Infrastructure Contribution Amendment.

WANDI SOUTH LOCAL STRUCTURE PLAN » WANDI » 10 FEB 2012 » GRA REF 4385 » 4385_12JAN_LSP REPORT_FINAL APPROVAL_RT.DOCX

5.0 Conclusion

The LSP provides a planning framework to guide the urban development of the subject land. The proposed land uses and subdivision layout are consistent with the planning context provided under the MRS, TPS 2, JSP and ERIC. The structure plan design has been guided by the principles of Liveable Neighbourhoods.

The preparation of this structure plan has been guided by an analysis of the opportunities and constraints within the subject site.

The LSP area also includes a number of vegetated areas which are proposed to be retained and enhanced, serving both a conservation and recreation purpose to the community. The majority of these areas proposed for retention are connected via public open space links and corridors or strong road based pedestrian connections.

The information provided within this report reflects that the subject site is capable of being suitably developed for urban purposes. Suitable provisions of POS and a High School site have been made. These facilities are connected to the surrounding areas through an integrated road layout. Servicing requirements including roads and utilities have been adequately addressed.

APPENDIX 1

FIGURES

LEGEND

- LOCAL STRUCTURE PLAN AREA
- PROPOSED LAYOUT
- INDICATIVE ROAD CONNECTION
- WSD WATER AUTHORITY OF WA

date 24 November 2011 job no. 4385
scale 1:5000 @ A3 e-ref 111102
designer R Thompson prepared by D McCulloch
client .

perth
Level 3, 369 Newcastle Street, Northbridge, Western Australia, 6003
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title figure 1 - local structure plan area
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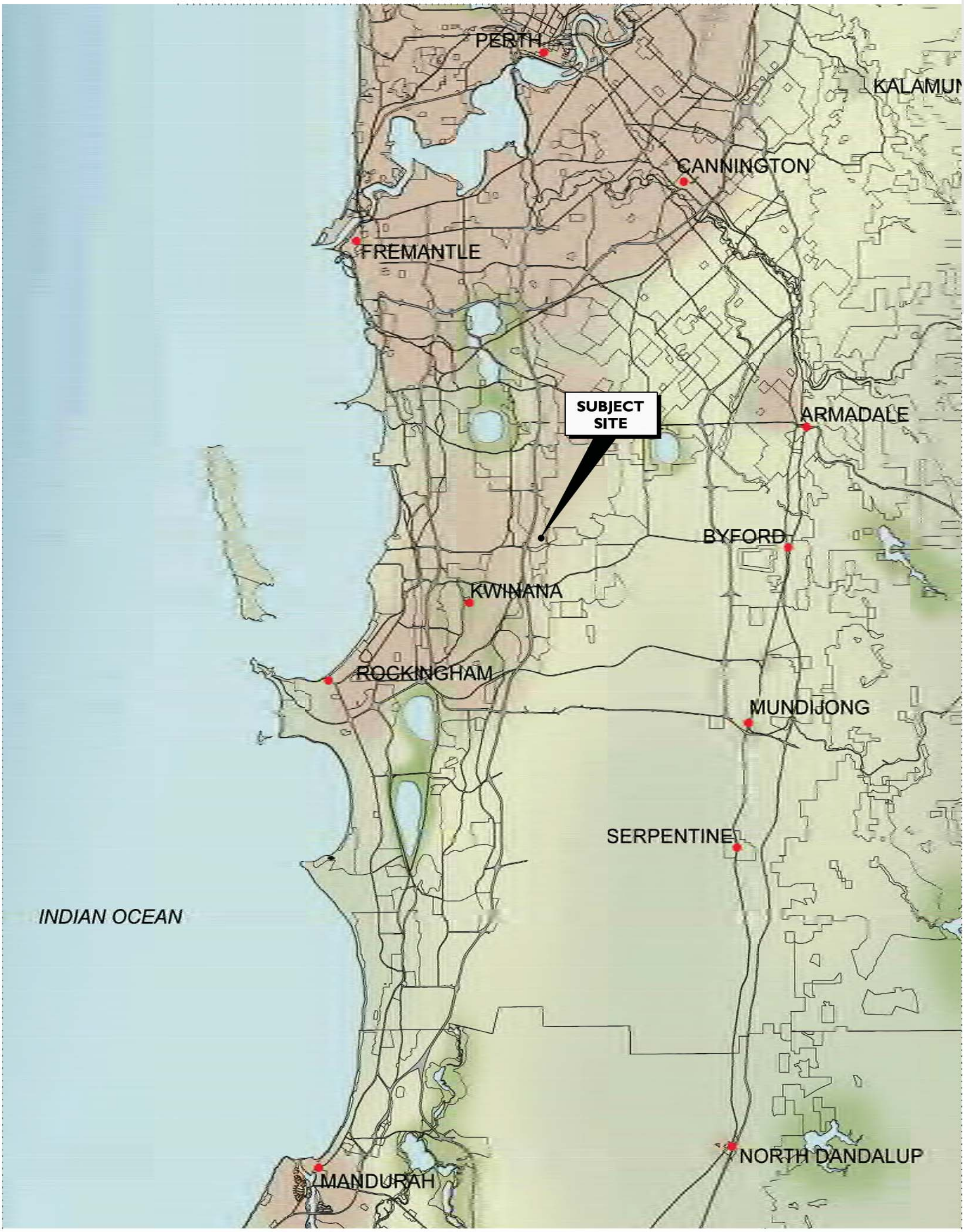

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date	24 November 2011	job no.	4385
scale	no to scale	e-ref	111102
designer	R Thompson	prepared by	D McCulloch
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title figure 2 - regional location

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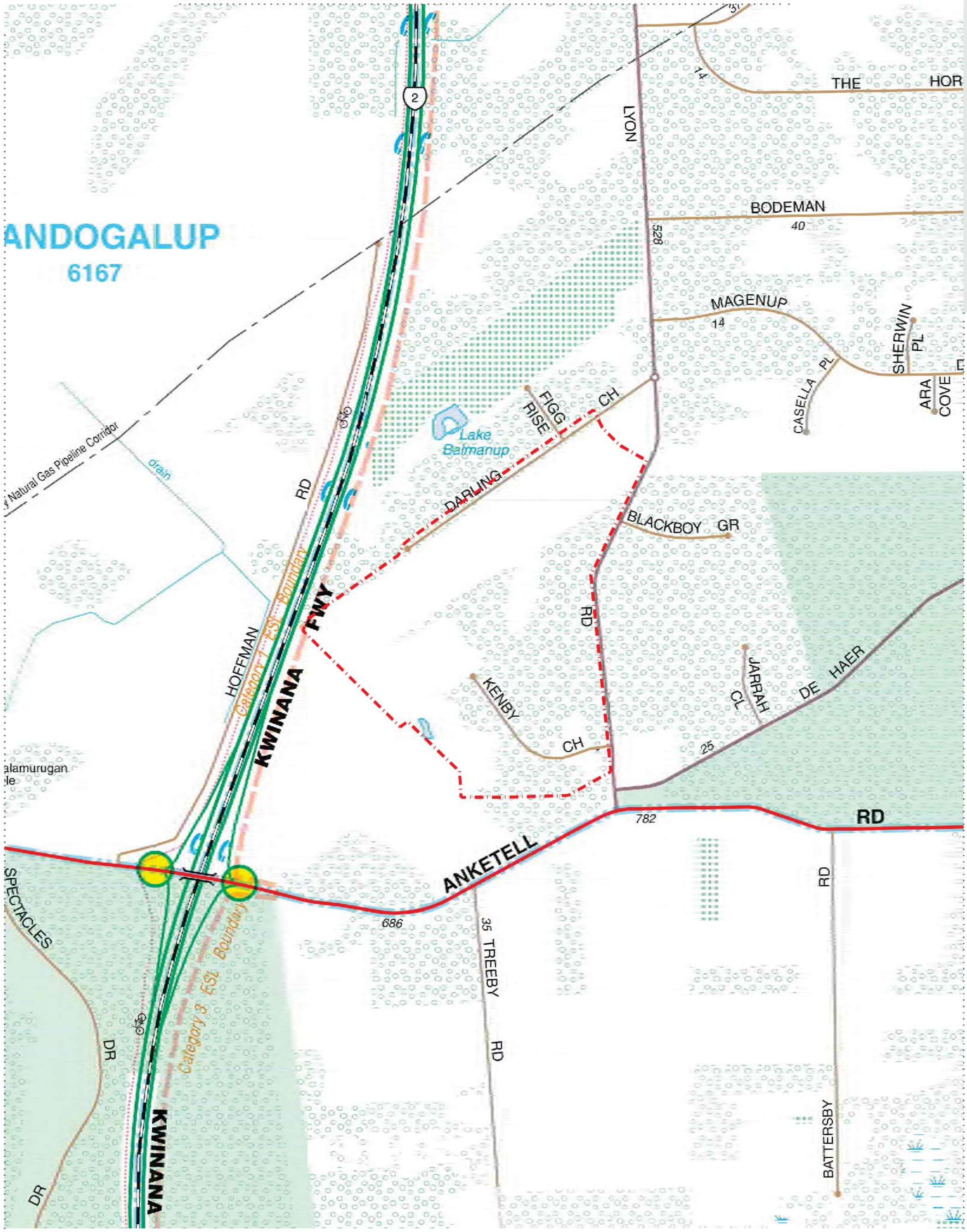

SUBJECT SITE

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title: figure 3 - local location

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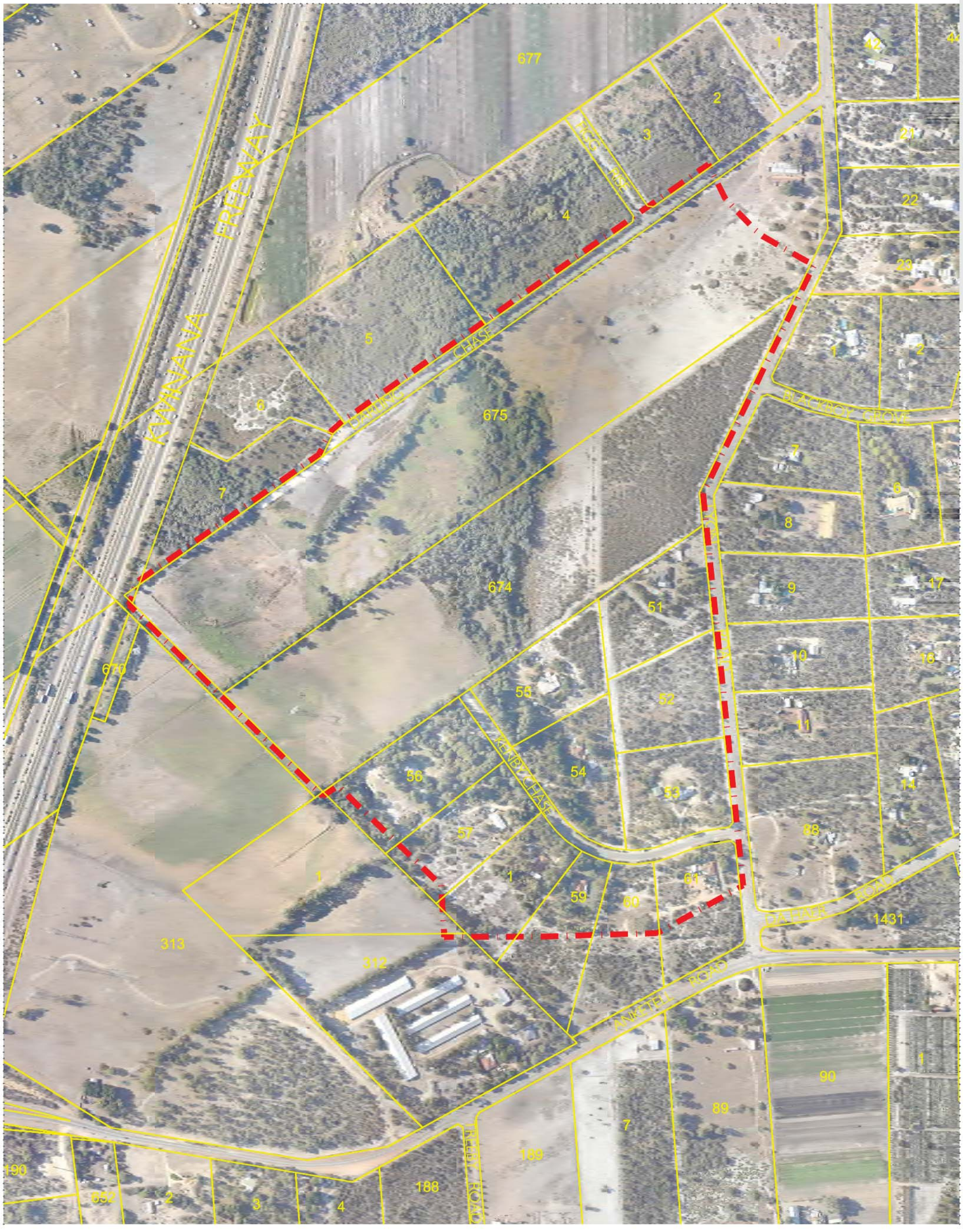

SUBJECT SITE

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job no.	4385
scale	1:5000 @ A3
e-ref	111102
designer	R Thompson
prepared by	D McCulloch
client	.

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title figure 4 - aerial

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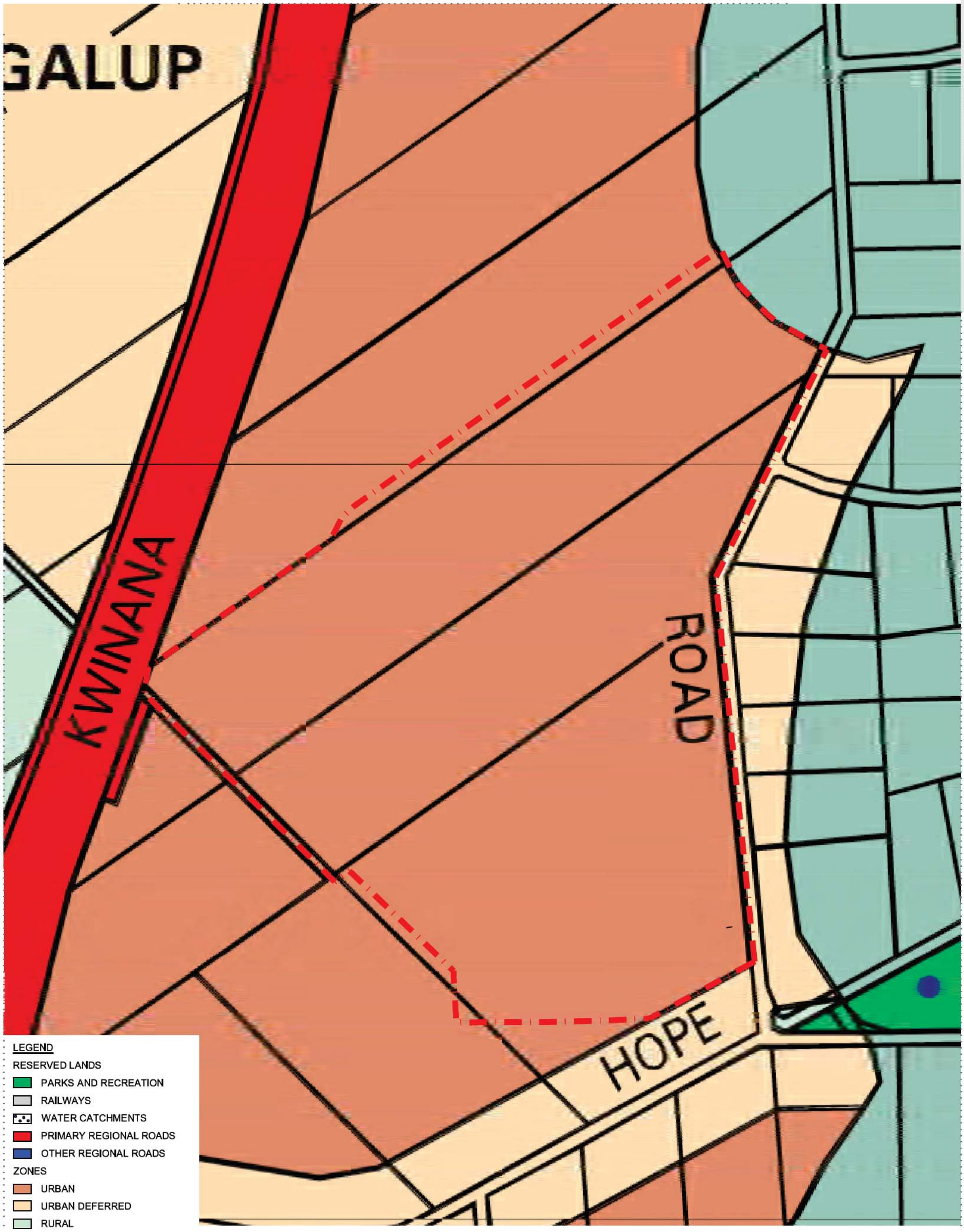

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date 24 November 2011 job no. 4385
scale 1:5000 @ A3 e-ref 111102
designer R Thompson prepared by D McCulloch
client .

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title figure 5 - metropolitan region scheme
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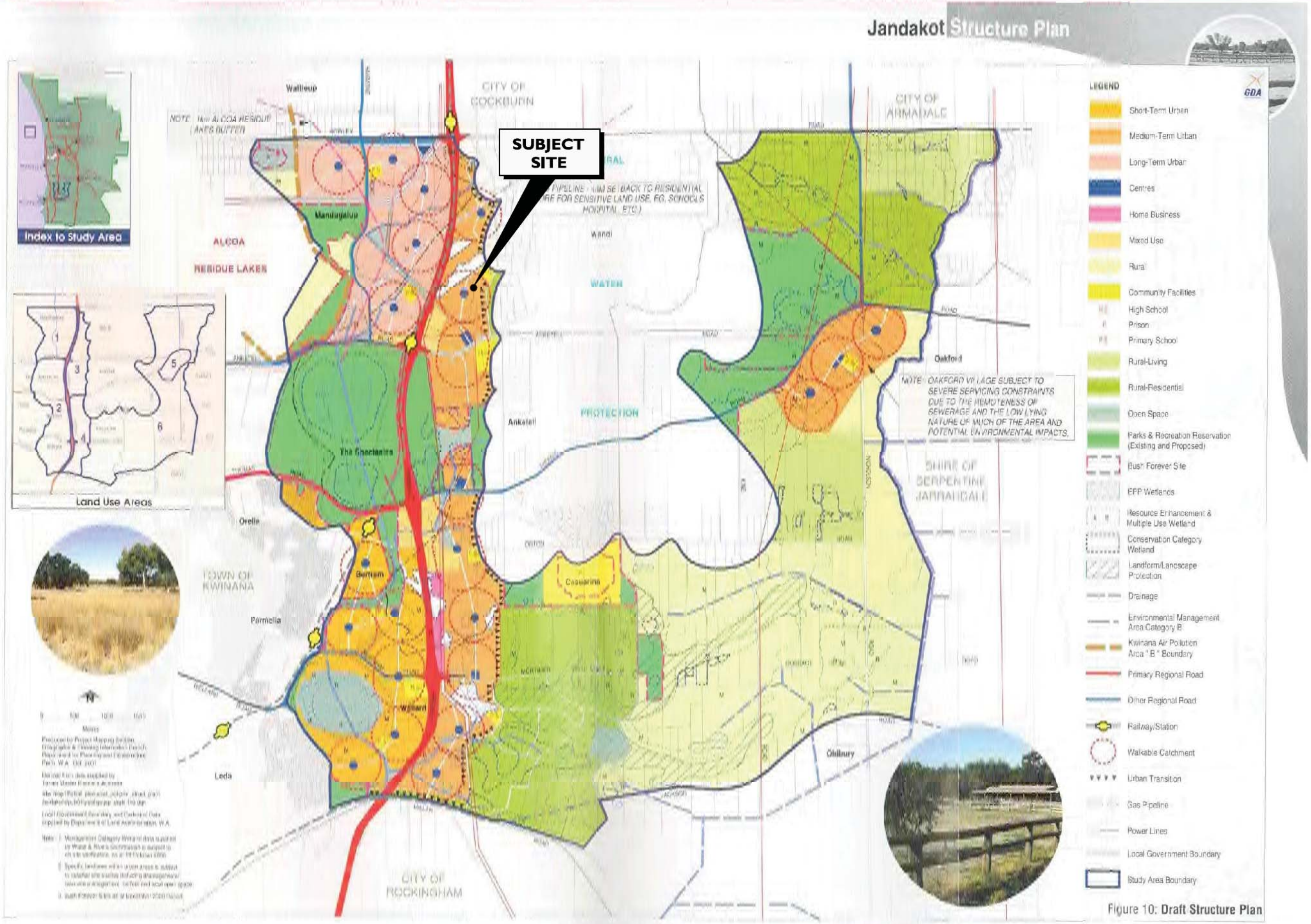

Figure 10: **Draft Structure Plan**

date 22 November 2011	job no. 4385	scale not to scale	title figure 6 - jandakot structure plan
designer R Thompson	prepared by D McCulloch	e-ref 111102	address wandi south lsp
client .			

