Western Australian Planning Commission

Your ref: 109/042