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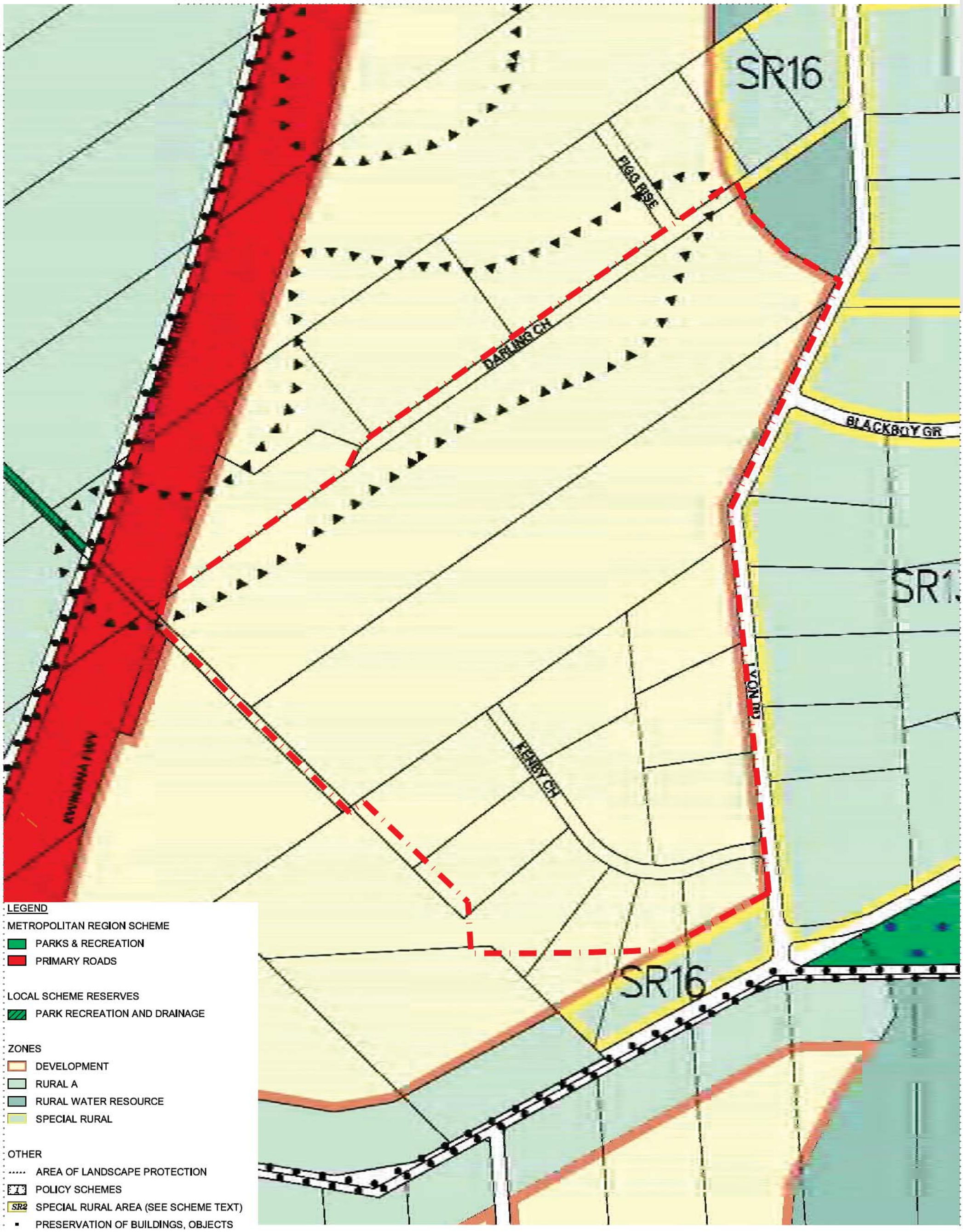

LEGEND

METROPOLITAN REGION SCHEME
- PARKS & RECREATION
- PRIMARY ROADS

LOCAL SCHEME RESERVES
- PARK RECREATION AND DRAINAGE

ZONES
- DEVELOPMENT
- RURAL A
- RURAL WATER RESOURCE
- SPECIAL RURAL

OTHER
- AREA OF LANDSCAPE PROTECTION
- POLICY SCHEMES
- SR2 SPECIAL RURAL AREA (SEE SCHEME TEXT)
- PRESERVATION OF BUILDINGS, OBJECTS AND PLACES (SEE SCHEME TEXT)
- NO ZONE
- SUBJECT SITE

TOWN PLANNING MASTER PLANNING URBAN DESIGN PROJECT MANAGEMENT

date	24 November 2011	job no.	4385
scale	1:5000 @ A3	e-ref	111102
designer	R Thompson	prepared by	D McCulloch
client	.		

title: figure 7 - town planning scheme no. 2

address: wandi south lsp

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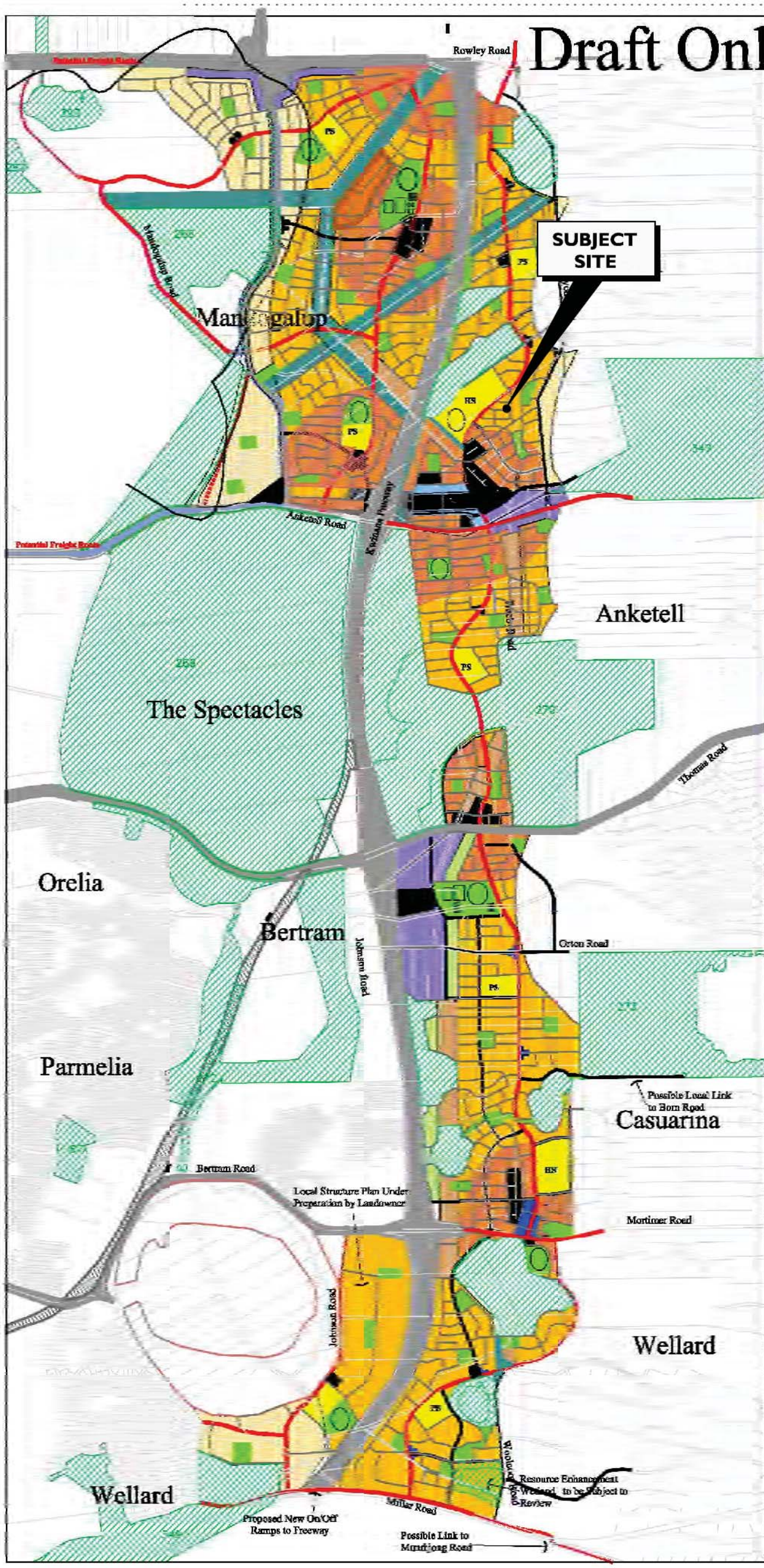
Town of Kwinana Eastern Residential Intensification Concept

(District Structure Plan)



Proposed Land Use

- Residential R20
- Residential R25 (& Higher)
- Residential/Business (Home Based Business)
- Special Residential R5
- Special Residential (Power Lines)
- Possible Mid to Long Term Future Residential
- Commercial Centre
- Mixed Business
- Commercial Centre Mixed Use
- Neighbourhood Node
- High School
- Primary School
- Local/District Recreation
- Community Facilities
- Conservation
- Bush Forever area No.
- Multiple Use Corridor -Infrastructure (Power & Gas Lines) & Ecological Linkages

Transport Infrastructure

- Regional Road
- Structure Plan Local & District Distributor
- Structure Plan Local Collector Roads
- Structure Plan Local Access/Collector Roads (Indicative Only)
- Long Term Road Closure Following Realignment of Current Route
- Railway Purposes
- Railway Station Location
- Noise and Impact Attenuation Bands

Other Factors

- Modeled Dust Buffer Edge Requires 2 Years of Dust Monitoring by Developers to Validate Model
- Future Urbanisation May be Considered Following Full Technical Environmental Review of Impacts of Urbanisation on Wetland Area. (To be Undertaken by Landowner/Developer in Consultation with DoE)

Scale 1: 10,000

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scale	not to scale	e-ref	111102
designer	R Thompson	prepared by	D McCulloch
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title: figure 8 - eastern residential intensification concept

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Wandi South Local Structure Plan

6 February 2012

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TOWN PLANNING · MASTER PLANNING · URBAN DESIGN · PROJECT MANAGEMENT

N:\Town Planning\4000-4999\4385\drafting

date	10 February 2012	job no.	4385
scale	NTS	e-ref	111102
designer	R Thompson	prepared by	K Trenberth
client	.		

perth
Level 3, 369 Newcastle Street, Northbridge, Western Australia, 6003
email gra@greg-rowe.com web www.greg-rowe.com
tel +618 9221 1991 fax +618 9221 1919

title: Figure 9 - local structure plan

address: wandi south lsp

PERTH • PEEL / SOUTH WEST • MID WEST • PILBARA

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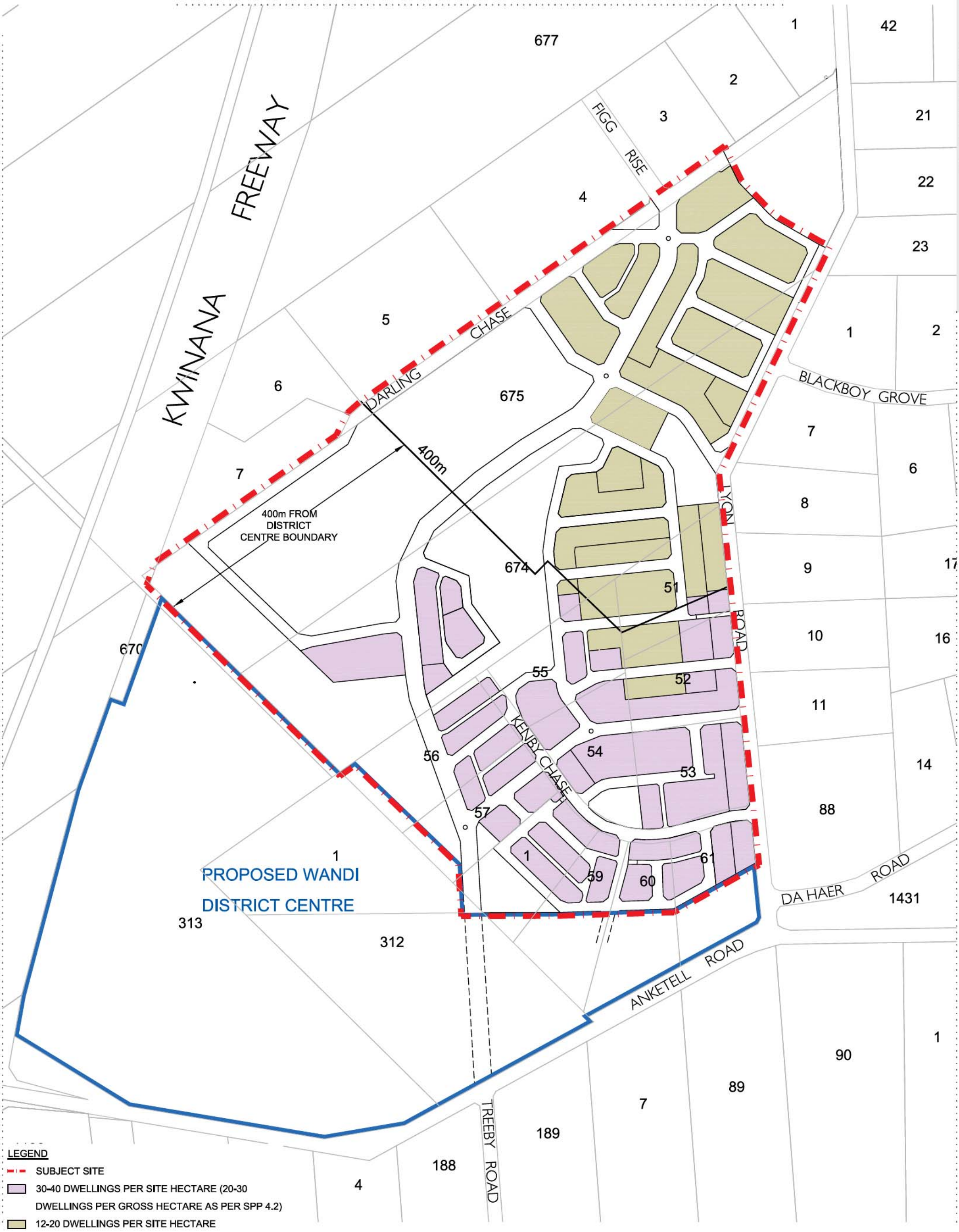

PROJECT MANAGEMENT
URBAN DESIGN
MASTER PLANNING
TOWN PLANNING

date 24 November 2011	job no. 4385
scale 1:5000 @ A3	e-ref 111102
designer R Thompson	prepared by D McCulloch
client .	

perth
Level 3, 369 Newcastle Street, Northbridge, Western Australia, 6003
email gra@greg-rowe.com web www.greg-rowe.com
tel +618 9221 1991 fax +618 9221 1919

title figure 10 - target densities

address wandi south lsp

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LEGEND

ZONES AND R-CODES

- RESIDENTIAL - R20
- RESIDENTIAL - R25
- RESIDENTIAL - R30
- RESIDENTIAL - R40
- RESIDENTIAL - R60
- DEVELOPMENT ZONE

LOCAL SCHEME RESERVES

- PARKS, RECREATION AND DRAINAGE

OTHER

- NO ZONE
- SUBJECT SITE

date 06 February 2012 job no. 4385
scale 1:5000 @ A3 e-ref 111102
designer R Thompson prepared by K Trenberth
client .

perth
Level 3, 369 Newcastle Street, Northbridge, Western Australia, 6003
email gra@greg-rowe.com web www.greg-rowe.com
tel +618 9221 1991 fax +618 9221 1919

title figure 11 - zoning plan
address wandi south lsp

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KWINANA FREEWAY

FIGG RISE

DARLING CHASE

BLACKBOY GROVE

LYON ROAD

KENBY CHASE

DA HAER ROAD

ANKETELL ROAD

TREEBY ROAD

WSD

677 1 2 3 4 5 6 7 675 674 670 51 52 53 54 55 56 57 59 60 61 42 44 21 22 23 1 2 7 6 5 8 9 17 10 16 11 15 14 88 1431 313 312 1 90 89 7 189 188 652 2 3 4

PROJECT MANAGEMENT
URBAN DESIGN
MASTER PLANNING
TOWN PLANNING

LEGEND

- SUBJECT SITE
- STAGE 1
- STAGE 2
- STAGE 3
- STAGE 4
- STAGE 5
- STAGE 6
- STAGE 7
- WSD WATER AUTHORITY OF WA

date 24 November 2011 job no. 4385
scale 1:5000 @ A3 e-ref 111102
designer R Thompson prepared by D McCulloch
client .

perth
Level 3, 369 Newcastle Street, Northbridge, Western Australia, 6003
email gra@greg-rowe.com web www.greg-rowe.com
tel +618 9221 1991 fax +618 9221 1919

title figure 12 - indicative staging
address wandi south lsp

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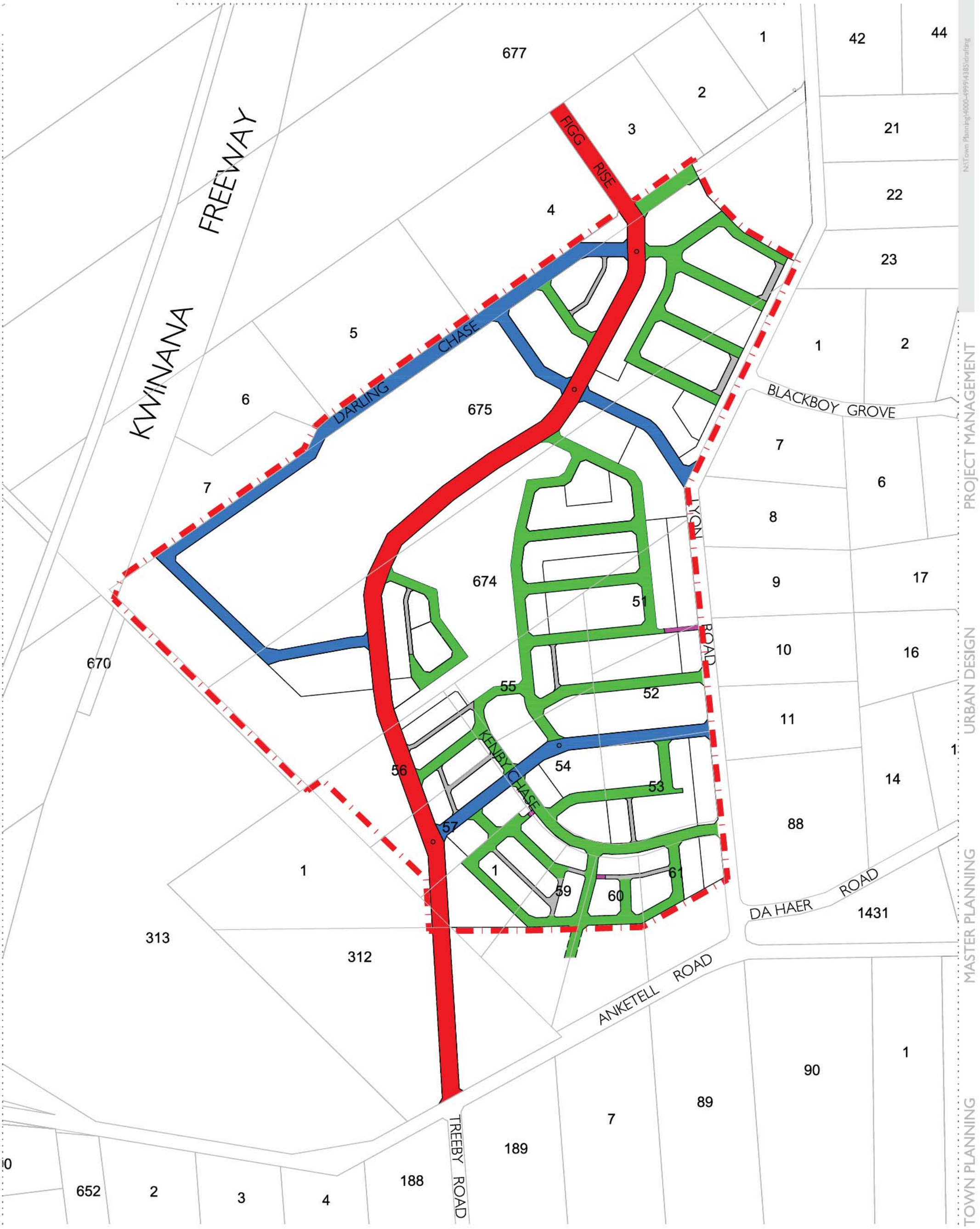

LEGEND

- SUBJECT SITE
- INTEGRATOR "B"
- ACCESS STREET "B"
- ACCESS STREET "C"
- PUBLIC ACCESS WAY
- LANEWAY

date	22 November 2011
job no.	4385
scale	1:5000 @ A3
e-ref	111102
designer	R Thompson
prepared by	D McCulloch
client	.

perth
Level 3, 369 Newcastle Street, Northbridge, Western Australia, 6003
email gra@greg-rowe.com web www.greg-rowe.com
tel +618 9221 1991 fax +618 9221 1919

title: figure 13 - street hierarchy plan

address: wandi south lsp

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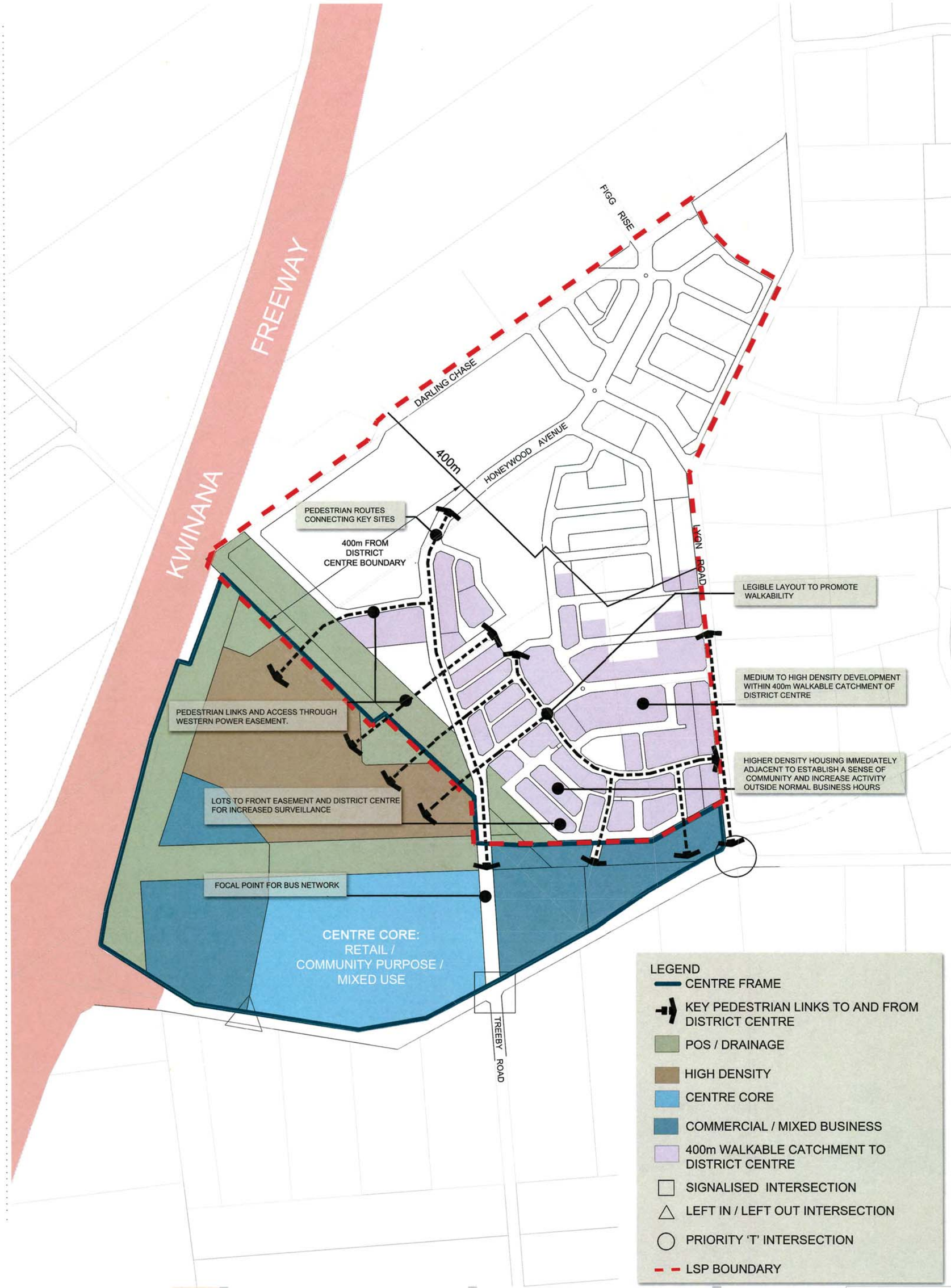

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PROJECT MANAGEMENT
URBAN DESIGN
MASTER PLANNING
TOWN PLANNING

date	24 November 2011	job no.	4385
scale	1:6000 @ A3	e-ref	111102
designer	R Thompson	prepared by	D McCulloch
client	.		

title Figure 14 - lsp relationship to future wandi district centre

address wandi south lsp

perth
Level 3, 369 Newcastle Street, Northbridge, Western Australia, 6003
email gra@greg-rowe.com web www.greg-rowe.com
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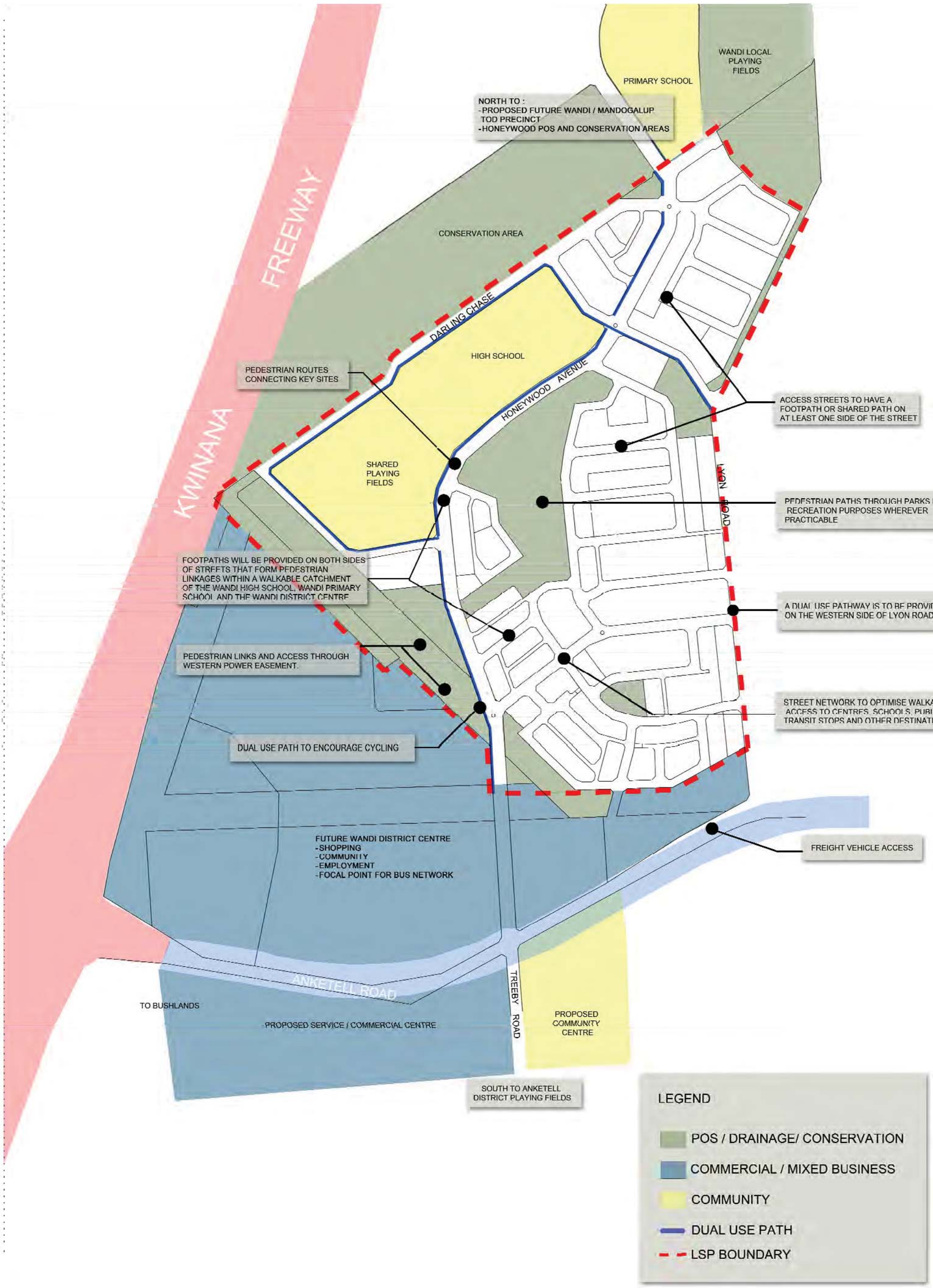

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URBAN DESIGN
MASTER PLANNING
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date	06 February 2012
job no.	4385
scale	1:6000 @ A3
e-ref	111102
designer	R Thompson
prepared by	K Trenberth
client	.

perth
Level 3, 369 Newcastle Street, Northbridge, Western Australia, 6003
email gra@greg-rowe.com web www.greg-rowe.com
tel +618 9221 1991 fax +618 9221 1919

title: Figure 15 - pedestrian network plan

address: wandi south lsp

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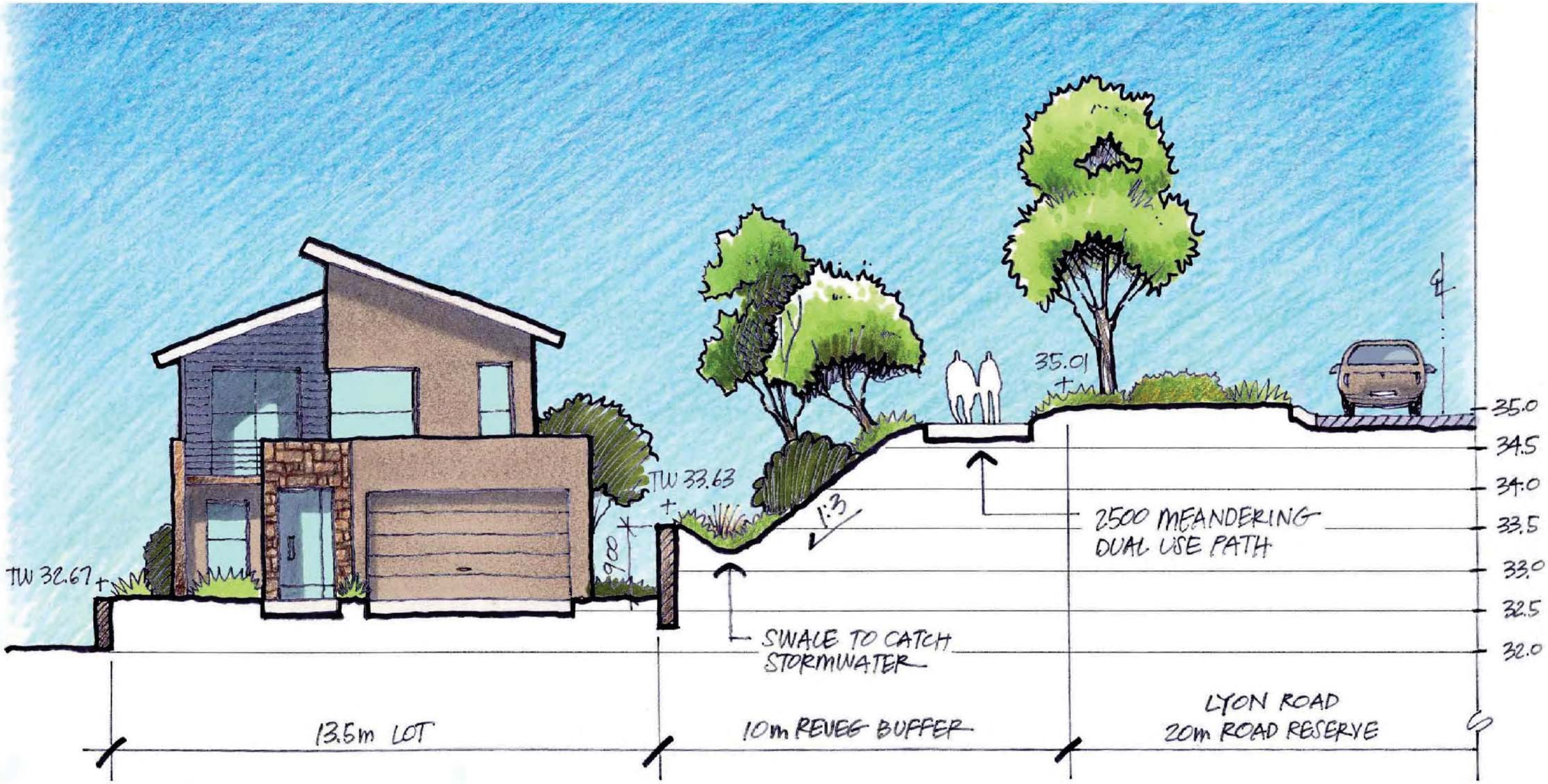

SECTION 6 - REVEGETATION BUFFER
WANDI SOUTH
APRIL 2011

emerge ASSOCIATES
Integrated Science & Design

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URBAN DESIGN
MASTER PLANNING
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date	24 November 2011	job no.	4385	scale	NTS
designer	R Thompson	prepared by	D McCulloch	e-ref	111102
client					

perth
Level 3, 369 Newcastle Street, Northbridge, Western Australia, 6003
email gra@greg-rowe.com web greg-rowe.com tel +618 9221 1991 fax +618 9221 1919

title Figure 16 - lyon road landscape buffer
address wandi south lsp

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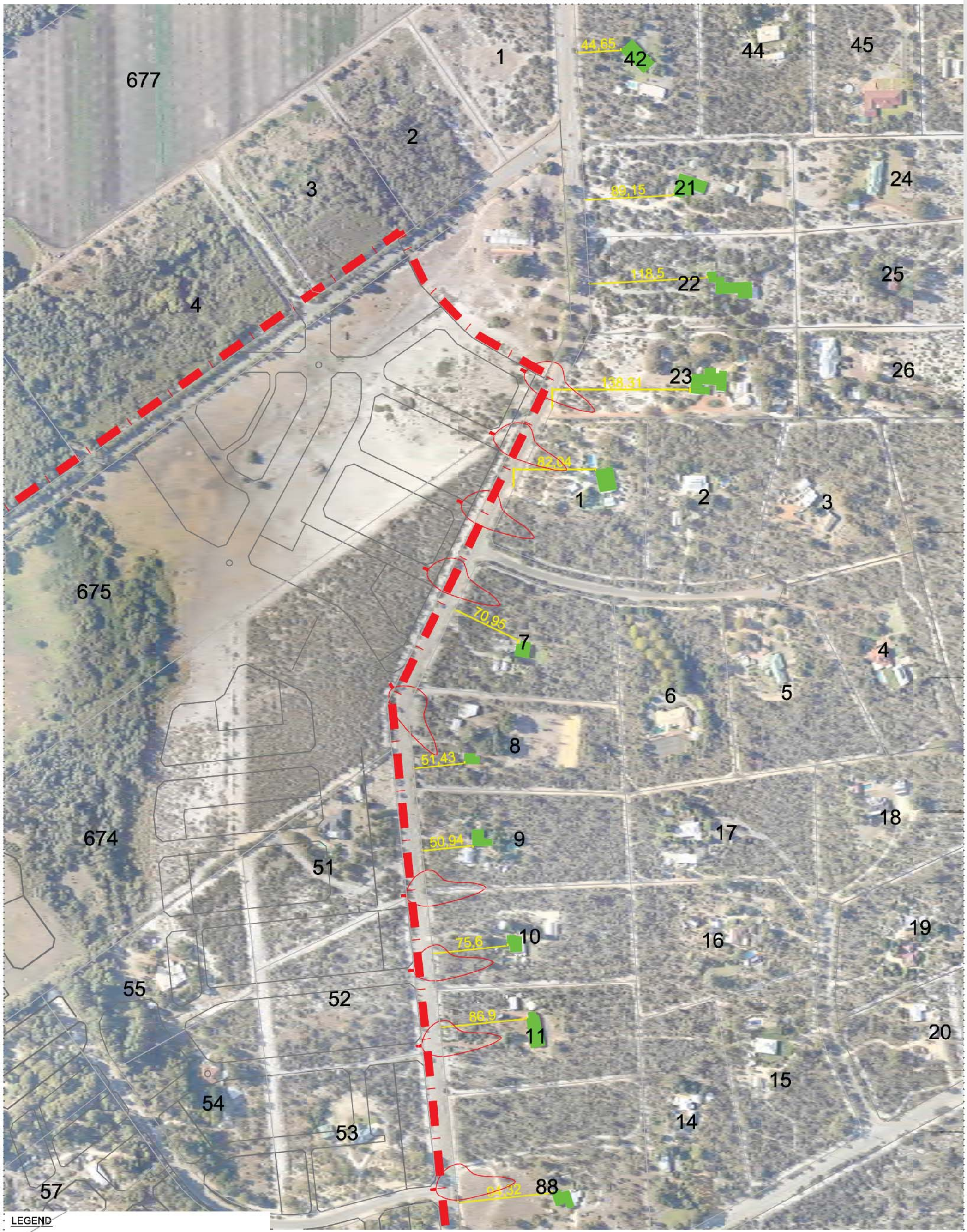

LEGEND

LOCAL STRUCTURE PLAN

EXISTING RESIDENCE

DIRECTION OF POTENTIAL HEADLIGHT GLARE

date	22 November 2011	job no.	4385
scale	1:3500 @ A3	e-ref	111102
designer	R Thompson	prepared by	D McCulloch
client	.		

perth
Level 3, 369 Newcastle Street, Northbridge, Western Australia, 6003
email gra@greg-rowe.com web www.greg-rowe.com
tel +618 9221 1991 fax +618 9221 1919

title figure 17 - headlight glare plan

address wandi south lsp

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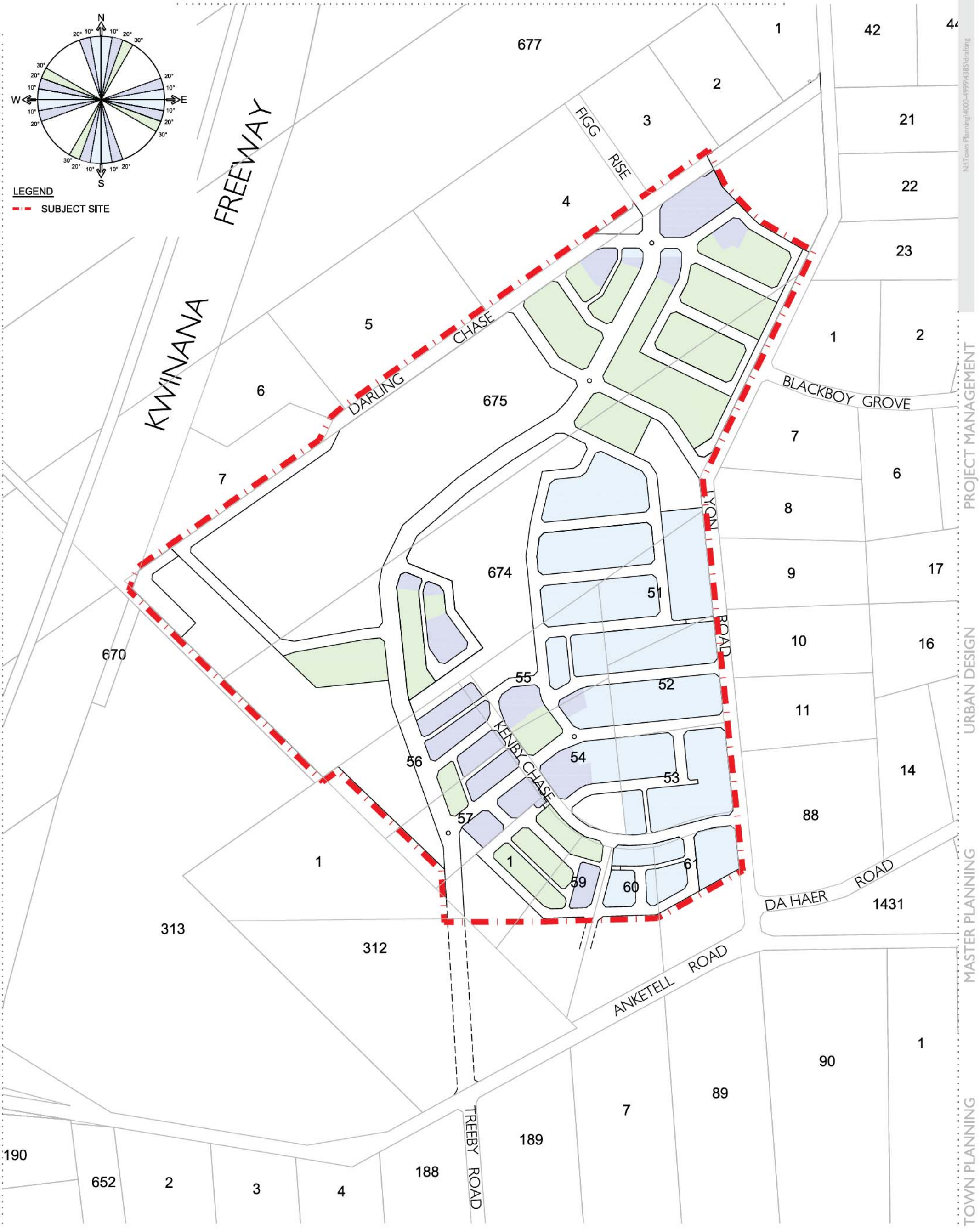

date 24 November 2011 job no. 4385
scale 1:5000 @ A3 e-ref 111102
designer R Thompson prepared by D McCulloch
client .

perth
Level 3, 369 Newcastle Street, Northbridge, Western Australia, 6003
email gra@greg-rowe.com web www.greg-rowe.com
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title figure 18 - solar orientation
address wandi south lsp

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LEGEND

- SUBJECT SITE
- UNRESTRICTED POS
- RESTRICTED POS
- PLAYING FIELDS(FOR NOTING)
- WSD WATER AUTHORITY OF WA
- WESTERN POWER EASEMENT

date 06 February 2012 job no. 4385
scale 1:5000 @ A3 e-ref 111102
designer R Thompson prepared by K Trenberth
client .

perth
Level 3, 369 Newcastle Street, Northbridge, Western Australia, 6003
email gra@greg-rowe.com web www.greg-rowe.com
tel +618 9221 1991 fax +618 9221 1919

title figure 19 - public open space distribution
address wandi south lsp

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LEGEND

- SUBJECT SITE
- KEY ACTIVE OPEN SPACE AREAS
- 400m WALKABLE CATCHMENT

date 24November 2011 job no. 4385
scale 1:5000 @ A3 e-ref 111102
designer R Thompson prepared by D McCulloch
client .

perth
Level 3, 369 Newcastle Street, Northbridge, Western Australia, 6003
email gra@greg-rowe.com web www.greg-rowe.com
tel +618 9221 1991 fax +618 9221 1919

title figure 20 - active open space distribution
address wandi south lsp

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Lot No.	Address	Total Site Area (ha)	Deductions (Easement / WSD / High School / landscape buffer / existing roads to be retained	Gross Subdivisible Area (ha)	POS Requirement (10% of Gross Subdivisible Area) (ha)			POS Provision (ie. total amount of POS provided) (ha)			POS Shortfall / Oversupply (ha)	
					Restricted (2%)	Unrestricted (8%)	Total	Restricted	Unrestricted	Total	Restricted	Unrestricted
1	25 Kenby Chase	1.8938 *	0.6984	1.1954	0.0239	0.0956	0.1195	0.0617		0.0617	0.0378	-0.0956
51	642 Lyon Road	2.1393		2.1393	0.0428	0.1711	0.2139				-0.0428	-0.1711
53	6 Kenby Chase	2.1618 *		2.1618	0.0432	0.1729	0.2162				-0.0432	-0.1729
54	32 Kenby Chase	2.0422		2.0422	0.0408	0.1634	0.2042		0.3420	0.3420	-0.0408	0.1786
55	40 Kenby Chase	2.1660		2.1660	0.0433	0.1733	0.2166	0.1861	0.2362	0.4223	0.1428	0.0629
56	45 Kenby Chase	2.5464 *	0.7446	1.8018	0.0360	0.1441	0.1802	0.3368		0.3368	0.3008	-0.1441
57	31 Kenby Chase	1.7556 *	0.6000	1.1555	0.0231	0.0924	0.1156				-0.0231	-0.0924
59	21 Kenby Chase	0.8625 *	0.1612	0.7013	0.0140	0.0561	0.0701				-0.0140	-0.0561
60	15 Kenby Chase	0.7740 *	0.1211	0.6530	0.0131	0.0522	0.0653				-0.0131	-0.0522
61	3 Kenby Chase	0.9954 *	0.0130	0.9823	0.0196	0.0786	0.0982				-0.0196	-0.0786
52	Lyon Road	2.0763		2.0763	0.0415	0.1661	0.2076				-0.0415	-0.1661
674	Lyon Road	16.2367	2.1620	14.0746	0.2815	1.1260	1.4075	3.7207	1.3352	5.0559	3.4392	0.2092
675	574 Lyon Road	20.3480 **	10.8410	9.5070	0.1901	0.7606	0.9507	0.1620	0.5963	0.7583	-0.0282	-0.1643
Existing Kenby Chase reserve to be retained		1.2264	1.2264									
Existing Darling Chase reserve to be retained		0.6750	0.6750									
	Total	57.8992	17.2427	40.6565	0.8131	3.2525	4.0656	4.4673	2.5097	6.9770	3.6541	-0.7428

Note: All Calculations are subject to survey
* includes portion of Kenby Chase reserve to be amalgamated into lot
** includes portion of Darling Chase reserve to be amalgamated into Lot 675

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PROJECT MANAGEMENT URBAN DESIGN MASTER PLANNING TOWN PLANNING

date 06 February 2012 job no. 4385 scale NTS
designer R Thompson prepared by D McCulloch e-ref 111102
client
perth
Level 3, 369 Newcastle Street, Northbridge, Western Australia, 6003
email gra@greg-rowe.com web greg-rowe.com tel +618 9221 1991 fax +618 9221 1919

title Figure 21 - public open space provision -lot by lot basis
address wandi south lsp

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APPENDIX 2

CERTIFICATES OF TITLE

REGISTER NUMBER	
51/P18485	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
2	10/5/2006

WESTERN AUSTRALIA

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 1934 FOLIO 51

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

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 51 ON PLAN 18485

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

MOSHEE PTY LTD OF 2 DUNCRAIG ROAD, APPLECROSS
(T J723769) REGISTERED 2 MAY 2006

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

1. *L087392 MORTGAGE TO COMMONWEALTH BANK OF AUSTRALIA REGISTERED 29.9.2009.

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

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

STATEMENTS:

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

SKETCH OF LAND: 1934-51 (51/P18485).
PREVIOUS TITLE: 1345-127.
PROPERTY STREET ADDRESS: 642 LYON RD, WANDI.
LOCAL GOVERNMENT AREA: TOWN OF KWINANA.

NOTE 1: DUPLICATE CERTIFICATE OF TITLE NOT ISSUED AS REQUESTED BY DEALING L087392

LANDGATE COPY OF ORIGINAL NOT TO SCALE Sat Oct 15 10:29:20 2011 JOB 37762936

REGISTER NUMBER	
52/P18485	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
2	8/4/2010

WESTERN AUSTRALIA

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 1934 FOLIO 52

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

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 52 ON PLAN 18485

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

GUCCE HOLDINGS PTY LTD OF 48 WICKHAM STREET, EAST PERTH
(T K218459) REGISTERED 7 JUNE 2007

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

1. L271267 MORTGAGE TO ROSINITA NOMINEES PTY LTD REGISTERED 29.3.2010.

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

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

STATEMENTS:

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

SKETCH OF LAND: 1934-52 (52/P18485).
PREVIOUS TITLE: 1345-127.
PROPERTY STREET ADDRESS: LOT 52 LYON RD, WANDI.
LOCAL GOVERNMENT AREA: TOWN OF KWINANA.

LANDGATE COPY OF ORIGINAL NOT TO SCALE Wed May 4 13:45:44 2011 JOB 36671856

REGISTER NUMBER	
53/P18485	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
2	22/9/2006

WESTERN AUSTRALIA

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 1934 FOLIO 53

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

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 53 ON PLAN 18485

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

TINA MICHELLE BAZZO OF 2 DUNCRAIG ROAD, APPLECROSS
(T J872045) REGISTERED 14 AUGUST 2006

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

1. J872046 MORTGAGE TO NATIONAL AUSTRALIA BANK LTD REGISTERED 14.8.2006.
2. *J872047 CAVEAT BY VINCENT THOMAS RAMSAY, KRISTY AMANDA RAMSAY AS TO PORTION ONLY LODGED 14.8.2006.

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

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

STATEMENTS:

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

SKETCH OF LAND:	1934-53 (53/P18485).
PREVIOUS TITLE:	1345-127.
PROPERTY STREET ADDRESS:	6 KENBY CH, WANDI.
LOCAL GOVERNMENT AREA:	TOWN OF KWINANA.

LANDGATE COPY OF ORIGINAL NOT TO SCALE Sat Oct 15 10:29:20 2011 JOB 37762936

REGISTER NUMBER	
54/P18485	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
3	21/2/2008

WESTERN AUSTRALIA

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 1934 FOLIO 54

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

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 54 ON PLAN 18485

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

NEWSONIC PTY LTD OF POST OFFICE BOX 30, GUILDFORD
(T K498836) REGISTERED 6 FEBRUARY 2008

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

1. K498837 MORTGAGE TO NATIONAL AUSTRALIA BANK LTD REGISTERED 6.2.2008.

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

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

STATEMENTS:

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

SKETCH OF LAND:	1934-54 (54/P18485).
PREVIOUS TITLE:	1345-127.
PROPERTY STREET ADDRESS:	32 KENBY CH, WANDI.
LOCAL GOVERNMENT AREA:	TOWN OF KWINANA.

LANDGATE COPY OF ORIGINAL NOT TO SCALE Tue Jul 7 15:44:53 2009 JOB 32527093

REGISTER NUMBER	
55/P18485	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
2	17/11/2004

WESTERN AUSTRALIA

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 1934 FOLIO 55

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

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 55 ON PLAN 18485

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

ANDREW EDWIN FLIGHT
JANE ELIZABETH FLIGHT
BOTH OF 14 FEDERAL STREET, COTTESLOE
AS JOINT TENANTS

(T I620803) REGISTERED 9 SEPTEMBER 2003

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

1. J053304 MORTGAGE TO SUNCORP-METWAY LTD REGISTERED 15.10.2004.

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

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

STATEMENTS:

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

SKETCH OF LAND:	1934-55 (55/P18485).
PREVIOUS TITLE:	1345-127.
PROPERTY STREET ADDRESS:	40 KENBY CH, WANDI.
LOCAL GOVERNMENT AREA:	TOWN OF KWINANA.

LANDGATE COPY OF ORIGINAL NOT TO SCALE Tue Jul 7 15:44:53 2009 JOB 32527093

REGISTER NUMBER	
56/P18485	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
N/A	N/A

WESTERN AUSTRALIA

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 1934 FOLIO 56

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

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 56 ON PLAN 18485

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

MURRAY ALLAN PARKER
PATRICIA JEAN PARKER
BOTH OF 18 GRACECHURCH CRESCENT, LEEMING
AS JOINT TENANTS

(T F076182) REGISTERED 24 DECEMBER 1992

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

1. C548979 EASEMENT TO THE STATE ENERGY COMMISSION OF WESTERN AUSTRALIA. SEE SKETCH ON VOL 1934 FOL 56. REGISTERED 13.5.1983.
2. EASEMENT BURDEN CREATED UNDER SECTION 27A OF T. P. & D. ACT - SEE PLAN 18485.

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

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

STATEMENTS:

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

SKETCH OF LAND:	1934-56 (56/P18485).
PREVIOUS TITLE:	1345-127.
PROPERTY STREET ADDRESS:	45 KENBY CH, WANDI.
LOCAL GOVERNMENT AREA:	TOWN OF KWINANA.

LANDGATE COPY OF ORIGINAL NOT TO SCALE Tue Jul 7 15:44:53 2009 JOB 32527093

REGISTER NUMBER	
57/P18485	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
2	9/6/2005

WESTERN AUSTRALIA

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 1934 FOLIO 57

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

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 57 ON PLAN 18485

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

MOSHEE PTY LTD OF 2 DUNCRAIG ROAD, APPLECROSS
(T J275346) REGISTERED 6 MAY 2005

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

1. C548979 EASEMENT TO THE STATE ENERGY COMMISSION OF WESTERN AUSTRALIA. SEE SKETCH ON VOL 1934 FOL 57. REGISTERED 13.5.1983.
2. *L087392 MORTGAGE TO COMMONWEALTH BANK OF AUSTRALIA REGISTERED 29.9.2009.

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

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

STATEMENTS:

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

SKETCH OF LAND: 1934-57 (57/P18485).
PREVIOUS TITLE: 1345-127.
PROPERTY STREET ADDRESS: 31 KENBY CH, WANDI.
LOCAL GOVERNMENT AREA: TOWN OF KWINANA.

NOTE 1: DUPLICATE CERTIFICATE OF TITLE NOT ISSUED AS REQUESTED BY DEALING L087392

LANDGATE COPY OF ORIGINAL NOT TO SCALE Sat Oct 15 10:29:20 2011 JOB 37762936

REGISTER NUMBER	
1/DP50729	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
1	8/8/2006

WESTERN AUSTRALIA

RECORD OF CERTIFICATE OF TITLE

VOLUME 2629 FOLIO 693

UNDER THE TRANSFER OF LAND ACT 1893

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

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 1 ON DEPOSITED PLAN 50729

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

TINA MICHELLE BAZZO OF 109 KENSINGTON STREET, EAST PERTH
(AF J840487) REGISTERED 4 AUGUST 2006

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

1.	B243774	EASEMENT TO THE STATE ENERGY COMMISSION OF WESTERN AUSTRALIA. SEE SKETCH ON DEPOSITED PLAN 50729. REGISTERED 10.11.1976.
2.	B634032	EASEMENT TO THE STATE ENERGY COMMISSION OF WESTERN AUSTRALIA. SEE SKETCH ON DEPOSITED PLAN 50729. REGISTERED 11.12.1978.
3.	C548979	EASEMENT TO THE STATE ENERGY COMMISSION OF WESTERN AUSTRALIA. SEE SKETCH ON DEPOSITED PLAN 50729. REGISTERED 13.5.1983.
4.	*J840488	NOTIFICATION CONTAINS FACTORS AFFECTING THE WITHIN LAND. LODGED 4.8.2006.
5.	J840491	MORTGAGE TO SUNCORP-METWAY LTD REGISTERED 4.8.2006.

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

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

STATEMENTS:

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

SKETCH OF LAND:	DP50729 [SHEET 1].
PREVIOUS TITLE:	1934-58, 1753-696.
PROPERTY STREET ADDRESS:	25 KENBY CH, WANDI.
LOCAL GOVERNMENT AREA:	TOWN OF KWINANA.

LANDGATE COPY OF ORIGINAL NOT TO SCALE Sat Oct 15 10:29:20 2011 JOB 37762936

REGISTER NUMBER	
59/P18485	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
N/A	N/A

WESTERN AUSTRALIA

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 1934 FOLIO 59

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

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 59 ON PLAN 18485

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

ARTHUR LEE OF 3 KAROO STREET, SOUTH PERTH

(T E955670) REGISTERED 6 AUGUST 1992

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

1.	B634032	EASEMENT TO THE STATE ENERGY COMMISSION OF WESTERN AUSTRALIA. SEE SKETCH ON VOL 1934 FOL 59. REGISTERED 11.12.1978.
2.	C548979	EASEMENT TO THE STATE ENERGY COMMISSION OF WESTERN AUSTRALIA. SEE SKETCH ON VOL 1934 FOL 59. REGISTERED 13.5.1983.
3.	H192078	MORTGAGE TO PERPETUAL TRUSTEES AUSTRALIA LTD REGISTERED 10.8.1999.

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

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

STATEMENTS:

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

SKETCH OF LAND:	1934-59 (59/P18485).
PREVIOUS TITLE:	1345-127.
PROPERTY STREET ADDRESS:	21 KENBY CH, WANDI.
LOCAL GOVERNMENT AREA:	TOWN OF KWINANA.

LANDGATE COPY OF ORIGINAL NOT TO SCALE Tue Jul 7 15:44:53 2009 JOB 32527093

REGISTER NUMBER	
60/P18485	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
N/A	**N/A**

WESTERN AUSTRALIA

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME **1934** FOLIO **60**

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

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 60 ON PLAN 18485

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

CHARLIE TASSONE
CATERINA ROSA ANGELA TASSONE
BOTH OF 137 CHAPMAN ROAD, WILSON
AS JOINT TENANTS

(T E946507) REGISTERED 27 JULY 1992

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

1. B634032 EASEMENT TO THE STATE ENERGY COMMISSION OF WESTERN AUSTRALIA. SEE SKETCH ON VOL 1934 FOL 60. REGISTERED 11.12.1978.
2. C548979 EASEMENT TO THE STATE ENERGY COMMISSION OF WESTERN AUSTRALIA. SEE SKETCH ON VOL 1934 FOL 60. REGISTERED 13.5.1983.

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

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

STATEMENTS:

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

SKETCH OF LAND:	1934-60 (60/P18485).
PREVIOUS TITLE:	1345-127.
PROPERTY STREET ADDRESS:	LOT 60 KENBY CH, WANDI.
LOCAL GOVERNMENT AREA:	TOWN OF KWINANA.

LANDGATE COPY OF ORIGINAL NOT TO SCALE Tue Jul 7 15:44:53 2009 JOB 32527093

REGISTER NUMBER	
61/P18485	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
N/A	**N/A**

WESTERN AUSTRALIA

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME **1934** FOLIO **61**

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

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 61 ON PLAN 18485

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

GRAHAM MONTAGUE HARDY
LYNETTE CARMEL KATHERINE HARDY
BOTH OF 40B HARPENDEN STREET, HUNTINGDALE
AS JOINT TENANTS

(T E959403) REGISTERED 11 AUGUST 1992

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

1. B634032 EASEMENT TO THE STATE ENERGY COMMISSION OF WESTERN AUSTRALIA. SEE SKETCH ON VOL 1934 FOL 61. REGISTERED 11.12.1978.
2. F679084 MORTGAGE TO ADVANCE BANK AUSTRALIA LTD REGISTERED 20.9.1994.

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

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

STATEMENTS:

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

SKETCH OF LAND:	1934-61 (61/P18485).
PREVIOUS TITLE:	1345-127.
PROPERTY STREET ADDRESS:	3 KENBY CH, WANDI.
LOCAL GOVERNMENT AREA:	TOWN OF KWINANA.

LANDGATE COPY OF ORIGINAL NOT TO SCALE Tue Jul 7 15:44:53 2009 JOB 32527093

REGISTER NUMBER	
674/DP202618	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
3	7/9/2006

WESTERN AUSTRALIA

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 1233 FOLIO 518

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

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 674 ON DEPOSITED PLAN 202618

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

ANKETELL FARMS PTY LTD OF POST OFFICE BOX 1130, CANNING BRIDGE, APPLECROSS
(T J898283) REGISTERED 1 SEPTEMBER 2006

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

1.	C004966	EASEMENT TO THE STATE ENERGY COMMISSION OF WESTERN AUSTRALIA. SEE SKETCH ON VOL 1233 FOL 518. REGISTERED 8.10.1980.
2.	J898284	MORTGAGE TO SUNCORP-METWAY LTD REGISTERED 1.9.2006.
3.	*L313591	MEMORIAL. TAXATION ADMINISTRATION ACT 2003, SECTION 76 (LAND TAX) REGISTERED 13.5.2010.

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

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

STATEMENTS:

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

SKETCH OF LAND:	1233-518 (674/DP202618).
PREVIOUS TITLE:	1098-208.
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AREA:	TOWN OF KWINANA.

NOTE 1: A000001A LAND PARCEL IDENTIFIER OF PEEL ESTATE LOT 674 (OR THE PART THEREOF) ON SUPERSEDED PAPER CERTIFICATE OF TITLE CHANGED TO LOT 674 ON DEPOSITED PLAN 202618 ON 30-APR-02 TO ENABLE ISSUE OF A DIGITAL CERTIFICATE OF TITLE.

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

LANDGATE COPY OF ORIGINAL NOT TO SCALE Wed Oct 5 11:13:48 2011 JOB 37690742

REGISTER NUMBER	
675/DP202618	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
1	**21/6/2005**

WESTERN AUSTRALIA

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME **1905** FOLIO **92**

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

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 675 ON DEPOSITED PLAN 202618

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

ANKETELL LAND HOLDING COMPANY PTY LTD OF POST OFFICE BOX 1130, CANNING BRIDGE, APPLECROSS
(T J308858) REGISTERED 2 JUNE 2005

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

1. THE LAND THE SUBJECT OF THIS CERTIFICATE OF TITLE EXCLUDES ALL PORTIONS OF THE LOT DESCRIBED ABOVE EXCEPT THAT PORTION SHOWN IN THE SKETCH OF THE SUPERSEDED PAPER VERSION OF THIS TITLE.
2. B887237 EASEMENT TO THE STATE ENERGY COMMISSION OF WESTERN AUSTRALIA. SEE SKETCH ON VOL 1905 FOL 92. REGISTERED 25.3.1980.
3. J308859 MORTGAGE TO SUNCORP-METWAY LTD REGISTERED 2.6.2005.
4. *L313579 MEMORIAL. TAXATION ADMINISTRATION ACT 2003, SECTION 76 (LAND TAX) REGISTERED 13.5.2010.

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

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

STATEMENTS:

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

SKETCH OF LAND: 1905-92 (675/DP202618).
PREVIOUS TITLE: 1236-568.
PROPERTY STREET ADDRESS: 574 LYON RD, WANDI.
LOCAL GOVERNMENT AREA: TOWN OF KWINANA.

NOTE 1: A000001A LAND PARCEL IDENTIFIER OF PEEL ESTATE LOT 675 (OR THE PART THEREOF) ON SUPERSEDED PAPER CERTIFICATE OF TITLE CHANGED TO LOT 675 ON DEPOSITED PLAN 202618 ON 13-SEP-02 TO ENABLE ISSUE OF A DIGITAL CERTIFICATE OF TITLE.
NOTE 2: THE ABOVE NOTE MAY NOT BE SHOWN ON THE SUPERSEDED PAPER CERTIFICATE

END OF PAGE 1 - CONTINUED OVER

LANDGATE COPY OF ORIGINAL NOT TO SCALE Wed Oct 5 11:13:48 2011 JOB 37690742

OF TITLE OR ON THE CURRENT EDITION OF DUPLICATE CERTIFICATE OF TITLE.

NOTE 3: L634686 DEPOSITED PLAN 69504 LODGED.

LANDGATE COPY OF ORIGINAL NOT TO SCALE Wed Oct 5 11:13:48 2011 JOB 37690742

APPENDIX 3

360 ENVIRONMENTAL – ENVIRONMENTAL ASSESSMENT REPORT

Wandi South Cell Local Structure Plan Area

Environmental Assessment Report

May 2011

Prepared for: Mammoth Nominees Pty Ltd

Document Reference	Revision	Prepared by	Reviewed by	Submitted to Client	
				Copies	Date
701 AC	A INTERNAL DRAFT	TC	TS	-	-
701 AC	B CLIENT	TC	TS, GRA	1 Electronic (email)	10/07/09
701 AC	C CLIENT	JT	TS	1 Electronic (CD)	02/06/ 10
LD010 AB	D CLIENT	JT	TS	1 Electronic (CD)	20/04/11
LD010 AB	E CLIENT	RH	JT	1 Electronic (CD)	12/05/11

Disclaimer

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1 Introduction

1.1 Background

360 Environmental Pty Ltd (360 Environmental) was commissioned by Mammoth Nominees Pty Ltd to undertake an environmental assessment of the Wandi (south) Local Structure Plan (LSP) area (the site), comprising 13 lots bounded by the Kwinana Freeway and Lyon Road, Perth Western Australia (Figure 1).

The site comprises a total area of approximately 60 hectares (ha) and is located 27 kilometres (km) south of Perth, in the Town of Kwinana.

The Environmental Assessment Report is prepared to support the Wandi (south) LSP and investigates the existing environment, the environmental opportunities and constraints associated with the development of the site in accordance with the proposed LSP, including recommended management measures to mitigate impacts.

The Metropolitan Region Scheme (MRS) Amendment relating to the site was referred to the Environmental Protection Authority (EPA) in February 2006. The EPA set the level of assessment as a Scheme Amendment Not Assessed – Advice Given. The environmental issues identified by the EPA included:

- Drainage (management of water quality and quantity)
- Special catchment requirements – Peel Harvey Catchment
- Wetlands
- Remnant vegetation
- Fauna
- Soil and groundwater contamination
- Emissions impacting adjoining land uses
- Noise and vibration
- Cockburn Sound catchment.

The MRS amendment to Urban Deferred was gazetted in January 2008 with the subsequent lifting of deferment gazetted in January 2009.

1.2 Surrounding Land Use

1.2.1 Existing Land Use

Rural residential development abuts the eastern portion of the site, east of Lyon Road. These rural residential allotments are predominantly uncleared and have a defined building envelope for development and clearing. These lots are located within the Jandakot Underground Water Pollution Control Area (JUWPCA) and retain a P2 Public Drinking Water Source Area classification (Figure 2).

Rural landholdings are located to the west of the Cell in Mandogalup on the eastern side of the Kwinana Freeway and are generally utilised for market gardening activities and horse agistment. The majority of market gardens are ceasing operation as urban development occurs within the corridor.

The Kwinana Freeway and the Perth to Mandurah Rail Line is located to the west of the site. Access to the freeway is provided via flyovers at both Anketell and Rowley Roads. High voltage power lines run along the western and southern boundary of the site.

1.2.2 Future Land Uses

Urban development is occurring to the north of the site within the Wandi (north) Cell and south of Anketell Road within the Anketell (north) Cell. A district town centre is proposed to the west of the site and will be the subject of a separate structure plan.

Anketell Road is identified by Main Roads and the Department of Planning as a freight route to support the proposed future port developments within Cockburn Sound and therefore is classified as a “high wide” route.

A train station is proposed within the Wandi (north) LSP area approximately 500 m south of Rowley Road. This station will service both the Mandogalup and Wandi Cells.

2 EXISTING ENVIRONMENT

2.1 Climate

The site is located in the southern Perth Metropolitan area and therefore experiences a Mediterranean climate, with mild winters and hot dry summers. The average maximum summer temperature is 30.7oC and for winter is18.4oC (BoM, 2009). The majority of rain falls between May and August with an average annual rainfall of 780 mm (BoM, 2009).

2.2 Topography and Surface Hydrology

The site generally slopes to the west from 35 mAHD along Lyon Road in the east to 14 mAHD at the lowest point in the west near the Kwinana Freeway (DoW, 2009).

The site is intersected with a number of drains, largely located along property boundaries. These drains form part of a larger drainage network associated with the Peel Main Drain.

The western parts of the site are relatively low lying and are subject to inundation, water logging and seasonal surface water ponding. There does not appear to be any natural surface water flows, such as creeks or streams, on the site. The natural hydrology of the site is considered "highly modified" (Figure 2).

2.3 Wetlands

There are no Ramsar wetlands or Directory of Important Wetlands on the site (Department of Sustainability, Environment, Water, Populations and Communities (SEWPAC), 2010). The nearest Directory of Important Wetlands site is located approximately 1.2 km to the southwest of the site and is known as "Spectacles Swamp" (SEWPAC, 2010) and is part of the Spectacles Wetlands.

The Mandogalup Swamp South geomorphic wetland (dampland) is located on approximately half the site (Figure 3). This wetland is classified by Hill et al. (1996) as Multiple Use Wetland.

A Conservation Category Wetland (CCW) is located adjacent to the northern boundary of the site (Figure 3).

2.4 Groundwater

The Perth Groundwater Atlas indicates that groundwater contours range from approximately 21 m AHD in the eastern area of the site along Lyon Road to approximately 14 m AHD in the western area of the site adjacent to the Kwinana Freeway (DoW, 2009) indicating groundwater flows approximately east to west across the site with some surface expression from time to time in the western parts of the site.

Based on the groundwater information and surface contours, average depth to groundwater ranges between approximately 9 - 10 m below ground level (bgl) in the eastern areas of the site and between 0 and 1 m in the west (DoW, 2009).

A significant portion of land in the Anketell/Wandi area is subjected to very shallow groundwater and seasonal waterlogging. Therefore, considerations of drainage and nutrient management requirements are needed to ensure future developments occur in an environmentally sensitive manner.

JDA Consulting Hydrologists were commissioned by the Client to install several groundwater monitoring bores across the site to assist in determining the groundwater regime of the site and to develop the Local Water Management Strategy which accompanies the LSP. This includes a completed two year programme of groundwater monitoring at the site.

2.4.1 Groundwater Bore Search

The results of a search of the DoW WIN database for groundwater bores within a 3 km radius of the site are contained in Appendix A.

The search indicated that there are 235 groundwater bores located within approximately 3 km of the site. Many of the bores have recorded water quality data such as metals, organics, nutrients and water depth. The large number of existing bores in the area suggests that groundwater is readily available. However, as the area is a proclaimed groundwater area, a Licence from the Department of Water is required to extract groundwater.

2.4.2 Public Drinking Water Source Areas

The most northeastern corner of the site is mapped as part of the Jandakot Public Drinking Water Source Area (PDWSA) (Figure 2).This portion of the site is designated as a P2 Protection Area. The Department of Water advises that urban subdivisions are incompatible in P2 PDWSAs, however special-rural subdivisions are compatible (DoE, 2004). The remainder of the site is outside the PDWSA.

2.5 Regional Geology and Soils

The site is located in the Bassendean Dune System, a series of shoreline deposits developed between 100,000 and 240,000 years ago (Gozzard, 2007). The Bassendean dunes consist of low hills of quartz sand with sandy swamps in dune depressions (Gozzard, 2007).

The two geological units featured on the site are:

- Higher ridge along eastern site boundary: Very light grey at surface and yellow at depth Bassendean Sands. This area is likely to facilitate groundwater recharge (Gozzard, 1983).
- Wetland area north and west of the site: Dark brownish grey sandy silt with disseminated fine-grained quartz sand throughout and firm, variable clay

content. This area is described geologically as a marsh in an interdunal swale. This area has a high watertable and although prone to flooding is generally free draining (Gozzard, 1983).

The Department of Agriculture and Food Western Australia (DAFWA, 2009) maps three soils types across the site as outlined in Table 1 (Figure 4).

Table 1. Summary of Site Soils

Soil Name	Soil Description	Main Landform Unit	Location on the Site
Bassendean B1 Phase (212Bs_B1)	Extremely low to very low relief dunes, undulating sandplain and discrete sand rises. Deep bleached grey sands sometimes with a pale yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2 m. Banksia dominant.	Gentle slopes and flats of Pale sands. Low risk of salinity and waterlogging. Moderate risk of water erosion, low to moderate risk of phosphorus loss.	Eastern boundary along Lyon Road (ridge).
Bassendean B2 Phase (212Bs_B2)	Flat to very gently undulating well drained sandplain. Deep bleached grey sands with a pale yellow B horizon or a weak iron-organic hardpan 1-2 m.	Gentle slopes and flats of pale sands. Low risk of salinity and waterlogging. Moderate risk of water erosion, low to moderate risk of phosphorus loss. Well drained and flat.	Southern area of site.
Vasse V9 Phase (211Va_V9)	Areas of former swamps which have been artificially drained, with uniform loamy or peaty sands.	Poorly drained floodplain. Low risk of salinity and wind erosion. Moderate risk of waterlogging and phosphorus loss. Low to moderate risk of water erosion.	Central, western and northern parts of the site.

2.5.1 Acid Sulfate Soils

The northern and western sections of the site are classified as having a high risk of shallow ASS or Potential Acid Sulfate Soil (PASS) less than 3 m depth (Figure 5).

In accordance with the requirements of the DEC's *Identification and Investigation of Acid Sulphate Soils and Acidic Landscapes* (2009), an ASS investigation is likely to be required if the following occurs:

- Soil or sediment disturbance of equal to or greater than 100m^3 in areas depicted in an ASS risk map as "high to moderate risk" of AASS or PASS occurrence within three metres of natural ground surface (e.g. construction of roads, foundations, installation of underground infrastructure, drainage works, land forming works, dams and aquaculture ponds or sand or gravel extraction).
- Soil or sediment disturbance of equal to or greater than 100m^3 with excavation from below the natural watertable in areas depicted in an ASS risk map as "moderate to low risk" of AASS or PASS occurrence within three metres of natural ground surface.
- Lowering of the watertable, whether temporary or permanent (e.g. for groundwater abstraction, dewatering, installation of new drainage, modification to existing drainage), in areas depicted in an ASS risk map as 'high to moderate risk of AASS or PASS occurrence' or 'moderate to low risk of AASS or PASS occurrence within three metres of natural ground surface'.

2.6 Flora and Vegetation

A significant area of the Wandi (south) LSP area has been cleared for pasture or housing, with some degraded native vegetation remaining around houses on the smaller blocks off Kenby Chase. The site has been significantly disturbed over time to facilitate land uses such as grazing, agistment, farming and residential housing. Despite this disturbance, pockets of remnant vegetation remain, for example, in the wetland area to the north and along the eastern margins of Lyon Road.

2.6.1 Vegetation Complexes

Mapping for the Interim Biogeographic Regionalisation for Australia (IBRA) program placed the Wandi area within the Swan Coastal Plain Bioregion of the Southwest Botanical Province (DEWHA, 2009a). Within the Swan Coastal Plain Bioregion the vegetation of the Wandi area has been mapped as 'Eucalyptus Open Woodlands'.

Earlier mapping by Beard (1979) included Wandi in the Drummond subdistrict of the Darling Botanical District. Within this subdistrict the Wandi area mostly fell within the Bassendean Vegetation System, with the vegetation of the survey area being described as 'Banksia low woodland with scattered jarrah and sheoak'.

Surveys by Weston (2005) that cover only a portion of the site confirm that the vegetation is typically Banksia and Eucalyptus.

A Level 2 spring flora and vegetation survey of the site was undertaken in accordance with EPA *Guidance Statement No. 51 Guidance for the Assessment of*

Environmental Factors – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA, 2004). The detailed report is included in Appendix B and a summary is provided below.

2.6.2 Vegetation Types

The Level 2 survey identified seven vegetation types, described below using the structural classifications of Beard (1990) (Figure 6). No Threatened Ecological Communities (TEC) were recorded (* indicates weed/introduced species):

- Vegetation Type F1

Forest of *Eucalyptus rudis* subsp. *rudis* and *Melaleuca rhaphiophylla* over Thicket or Scrub of *Taxandria linearifolia* and Astartea scoparia over bracken (*Pteridium esculentum*). This vegetation was found in the mid north of the survey area, growing on poorly drained brown peaty soils.

- Vegetation Type F2

Forest of *Eucalyptus rudis* subsp. *rudis* and *Melaleuca rhaphiophylla* over **Pennisetum clandestinum*, **Zantedeschia aethiopica* and **Juncus microcephala*. This degraded wetland vegetation was seen along some drains in the northern half of the survey area.

- Vegetation Type W1

Low Woodland of *Banksia menziesii*, *Eucalyptus marginata* subsp. *marginata*, *Allocasuarina fraseriana* and *Banksia attenuata* over Low Shrubland of *Hibbertia hypericoides*, *Kunzea glabrescens* and *Jacksonia furcellata*. This vegetation was found in the south of the survey area growing on well drained grey sands. It was infested to differing degrees with exotic grasses and herbs, especially **Ehrharta calycina*, * *Lagurus ovatus* and **Lolium rigidum*.

- Vegetation Type T1

Thicket or Scrub of *Adenanthos cygnorum* subsp. *cygnorum* and *Kunzea glabrescens* over Low Shrubland of *Scholtzia involucrata* and *Brachyloma preissii* subsp. *obtusifolium* with emergent *Banksia menziesii* and *Banksia attenuata*. This vegetation was found over large areas of the north-east and south-east of the survey area growing on well drained grey sands. Most was infested with exotic grasses, especially **Ehrharta calycina* and **Briza maxima*.

- Vegetation Type T2

Thicket or Scrub of *Kunzea glabrescens* over Open Low Shrubland of *Scholtzia involucrata* and *Brachyloma preissii* subsp. *obtusifolium* ms over Grassland/Herbland of **Vulpia myuros* forma *myuros*, **Hypochaeris glabra* and **Briza maxima*. This vegetation was found in old pasture that was being colonized with species from native shrubland to its east.

- Vegetation Type D

Highly modified and degraded native vegetation. For mapping purposes this name was applied to degraded and regrowth vegetation seen on the blocks off Kenby Chase and Anketell Road.

- Vegetation Type C

Pasture, lawns, roads and other cleared ground.

2.6.3 Vegetation Condition

The condition of the site's vegetation ranged from 'excellent' to 'completely degraded' (Figure 7). The dense swamp vegetation in the central north of the survey area (type F1) was mostly in excellent condition, though in places, gaps in the canopy and mid-storey had allowed exotic grasses such as **Pennisetum clandestinum* and **Paspalum dilatatum* to dominate.

The condition of the T1 vegetation in the east of the survey area was mostly 'very good' to 'excellent' condition.

2.6.4 Flora

A total of 194 taxa (species, subspecies, varieties and formae) from 52 families and 144 genera were recorded in the course of the survey, including 73 non-native (weed) taxa. No Declared Rare Flora or (DRF) or Priority Flora were recorded.

This result is similar to that of Weston (2005), whose spring 2004 surveys also recorded no DRF and Priority Flora species. Based on these two results it is considered unlikely that DRF and Priority Flora species would be on the site.

2.6.5 Vegetation Significance

There were no TECs observed on site, however vegetation Type T1 showed an affinity to the Priority 3 Priority Ecological Community (PEC) 'Low lying *Banksia attenuata* woodlands or shrublands' or Floristic Community Type 21c (DEC, 2009a).

The site is not located in, or near, a National Park or Nature Reserve.

2.7 Fauna

2.7.1 Desktop Investigations

A search of the DEC's Threatened and Priority Fauna database has indicated that the following threatened fauna have been recorded within a 10 kilometre radius of the site (Appendix C), and have the potential to occur on the site:

- Chuditch (*Dasyurus geoffroii*)
- Numbat (*Myrmecobius fasciatus*)
- Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*)
- Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*)

- Bee (*Neopasiphe simplicior*).

A search of SEWPAC's (2011) *Protected Matters Search Tool* (Appendix D) was undertaken and identified three vulnerable and three endangered species listed under the EPBC Act as potentially occurring on the site:

- Forest Red-tailed Black-Cockatoo (Calyptorhynchus banksii naso)
- Carnaby's Black Cockatoo (Calyptorhynchus latirostris)
- Graceful Sun Moth (Synemon gratiosa)
- Chuditch or Western Quoll (Dasyurus geoffroii)
- Red-tailed Phascogale (Phascogale calura)
- Quokka (Setonix brachyurus).

2.7.1.1 Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*)

The Red-tailed Black Cockatoo is endemic to the southwest of Western Australia, frequenting the humid and subhumid south-west, mainly in the hilly interior, north to Gingin and east to Mt Helena, Christmas Tree Well, North Bannister, Mt Saddleback, Rocky Gully and the upper King River (Johnstone and Storr 1998).

The Red-tailed Black Cockatoo is essentially the cockatoo of the Jarrah forests; it eats seeds extracted from the woody fruits of Eucalypts, mostly Jarrah and Marri. Other species on which feeding has been recorded are Yarri (*E. patens*), Albany Blackbutt (*E. staeri*), Karri, Sheoak (*Allocasuarina fraseriana*), *Persoonia longifolia* and *B. grandis* (DEC, 2009b).

The Red-tailed Black Cockatoo has been recorded nesting in Jarrah, Marri, Karri and Wandoo trees (Johnstone and Kirkby 1999). It requires hollows in standing trees to provide nesting sites.

2.7.1.2 Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*)

Carnaby's Black Cockatoo is endemic to the southwest of Western Australia, extending from the Murchison River to Esperance, and inland to Coorow, Kellerberrin and Lake Cronin (DEC, 2009b). Carnaby's Black Cockatoos are believed to breed mostly in the wheatbelt region of Western Australia (DEC, 2009b). However, there is evidence the species is currently expanding its breeding range westward and south into the Jarrah-Marri forests of the Darling Range and into the Tuart (*E. gomphocephala*) forests of the Swan Coastal Plain (Johnstone and Kirkby 2006). After breeding, Carnaby's Black Cockatoo disperse to the higher rainfall coastal areas of the south-west of Western Australia to feed in late December to July (DEC, 2009b).

They occur in uncleared or remnant areas of Eucalypt woodland, principally Salmon gum (*E. salmonophloia*) or Wandoo (*E. wandoo*), and shrubland or kwongan heath dominated by Hakea and Banksia species. Carnaby's Cockatoo nest in the hollows of live or dead smooth-barked Eucalypts (Salmon Gum and Wandoo) but also in Red

Morrell (*E. longicornis*), York Gum (*E. loxophlebal*), Marri (*Corymbia calophylla*) and Tuart (*E. gomphocephala*) (Johnstone and Storr, 1998).

On the Swan Coastal Plain, the birds feed on a large variety of plants including Proteaceae (Banksia and Grevillea), Marri nuts and introduced species – notably pines (DEC, 2009b).

2.7.1.3 Graceful Sun Moth (*Synemon gratiosa*)

Endemic to Western Australia, the Graceful Sun Moth (GSM) is restricted to the Swan Coastal Plain between the Wanneroo areas in northern Perth, south to Mandurah and are currently known from nine sub-populations (WA CALM 2005a). The DEC has indicated the plant species *Lomandra maritima* and *Lomandra hermaphrodita* are identified as possible host plants for the lifecycle of the GSM (July 2009). Department of the Environment, Water, Heritage and the Arts website (McNamara, 2009) specifically recognise both *Lomandra* sp. as food plants for the Graceful Sun Moth.

The information regarding habitat of the GSM is lacking with regard to the required habitat area, numbers and densities of host plants are required to sustain a viable breeding colony (WA CALM 2005a).

2.7.1.4 Chuditch (*Dasyurus geoffroii*)

In early April 2009, a chuditch (or quoll) was caught in a rabbit trap in the Wandi area (DEC, 2009b), indicating that this protected species may be present Anketell. The DEC has described the official record this chuditch in Wandi as very significant, as it has been almost 20 years since this species has been recorded in the metropolitan area this close to Perth (DEC, 2009b).

Chuditch are known to have occupied a wide range of habitats from woodlands, dry sclerophyll (leafy) forests, riparian vegetation, beaches and deserts. Chuditch at Lake Magenta Nature Reserve have shown a preference for woodland and mallee habitat (DEC, 2009b).

The chuditch now has a patchy distribution throughout the Jarrah forest and mixed Karri/Marri/Jarrah forest of southwest Western Australia. It also occurs in very low numbers in the Midwest, Wheatbelt and South Coast Regions with records from Moora to the north, Yellowdine to the east and south to Hopetoun. Chuditch have been translocated to Julimar State Forest east of Bindoon (1992), Lake Magenta Nature Reserve (1996), Cape Arid National Park (1997), Mt Lindsay National Park (1999), and Kalbarri National Park (2000) (DEC, 2009b).

The area of the site traditionally may have supported Chuditch, however it is unlikely to still support populations of them and search of the DEC's Threatened and Priority Flora Database (2009b) showed no known occurrences of Chuditch with a 5 km radius of the site. Desktop searches found no other evidence of nearby populations.

2.7.1.5 Red-tailed Phascogale (Phascogale calura)

The red-tailed phascogale inhabits Wandoo (*Eucalyptus wandoo*) and Sheoak (*Allocasuarina huegeliana*) woodland associations, with populations being most dense in the latter vegetation type. They show a preference for long unburnt habitat with a continuous canopy, as well as tree hollows. Wandoo trees provide excellent nesting sites in the form of hollow logs and limbs, which they line with grass and feathers. Nest sites occur in highly flammable areas, and may often be in dead sheoaks, skirts of live (or stumps of dead) grass trees (*Xanthorrhoea* spp.) (DEC, 2009c).

Populations are currently known from several isolated nature reserves in the south-west of Western Australia, from the wheatbelt to the south coast, such as Tutanning, Boyagin, Dryandra, Dongolocking, and Parkeyerring, as well as remnant vegetation on private property. Red-tailed phascogales have also been recorded on the south coast near Ravensthorpe DEC, 2009c).

2.7.1.6 Quokka (*Setonix brachyurus*)

There are two populations of Quokka found on Rottnest Island and the mainland. The mainland quokka lives in the Darling Range and south-west regions of Western Australia, mostly inhabiting densely vegetated swamps and sometimes tea-tree thickets on sandy soils along creek systems and dense heath on slopes (DEC 2009d).

The current distribution of the quokka includes Rottnest and Bald Islands and at least 25 sites on the mainland, including Two Peoples Bay Nature Reserve, Torndirrup National Park, Mt Manypeaks National Park, Walpole-Nornalup National Park and swamp areas through the south-west forests from Jarrahdale to Walpole (DEC 2009d).

2.7.1.7 Bee (*Neopasiphe simplicior*)

This native bee range is extremely restricted. It is currently only known from a single location within the bushland at the Forrestdale Lake Nature Reserve. There was a previous record from Cannington in 1954 but it has not been found at this location since and thus this population is presumed to be extinct (DEHWA, 2010c).

2.7.1.8 Numbat (*Myrmecobius fasciatus*)

The Numbat was originally widespread across southern semi-arid and arid Australia, from western NSW through South Australian and southern Northern Territory to the south-west of WA. There are currently two remnant native populations at Dryandra and Perup, WA and several reintroduced populations including Boyagin Nature Reserve, Tutanning Nature Reserve, Batalling block and Karroun Hill Nature Reserve (SEWPAC, 2010b).

2.7.2 Level 1 Fauna Survey

A Level 1 Fauna investigation was undertaken, observing a total of 26 fauna species (or positively identified from foraging evidence, scats, tracks, skeletons or calls) within the study area during the survey carried out on 22 April 2009 (Harewood, 2010a).

The vertebrate fauna species of conservation significance (listed on state or federal threatened species lists or DEC priority species) that were positively identified as utilising the study area for some purpose during the survey were:

2.7.2.1 Carnaby`s Cockatoo (*Calyptorhynchus latirostris*)

Sighted flying across the site during the survey period, potentially a seasonal visitor to forage (Banksia and Jarrah) or roost. No potential nest hollows observed on site therefore unlikely to be breeding on site.

2.7.2.2 Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*)

Sighted roosting during day survey, potentially an infrequent visitor to the site to forage on Jarrah and Sheoak, may also roost on site over night on occasions. Frequency of observations in other parts of Perth metropolitan area are increasing. No potential nest hollows observed, therefore unlikely to be breeding on site.

2.7.2.3 Southern Brown Bandicoot, Quenda (*Isoodon obesulus fusciventer*)

Presence confirmed during discussion with a landowner. Confined to areas with dense ground cover.

Invertebrate specific fauna surveys were not undertaken.

2.7.3 Targeted Graceful Sun Moth Survey

A GSM (*Synemon gratiosa*) survey was undertaken at the site during March 2011 (Appendix E). The GSM survey was undertaken in accordance with the *Graceful Sun Moth Information Kit and Survey Methods Version 1.2* and included targeted *Lomandra* sp mapping and targeted GSM survey.

No *Lomandra* sp in addition to what was found during the Autumn and Spring 2009 flora and vegetation surveys was observed and no GSM were recorded on site during any of the surveys conducted.

Based on the results of the survey it is likely, due to the absence of sufficient density of *Lomandra* sp and the generally disturbed nature of the site, that the site does not support a population of GSM.

2.8 Conservation Areas

The site is not located, in or near, a National Park or Nature Reserve. The site is in close proximity to two Bush Forever Protection Areas (Sites 270 and 347) and is located approximately 500 m from the Wandi Nature Reserve (Figure 8).

Wandi Nature Reserve is reserved for the conservation of flora and fauna.

There is a section along the northern boundary of the site that is allocated as an Environmentally Sensitive Area (ESA) which is a buffer for the neighbouring Conservation Category Wetland. The presence of the ESA indicates that certain exemptions for Clearing Permits outlined in the *Environmental Protection (Native Vegetation Clearing) Regulations 2005* do not apply. However, as the development will require a subdivision approval, the site will be exempt from requiring a Clearing Permit.

2.9 Aboriginal Heritage

There is an Aboriginal Heritage site located through the centre of the site being the Mandogalup Swamp / Spectacles – a mythological site and also recognised a hunting place and water source (Department of Indigenous Affairs (DIA), 2009) (Appendix F) (Figure 9).

A number of Aboriginal Heritage surveys have been undertaken in the area, largely as a result of the Kwinana Freeway extension, Southern Railway, Dampier to Bunbury Natural Gas Pipeline and electrical transmission infrastructure (DIA, 2009).

2.10 European History

The Heritage Council of Western Australia (HCWA) Heritage Places Database was searched for heritage places in Wandi listed on the State Register of Heritage Places. No places were identified (HCWA, 2009).

The following heritage place is listed on the Town of Kwinana Municipal Heritage Inventory for the site:

- Leslie Property Mandogalup, corner of Lyon Road and Darling Chase Wandi

The Leslie Property is one of a number of places established in the Mandogalup area during the 1920s and consists of a number of sheds and landscape structures set within paddocks. The site is listed as a category 3 (or category c), meaning the place is of some significance and should be considered for retention and conservation if possible. If not possible, detailed records, including photography, should be developed prior to demolition or substantial development.

Extracts from the Town of Kwinana Municipal Heritage Inventory regarding this property or these properties is contained in Appendix G.

2.11 Contaminated Sites

No properties within the site are listed as contaminated on the DECs *Contaminated Sites Database* (DEC, 2010).

Past activities undertaken on Lot 675 are likely to be considered as potentially contaminating activities as the derelict sheds on Lot 675 appear to have been poultry sheds.

Land within the Wandi locality has historically been utilised for rural pursuits with a number of lots within the site currently being utilised for grazing. Many surrounding lots have historically or are currently used for market gardening.

3 KEY ENVIRONMENTAL POLICIES AND APPROVALS

3.1 *Environment Protection and Biodiversity Conservation Act 1999*

SEWPAC recommends that proposed urban developments in an area which contain nationally listed Threatened Species or Ecological Communities (Matters of National Environmental Significance (MNES) is likely to be significant under the EPBC Act and should be referred to the Minister.

The *Protected Matters Database* search tool indicates there is a likelihood of Threatened plant and animal species being present on the site, and past botanical surveys in the area indicate the Endangered orchid *Drakaea elastica* is present in the south of the site. Although the Spring 2009 flora and vegetation survey did not locate on site any flora or ecological communities listed under the EPBC Act, Black Cockatoos are known to be present in the area, Also a number of the vegetation units observed during the Spring 2009 flora and vegetation survey are known to support Black Cockatoo habitat. Consideration of referral to SEWPAC to determine if the proposed development constitutes a "Controlled Action" is an integral component of the environmental approvals strategy for the future development of the site.

3.2 *Environmental Protection of Wetlands – Position Statement No. 4 and Environmental Guidance for Planning and Development – Guidance Statement No. 33*

The EPA's has used *Environmental Protection of Wetlands – Position Statement No. 4* (2004b) and *Guidance Statement No. 33 – Environmental Guidance for Planning and Development* (2008) to outline their principles for the protection of wetlands. The EPA's broad objectives are:

- To protect the environmental values and functions of wetlands in Western Australia.
- To protect, sustain and, where possible, restore the biological diversity of wetland habitats in Western Australia.
- To protect the environmental quality of the wetland ecosystems of Western Australia through sound management in accordance with the concept of 'wise use', as described in the Ramsar Convention, and ecologically sustainable development principles, regardless of land use or activity.
- To have as an aspirational goal, no net loss of wetland values and functions.

The conservation status of wetlands are divided into three categories. These and the EPA's position on each is as follows:

Conservation Category Wetlands

"that all CCW and their buffers are fully protected. Schemes and proposals that are likely to lead to a significant adverse impact on these wetlands are likely to be formally assessed by the EPA"

Resource Enhancement Wetlands

"that all reasonable measures are taken to minimise the potential impacts on resource enhancement wetlands and their buffers. These wetlands have the potential to be restored to CCW, and rehabilitation is encouraged"

Multiple Use Wetlands

"that all reasonable measures are taken to retain the wetlands hydrological functions (including on-site water infiltration and flood detention) and where possible, other wetland functions."

There are no CCWs located within the site however there is a CCW located adjacent to the northern boundary of the site and it is recognised environmentally sensitive management of groundwater is appropriate, drainage and nutrient management should be implemented as part of the site design.

3.3 Peel Harvey Catchment Water Quality Improvement Plan

The Peel Harvey Catchment Water Quality Improvement Plan (WQIP) was published by the EPA in November 2008 and is largely focused on achieving a reduction of phosphorus export from the catchment. The WQIP recommends the following concepts be considered during planning of the urban developments in the catchment:

3.3.1 Soil Amendment

The WQIP recommends phosphorus retention using amended soil be considered at the site as the soils are likely to be sandy, to have a relatively low phosphorus retention index (PRI) and potentially a low ability to retain moisture, nutrients and trace elements.

However, importing amended soil to the site will require careful planning and design which is likely to take place during subdivision and when geotechnical details for the site are available. The incorrect soil amendment strategy can lead to adverse environmental impacts on local water features. At this early stage of the process, soil amendment is being considered, at a high level, however further investigations will be required. Whilst both the EPA and DoW recommend soil amending agents be considered the site's proximity to the Jandakot Drinking Water Area and the nearby

Conservation Category Wetlands will influence the type and volume and placement of amending agents.

3.3.2 Urban Fertiliser Management

The EPA (2008) recommends the following fertiliser management techniques be considered in the planning of urban development in the catchment

- Use low water soluble fertiliser applied to sandy textured soils, applied sparingly to gardens and turf.
- Minimise lawn areas or plant an alternative lawn.
- Fertilise only when symptoms of nutrient deficiency occur eg. yellowing.
- If fertiliser is needed use a complete lawn fertiliser containing a nitrogen, phosphorus and potassium.
- Establish public education program on environmentally responsible gardening, including the use of native plants, reduced lawn, low water use and mulching for example.

3.3.3 Sewer Connections

The EPA recommends all new urban developments in the catchment to be connected to reticulated sewerage system.

3.3.4 Water Sensitive Urban Design

The EPA (2008) identified the need for water sensitive urban design (WSUD) in the Peel-Harvey catchment to:

- Improve the management of nutrients in stormwater
- Increase the efficiency of the use of water.

In achieving these, the use of features that incorporate stormwater into parks and public open space to retain first flush events onsite are recommended (EPA, 2008). In many cases, such features can be designed as part of streetscapes, bush or park landscaping and add to the amenity of a neighbourhood.

Urban Developments in the Peel-Harvey catchment are required to incorporate water sensitive urban design principles according to the *Peel-Harvey Coastal Catchment Water Sensitive Urban Design Technical Guidelines* (Peel Development Commission, 2006b). The large majority of the principles published in this guideline are applicable to the Local Structure Planning and Subdivision Phases of the project.

3.4 Draft Jandakot Structure Plan Area Drainage and Water Management Plan

The Department of Water developed the Draft Jandakot Structure Plan Area Drainage and Water Management Plan (DWMP) in 2008. The DWMP presents the

Department of Water's guidance for developers and stakeholders with regards to stormwater management issues to help development proceed. It has been prepared with reference to the Jandakot Structure Plan (JSP), approved by Western Australian Planning Commission (WAPC) in August 2007. The DWMP is focused on:

- Protecting environmental assets in the area, such as wetlands
- Managing stormwater
- Managing groundwater.

The DWMP recommends the following Water Sensitive Urban Design concepts be addressed in local structure plans and subdivision plans submitted for areas within the site:

- Compliance with environmental quality criteria in local planning policy
- Compliance with stormwater management policies
- Application of water sensitive urban design treatment trains
- Preparation of water management strategies.
- Soil amendment
- Total phosphorus and total nitrogen import and export criteria
- Minimum percentage area of deep-rooted perennial vegetation
- Building and landscaping covenants
- Construction and building site management.

3.5 Environmental Protection (Peel Inlet – Harvey Estuary) Policy 1992

The proposed development area lies within the Peel Main Drain sub-catchment of the Serpentine River and Peel-Harvey Catchment. Accordingly, the area is subject to the requirements of the Environmental Protection (Peel Inlet – Harvey Estuary) Policy 1992.

In 2003, the Peel-Harvey Catchment was identified as a priority hotspot under the Australian Government's Coastal Catchments Initiative (CCI). The CCI programme for the Peel-Harvey resulted in the development of the following:

- Water Quality Improvement Plan
- Decision Support System for Water Quality Protection
- Support System for the Phosphorus Reduction Decisions
- Water Quality Monitoring Program
- Water Sensitive Urban Design
- Regulation/ Licensing Review

- Targeted Assistance to Intensive Agricultural Industries
- Stock Exclusion from Catchment Waterways.

3.6 Water Sensitive Urban Design Technical Guidelines

Urban developments in the Peel-Harvey catchment are required to incorporate water sensitive urban design principles according to the Peel-Harvey Coastal Catchment Water Sensitive Urban Design Technical Guidelines (Peel Development Commission, 2006b). The large majority of the principles published in this guideline are applicable to the Local Structure Planning and Subdivision Phases of the project.

3.7 Town of Kwinana Local Biodiversity Strategy

The Town of Kwinana has developed a Local Biodiversity Strategy (LBS), by which the preservation of vegetation can be advanced to ensure biological systems are protected (Town of Kwinana, 2009). The LBS highlights that much of the remaining Bassendean Central and South Vegetation Complex remaining in the Town of Kwinana is located within the Eastern Residential Intensification Concept (ERIC) Area (438.5 ha) or on Special Rural type subdivisions of the localities of Wandi, Anketell, Casuarina and Wellard (878 ha). The LBS recommends protecting at least 30 hectares of vegetation within the future residential areas created through the Eastern Residential Intensification Concept. The LBS further recommends that the following principles be considered when preserving bushland in urban areas:

- At least 4 hectares in size
- Compact in size and shape, with a low perimeter to area ratio
- Have at least 75 % of their area in good or better condition
- Is within 500m of another protected natural area and located within a planned ecological linkage.

The Town of Kwinana also recommend:

- That any development be designed and implemented to ensure a high resilience against weed invasion and other threats, such as fire and disease (dieback)
- The Local Structure Planning process may require two spring surveys to confirm the presence of any DRF, Priority Flora, TECs and PECs
- Spring vegetation surveys should include an assessment of the conservation significance of the vegetation surveyed
- The results of spring surveys be used to determine areas of natural vegetation for protection (Town of Kwinana, 2009).

3.8 Key Approvals Process – EPBC Act

Although a number of polices and approvals processes have been addressed during the preparation of the LSP and will subsequently be managed through the State planning process, individual subdivision applications within the LSP area will still be required to address the need for assessment and approval under the EPBC Act. As an approved LSP is not an approval for development to occur and as there are multiple landowners within the LSP area, the responsibility for referral and assessment of potential impacts to matters of NES is most efficiently managed by individual landowners at the subdivision stage. Referral and assessment of projects under the EPBC Act is not necessarily constrained by any approvals granted through the State planning process, however development cannot commence within an approved subdivision application area if approval under the EPBC Act is required. Proponents are required to refer their own projects for assessment, and approval, under the EPBC Act prior to commencing any site works.

Table 2 outlines the basic assessment process for projects referred under the EPBC Act.

Table 2: Expected EPBC Referral process.

APPROVALS PROCESS SUMMARY
Desktop assessment to determine matters of NES potentially present onsite.
Undertake studies/collect data to determine the presence of matters NES, if required.
Begin consultation with SEWPAC.
Submit referral to SEWPAC for assessment under the EPBC Act.
Level of assessment set by SEWPAC based on referral information.
Project assessed by SEWPAC for impacts to matters of NES.
SEWPAC makes decision on project.

During the referral process, proponents are required to address the likely presence of matters of NES at the site. Information collected to date indicates the only matter of NES present at the site, or utilises the site for habitat, is the Black Cockatoo. No other federally listed species, including the GSM, have been observed on the site.

4 CONSULTATION AND LIAISON

4.1 Background

During the draft LSP phase, consultation was undertaken with ToK and the DEC regarding the existing environmental conditions at the site. The purpose of the consultation was to understand the management actions required to be incorporated into design and planning of the site for existing environmental values.

The key environmental factors raised by ToK and DEC that required additional management and planning included:

- Management/retention of wetlands on site
- Management/retention of the vegetation community (T1) that was considered to show an affinity to a PEC (Community Type 21c – 'Low lying *Banksia attenuate* woodlands or shrublands'.

4.2 Wetland Management and Retention

There were two issues raised by the DEC, with respect to wetlands on site. These included the current condition of the MUW in the central area of the site and the proximity of the CCW adjacent to the northern boundary of the site.

Vegetation mapping undertaken indicated the vegetation condition of the MUW in the central area of the site to be in "Excellent" condition. Although mapped as MUW, DEC and ToK indicated the remnant wetland area retained more environmental value than its management category indicated. Both DEC and ToK indicated a greater area of retention was preferable and design of the LSP needed to be sensitive to the wetland area's environmental values.

The outcome of the consultation process was to increase the area of wetland retention in the central area of the site and commit to the development of management plans to manage the wetland during design and construction. The outcome of consultation also included agreement that no buffers would be required around the wetland area.

The DEC also indicated that although there was a physical barrier (Darling Chase) between the site and the CCW wetland adjacent to the northern boundary, guidance indicated CCWs are typically afforded management protection by a 50m buffer. Through consultation, it was recognised there are a number of limitations associated with the site that result in a 50m buffer providing no additional benefit. These include:

- The area that would be within the buffer is completely degraded, comprised mostly of pasture grasses/weeds and retains no native vegetation.
- The area that would be within the buffer is an agreed school site.

- There is a road forming a hard edge to the wetland area that separates the wetland from other uses.

As a result the agreed outcome was that no buffer should be required if management actions were developed to assist in the future management and protection of the CCW.

Proposed management actions have been developed in consultation with ToK and DEC and are further discussed in Section 5.

4.3 Vegetation Retention

The most significant vegetation retention issue raised during consultation (excluding vegetation in the central wetland area) was the retention of vegetation within the vegetation community type (T1) (Figure 6) that showed an affinity to PEC 21c. Discussions with the DEC and ToK, assisted to guide the final area of POS adjacent to Lyon Road. This was considered the most appropriate area of vegetation to retain as it is within the area of vegetation that shows an affinity to a PEC and also contains vegetation that was considered during the 2009 Spring flora and vegetation survey to be in "Very Good" and "Excellent" condition.

Proposed management actions have been developed in consultation with ToK and DEC and are further discussed in Section 5.

5 ENVIRONMENTAL IMPACTS AND MANAGEMENT

5.1 Introduction

There are a number of environmental considerations that will require management at the subdivision level. Following consultation with ToK, the following management options will be developed:

- Wetland and Remnant Vegetation Management Plan (WRVMP)
- Fauna Management Plan (FMP)
- Mosquito and Midge Management Plan (MMMP)
- Acid Sulfate Soil Management Plan (ASSMP)
- Drainage and Nutrient Management Plan (DNMP)
- Noise Management Strategy
- Potential contamination management.

5.2 Wetland and Remnant Vegetation Management

The WRVMP will be developed in accordance with the outcomes of consultation with ToK and DEC. The key components to be addressed in the WRVMP include:

- Describe the wetlands present on site including ecosystem, attributes and value.
- Identify the management objectives of the WMP.
- Identify management actions to ensure that the management objectives are achieved. This may include, but not be limited to the determination of buffers, demarcation of buffers and fencing.
- Development of contingency plans.
- Outline and identify responsibilities and timeframes, if required, for the implementation of the WMP.

The WMP document will also include but not be limited to the following to address ToK comments:

- Identification of improvements proposed to be undertaken by the land developers (landscaping and design intent), estimated costs and the ongoing costs of maintenance of such sites for the Town over the longer term.

- Identification of landowner maintenance responsibilities during the development cycle specifying minimum developer maintenance responsibilities once the sites are developed.
- Information regarding the development of the WMP in accordance with DEC Guidelines *Checklist for Preparing a Wetland Management Plan*, December 2008, for wetlands and associated buffer vegetation.
- Information regarding areas of remnant vegetation not included in Wetland areas, including objectives and strategies to address issues of fire management, access control (vehicle, pedestrian and emergency vehicle), reserve fencing, weed management, revegetation (species selection, species composition, species density, revegetation rates and survival rates), feral species control and fauna management.
- Specific management objectives and strategies for all vegetation communities within the reserve.
- Address the interaction between public open space and conservation objectives.
- An approximation of yearly costs for reserve management expected during the developer management period will be indicated. Approximate costs of infrastructure installed within reserves and its life expectancy and replacement cost will also be provided.

5.3 Fauna and Habitat Protection

To assist in the management of fauna and fauna habitat protection a FMP will be developed based on the outcomes of consultation with ToK. The key components to be addressed in the fauna management plan include:

- Describe fauna and fauna habitat present on site.
- Identify the management objectives of the FMP.
- Identify management actions to ensure that the management objectives are achieved. This may include, but not be limited to the determination of buffers, demarcation of buffers, conservation of vegetation and fencing.
- Development of contingency plans.
- Outline and identify responsibilities and timeframes, if required, for the implementation of the FMP.

The FMP document will also include but not be limited to the following to address ToK comments:

- Identification of relevant state and federal legislation.
- Information regarding timeframes for conducting surveys for the presence of GSM and Carnaby Black Cockatoos.

- Details on survey methodologies carried out in accordance with the requirements of the DEC using appropriate survey methods by appropriately licensed individual.

5.4 Mosquito and Midge Management

The Wandi site is characterised by an area of multiple use wetland that is seasonally inundated/waterlogged that has the potential for mosquito breeding. There are also drains that run through the site, nearby drains offsite and other wetland areas in the local area. Mosquito and midge can be attracted to the wetland area and drains on the site, particularly in the warmer months. A MMMP will be developed in accordance with the outcomes of consultation with ToK. The key components of the MMMP will include the following:

- Describe the situation regarding mosquito and midge nuisance present on site.
- Identify the management objectives of the MMMP.
- Identify management actions to ensure that the management objectives are achieved. This may include, but not be limited to the determination and demarcation of buffers.
- Development of contingency plans.
- Outline and identify responsibilities and timeframes, if required, for the implementation of the MMMP.

The MMMP document will also include but not be limited to the following to address ToK comments:

- Details on mosquito monitoring, surveys and reports (larval / adult / timing) requirements.
- Provision of geographical survey – Identify breeding habitats
- Identification of land ownership and responsibilities.
- Identification of applicable environmental legislation
- Identification of key stakeholders.
- Determination of potential operational resources (operational timeframes / funding requirements and contributions / community awareness).
- Details regarding ongoing assessment and review timeframes.

5.5 Acid Sulfate Soils

Areas of the site have been mapped as 'high' to 'moderate' ASS risk. Following detailed site design it will be known if (and where) activities at the site will occur that have the potential to disturb PASS or AASS. Detailed management of ASS will

be developed during the subdivision stage of the proposed development and will be managed in accordance with DEC requirements.

Once the structure plan is finalised for the site, the investigations can be targeted at specific areas of the Wand (south) LSP area. This may include (but not be limited to) areas where trenches are to be excavated and dewatered for the purpose of laying water or sewage pipes. Final details of management will be provided once detailed earthwork design for the site has been completed.

5.6 Drainage and Nutrient Management

As there are wetlands present on site, it is recognised that protection of groundwater quality is an important environmental consideration, particularly as there is a CCW adjacent to the northern boundary of the site.

A DNMP will be developed that considers the following:

- Location of the site within the Peel-Harvey catchment
- Location of the site adjacent to a conservation category wetland
- Soil amendment
- Urban fertiliser management
- Stormwater management.

Background information to guide the development of the Drainage and Nutrient Management Plan will come from the Local Water Management Strategy developed for the site (JDA, 2010).

5.7 Noise Management

Noise issues associated with construction and the nearby Kwinana Freeway and Perth to Mandurah rail line will be investigated to assess potential concerns. Following consultation with ToK, the key items to be addressed as part of a Noise Management Strategy include:

- Identification of Australian Standards and local policies/regulations
- Identification of the noise sources/activities that will impact on future residents
- Procedures to ensure that all reasonable noise mitigation measures are applied
- Details of overall management methods and procedures that will be implemented to limit noise impacts (acoustic controls/noise attenuation)
- Noise monitoring, reporting and response procedures
- Procedures for notifying residents of potential noise impacts likely to affect their amenity.

5.8 Potential Contamination Management

A preliminary site investigation (PSI) is proposed to be undertaken on the site. Any potential contamination issues identified during this PSI will be further investigated and detailed actions developed dependent on the concerns raised. Any concerns raised will be addressed and managed prior to the subdivision. Any management measures that may be required will be developed and included for comment at that stage.

6 SUMMARY

This report has been developed as a supporting document for the LSP being submitted for the proposed development of the site. It has discussed the site environmental characteristics, site work undertaken and policy requirements applicable to the management of the development. The following summarises key factors considered during development planning for the site:

- The majority of the site is mapped as being a multiple use wetland subject to seasonal inundation.
- A portion of the site is subject to very shallow groundwater, seasonal waterlogging and periodic inundation. Therefore considerations of drainage and fill requirements are needed to ensure future developments occur in a safe manner.
- The site is located within a 'high risk' ASS area and therefore an ASS investigation required prior to ground-disturbing activities.
- Flora and vegetation surveys undertaken across the site indicate that there are no known occurrences of DRF, priority species or TECs on the site, however an area of remnant vegetation was considered to have an affinity to a PEC.
- Fauna of conservation significance have been noted on the site (Carnaby's Cockatoo, Forest Red-tailed Cockatoo and Quenda). A Fauna Management Plan is likely to be required and referral to SEWPAC is recommended to confirm if the development is considered a controlled action.
- It appears that historically a poultry facility was located on Lot 675. A Preliminary Site Investigation may be required prior to subdivision.

Through consultation with regulatory authorities, including ToK and DEC, the final LSP design incorporates environmental management actions into the plan to assist in the retention of environmental values at the site. Further, additional management plans will be developed for use during construction and future management of the site.

7 Limitations

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

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

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

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

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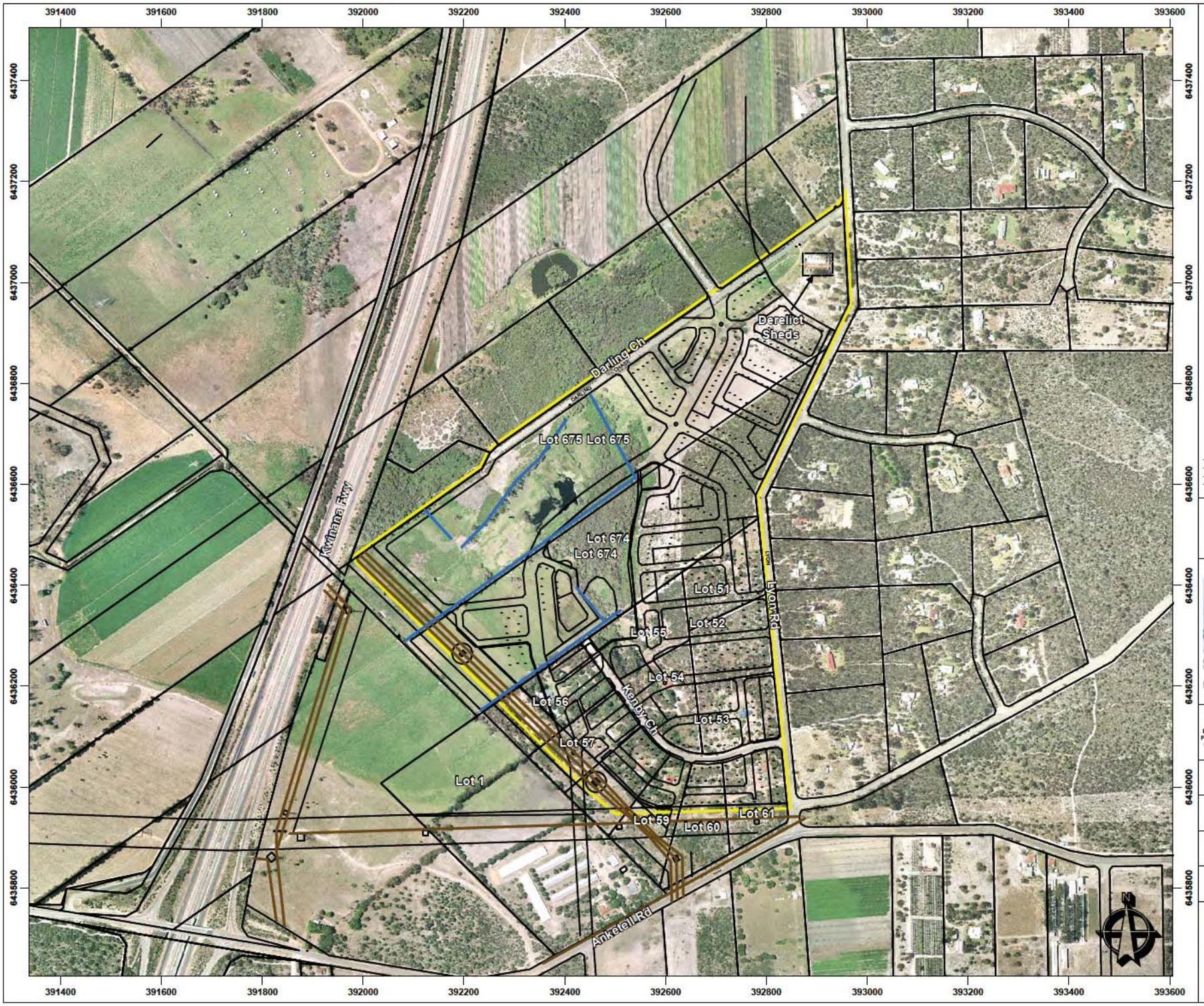
FIGURES



Legend

- Drains
- Power Lines
- Site Location
- Structure Plan

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2009
- CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2008
- LOCALITY MAP SOURCED FROM LANDGATE 2006

SCALE

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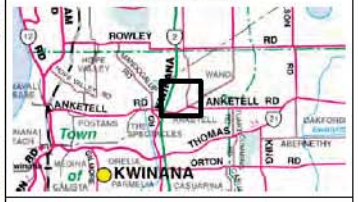
Metres

1:10,000 @ A4

LOCALITY MAP



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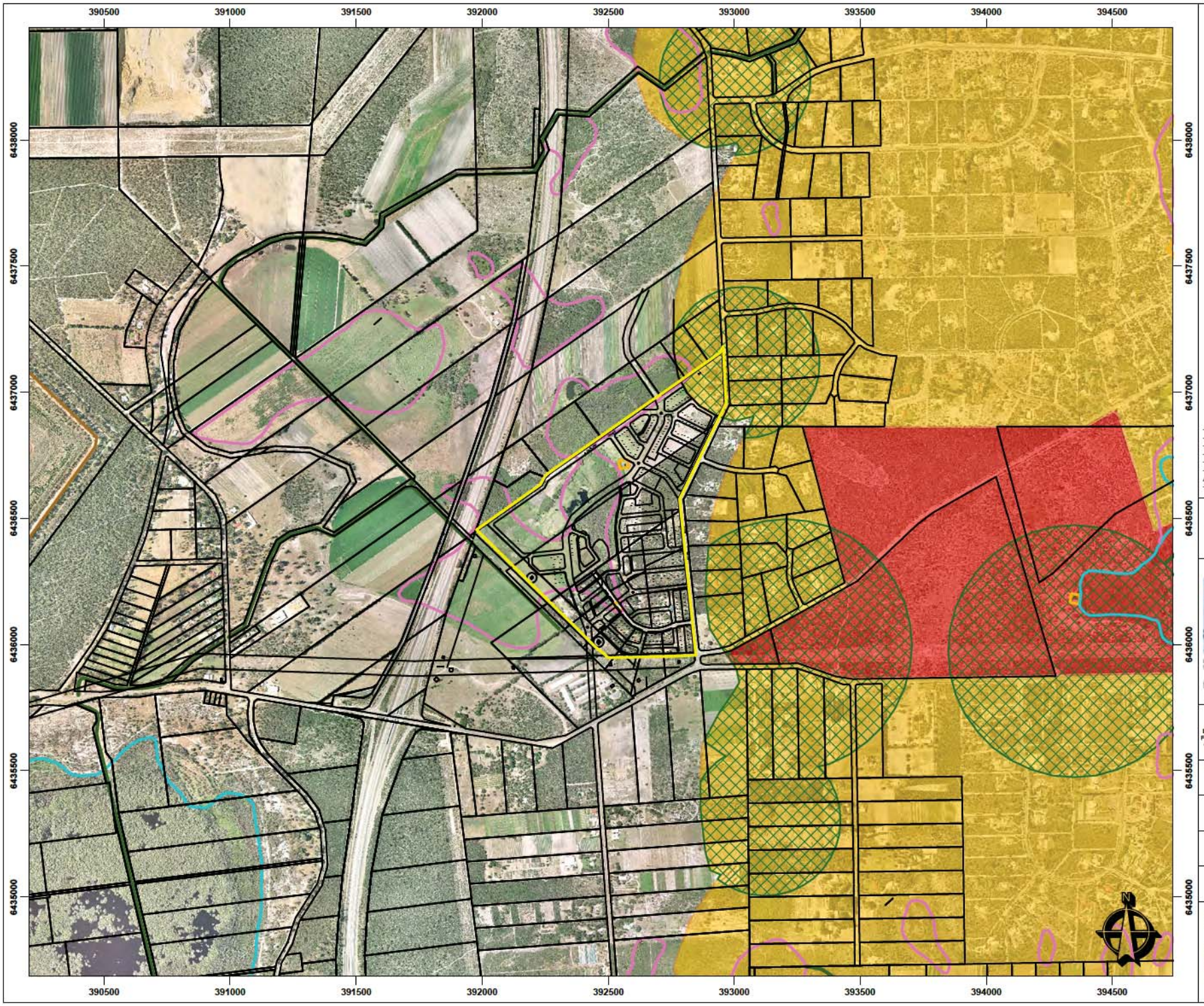
METADATA RECORDED	PROJECTION
100%	MGA ZONE 50
HORIZONTAL DATUM	**HEIGHT DATUM**
GDA 94	N/A

CREATED BY	CHECKED BY	APPROVED
TJ	JT	
DATE	**REVISION**	**DRAWING ID**
19/04/2011	0	LD010AB.01

Greg Rowe and Associates
WANDI

Wandi South Cell LSP Environmental Assessment Report
Site Location and Features
Figure 1

360 environmental



Legend

- Site Location
- Structure Plan

Hydrography

- Area Subject to Inundation
- Drain - major
- Earth Dam
- Levee Bank
- Swamp - perennial
- PWDSA Protection Zone (Jandakot Underground Pollution Control Area)
- Policy Use - P1
- Policy Use - P2
- Policy Use - P3
- Policy Use - Not Assigned

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2009
- HYDROGRAPHY SOURCED FROM DOW 2007
- PDWSA SOURCED FROM DOW 2006
- PDWSA PROTECTION ZONES SOURCED FROM DOW 2008
- STRUCTURE PLAN SOURCED FROM GREG ROWE AND ASSOCIATES 2010
- LOCALITY MAP SOURCED FROM LANDGATE 2006

SCALE

0 100 200 400 600 800

Metres

1:20,000 @ A4

LOCALITY MAP

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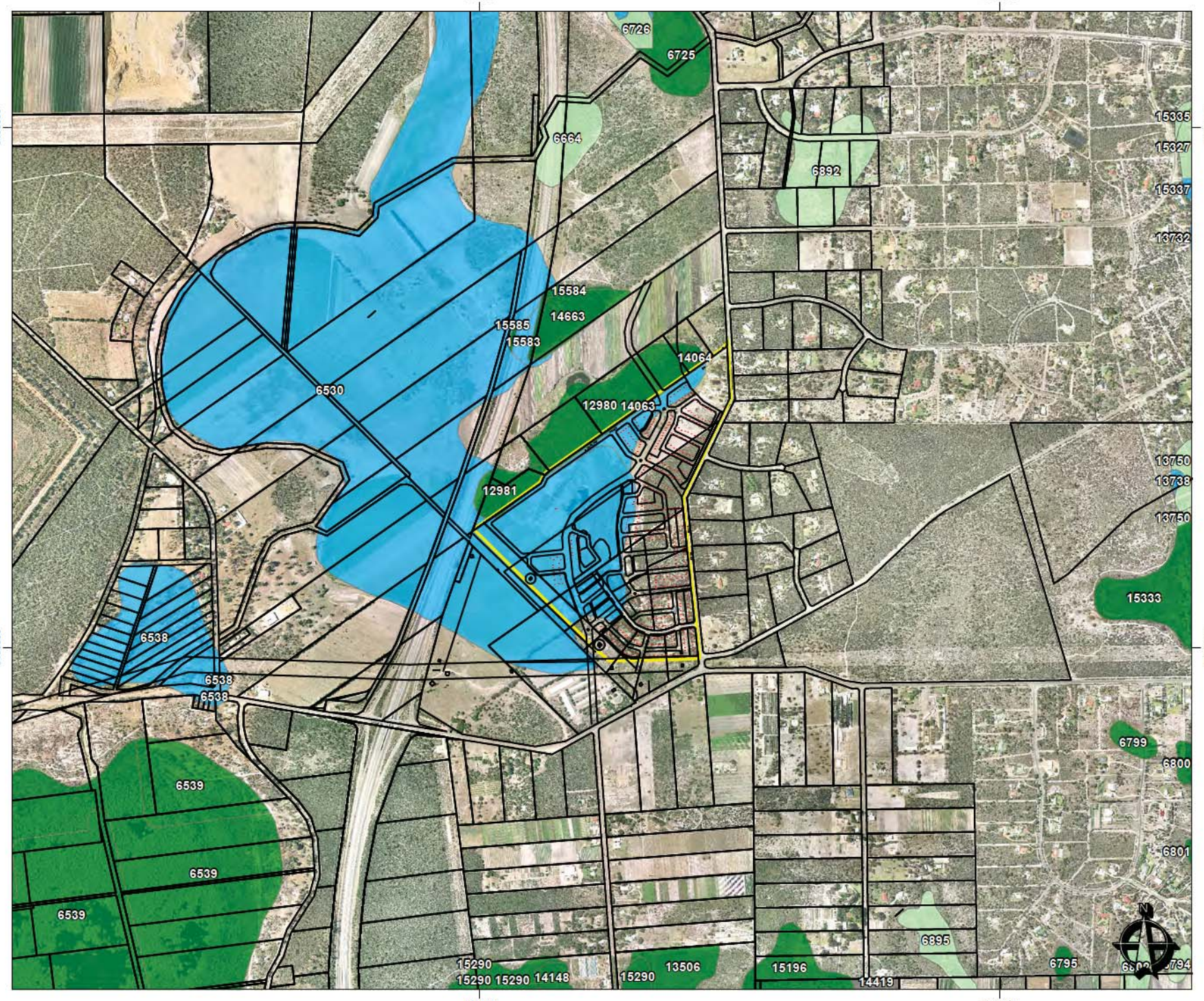
TJ	JT	
DATE	**REVISION**	**DRAWING ID**
19/04/2011	0	LD010AB.02

Greg Rowe and Associates
WANDI

Wandi South Cell LSP Environmental Assessment Report
Hydrography and PDWSA
Figure 2

360 environmental



Legend

- Site Location

Geomorphic Wetlands

- Conservation
- Resource Enhancement
- Multiple Use
- Not Assessed
- Not Applicable

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2009
- GEOMORPHIC WETLANDS SOURCED FROM DEC 2010
- STRUCTURE PLAN SOURCED FROM GREG ROWE AND ASSOCIATES 2010
- LOCALITY MAP SOURCED FROM LANDGATE 2006

SCALE

0 100 200 400 600 800

Metres

1:20,000 @ A4

LOCALITY MAP

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TJ	JT	
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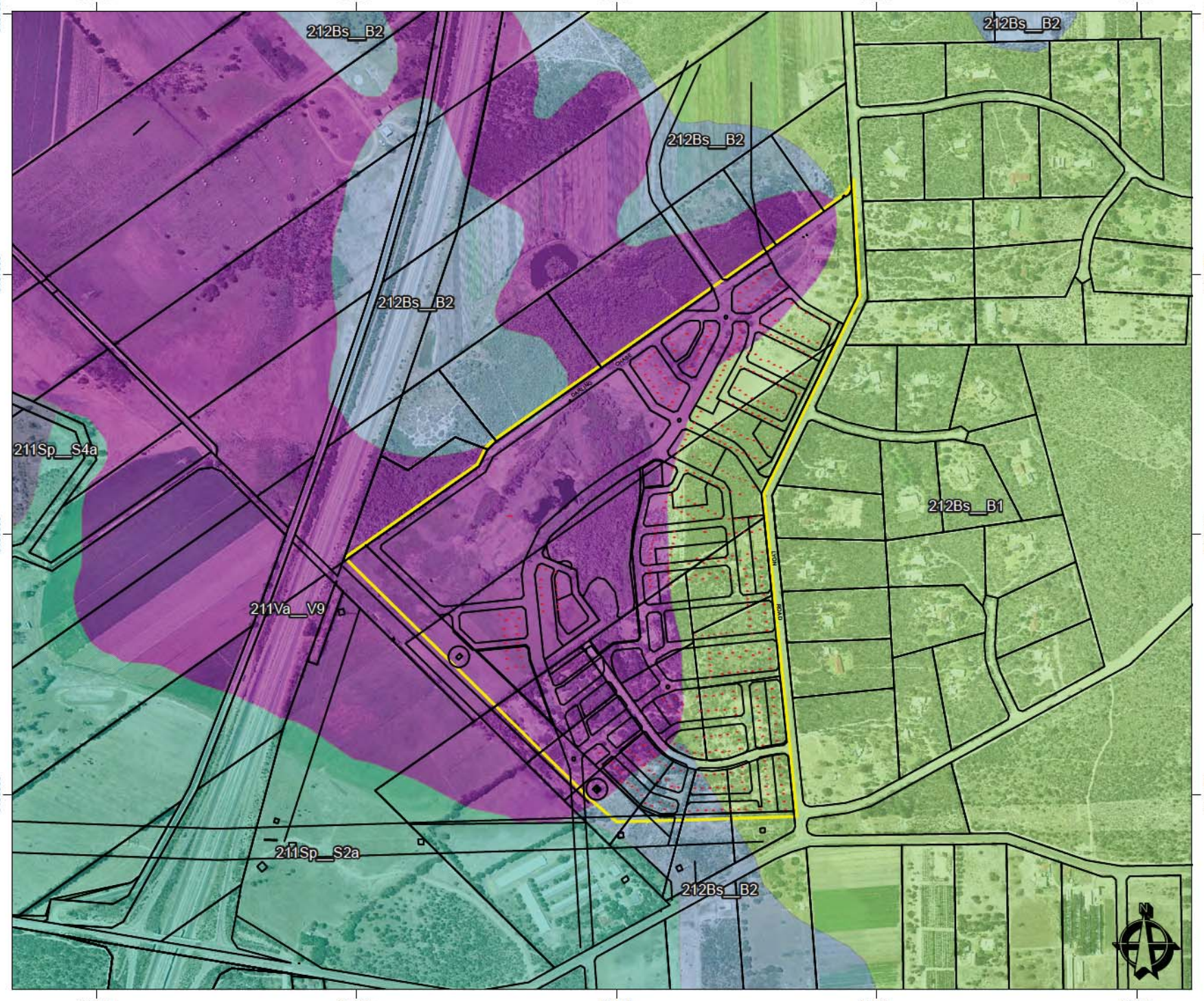
Wandi South Cell LSP Environmental Assessment Report
Geomorphic Wetlands
Figure 3

360 environmental



Legend

Site Location

Structure Plan

Soil Phases

211Sp__S2a: Lower slopes (1-5%) of dune ridge with moderately deep to deep siliceous yellow-brown sands or pale sands with yellow-brown subsoils and minor limestone outcrop.

211Sp__S4a: Flat to gently undulating sandplain with deep, pale and sometimes bleached, sands with yellow-brown subsoils.

211Va__V9: Areas of former swamps which have been artificially drained, with uniform loamy or peaty sands.

212Bs__B1: Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands sometimes with a pale yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2 m; banksia dominant.

212Bs__B2: Flat to very gently undulating sandplain with well to moderately well drained deep bleached grey sands with a pale yellow B horizon or a weak iron-organic hardpan 1-2 m.

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2009
- SOIL MAPPING SOURCED FROM DAFWA 2007
- STRUCTURE PLAN SOURCED FROM GREG ROWE AND ASSOCIATES 2010
- LOCALITY MAP SOURCED FROM LANDGATE 2006

SCALE

0 50 100 200 300 400

Metres

1:10,000 @ A4

LOCALITY MAP

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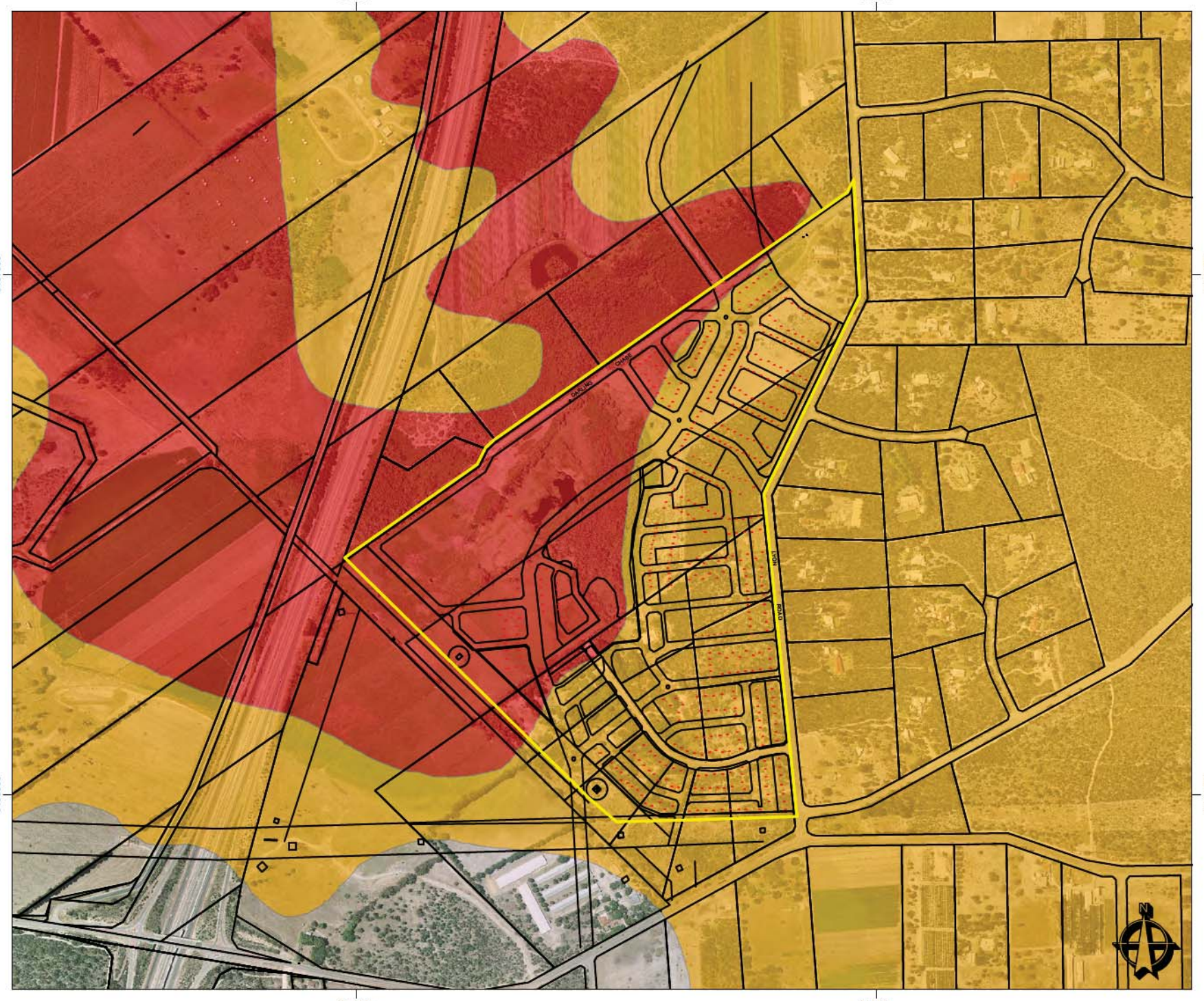
Wandi South Cell LSP Environmental Assessment Report
Soils
Figure 4

360 environmental



Legend

- Site Location
- Structure Plan

Acid Sulfate Soil Risk (<3 m from surface)

- High to moderate ASS disturbance risk
- Moderate to low ASS disturbance risk

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2009
- ACID SULFATE SOIL MAPPING SOURCED FROM DEC 2010
- STRUCTURE PLAN SOURCED FROM GREG ROWE AND ASSOCIATES 2010
- LOCALITY MAP SOURCED FROM LANDGATE 2006

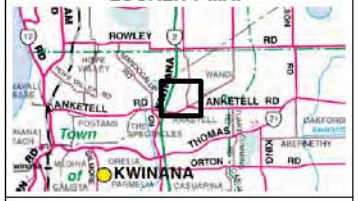
SCALE

0 50 100 200 300 400

Metres

1:10,000 @ A4

LOCALITY MAP



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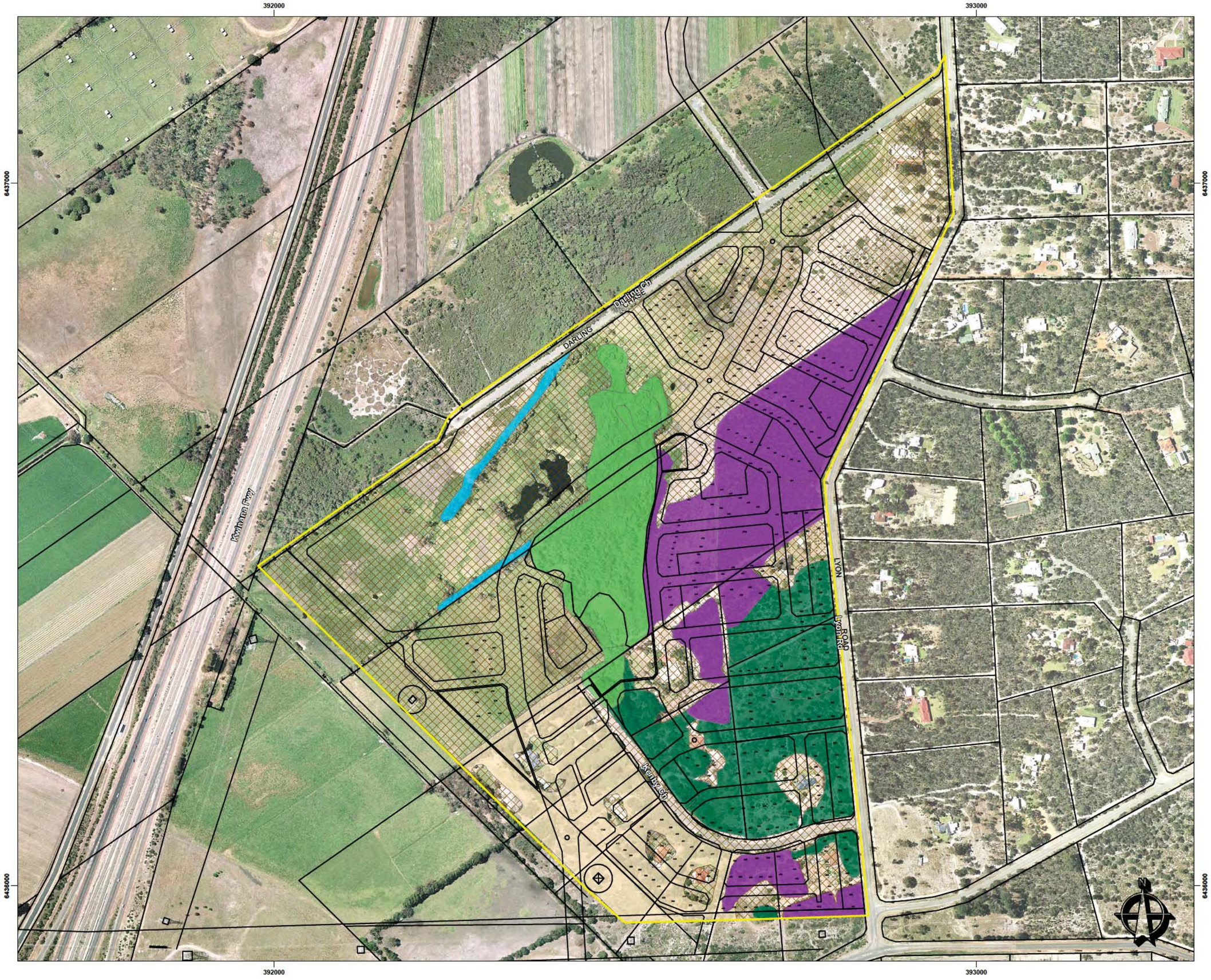
Acid Sulfate Soil Risk
Figure 5

360 environmental



Legend

- Site Location
- Structure Plan

Vegetation Communities

- **F1**: Forest of *E. rudis* and *M. rhaphiophylla* over a *Taxandria linearifolia* and *Astartea scoparia* over sedges and herbs on swampy ground
- **F2**: Degraded wetland vegetation
- **T1**: Thickets of *Adenanthos* spp and *Kunzea* spp. on well drained grey sands
- **W1**: Low Woodland of *Banksia menziesii, Banksia attenuata* and *Allocasuarina fraseriana* on well drained grey sands
- **C**: Pasture, lawns, roads and other cleared ground
- **D**: Degraded native vegetation

NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
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- STRUCTURE PLAN SOURCED FROM GREG ROWE AND ASSOCIATES 2010
- LOCALITY MAP SOURCED FROM LANDGATE 2006

SCALE

0 25 50 100 150 200 250

Metres

1:5,000 @ A3

LOCALITY MAP

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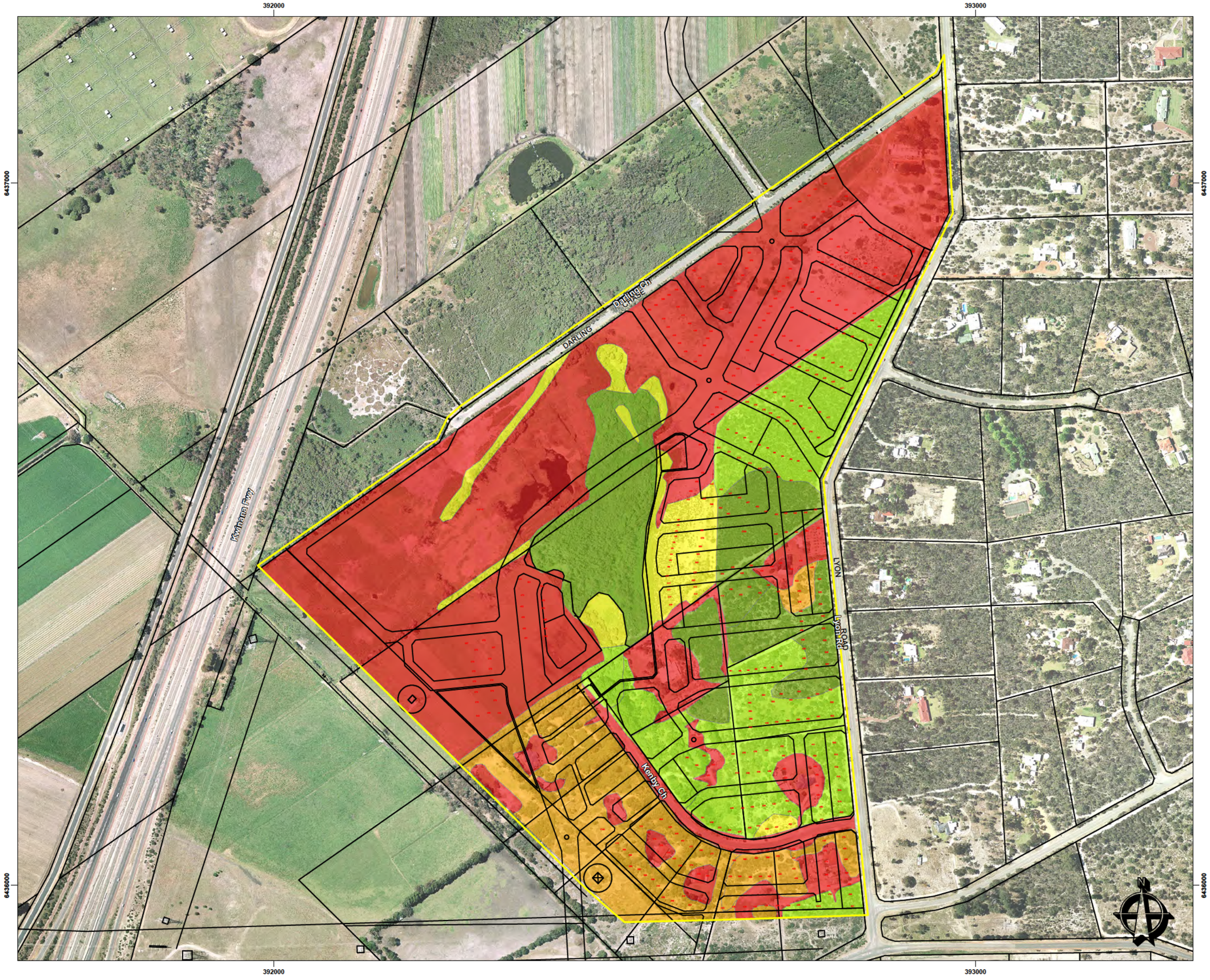
Wandi South Cell LSP Environmental Assessment Report
Vegetation Communities
Figure 6

360 environmental



Legend

- Site Location
- Structure Plan

Vegetation Conditions

- Pristine
- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2009
- STRUCTURE PLAN SOURCED FROM GREG ROWE AND ASSOCIATES 2010
- LOCALITY MAP SOURCED FROM LANDGATE 2006

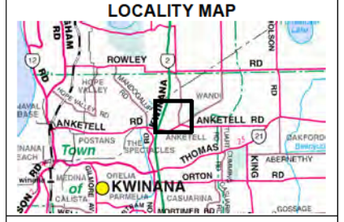
SCALE

0 25 50 100 150 200 250

Metres

1:5,000 @ A3

LOCALITY MAP



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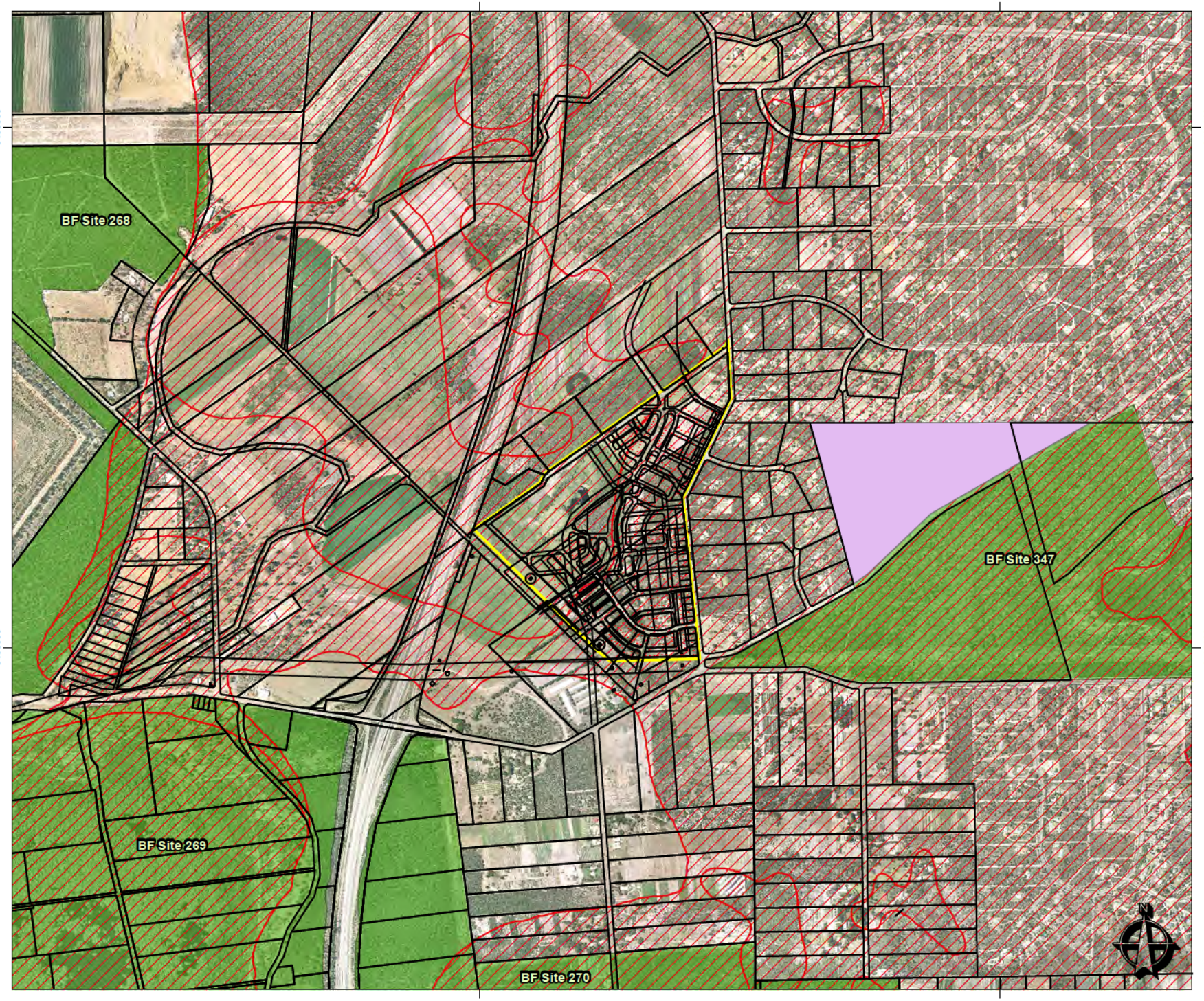
Wandi South Cell LSP Environmental Assessment Report
Vegetation Conditions
Figure 7

360 environmental



Legend

- Site Location
- Structure Plan
- Wandi Nature Reserve
- Environmentally Sensitive Area
- Bush Forever Site

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2009
- BUSH FOREVER SITES SOURCED FROM DPI 2003
- NATURE RESERVE SOURCED FROM DEC 2010
- ESAs SOURCED FROM DEC 2010
- STRUCTURE PLAN SOURCED FROM GREG ROWE AND ASSOCIATES 2010
- LOCALITY MAP SOURCED FROM LANDGATE 2006

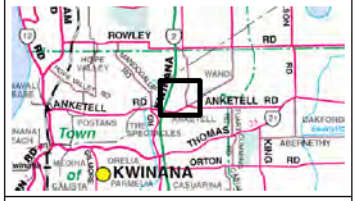
SCALE

0 100 200 400 600 800

Metres

1:20,000 @ A4

LOCALITY MAP



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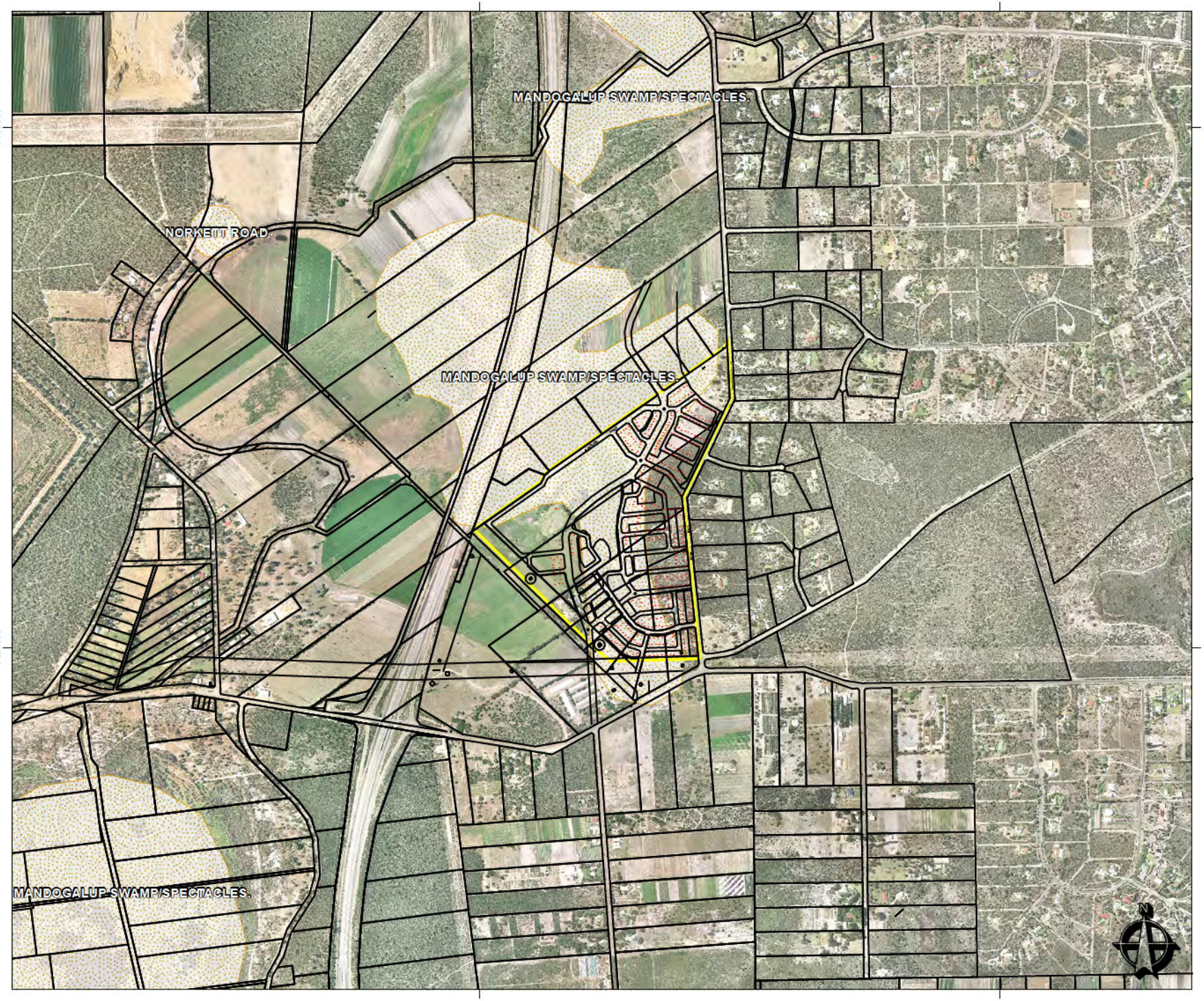
Wandi South Cell LSP Environmental Assessment Report
Conservation Areas
Figure 8

360 environmental



Legend

- Site Location
- Structure Plan
- Aboriginal Heritage Site

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2009
- INDIGENOUS HERITAGE SITES SOURCED FROM DIA 2007
- STRUCTURE PLAN SOURCED FROM GREG ROWE AND ASSOCIATES 2010
- LOCALITY MAP SOURCED FROM LANDGATE 2006

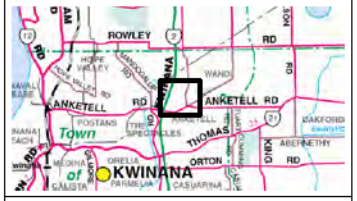
SCALE

0 100 200 400 600 800

Metres

1:20,000 @ A4

LOCALITY MAP



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Wandi South Cell LSP Environmental Assessment Report
Aboriginal Heritage Sites
Figure 9

360 environmental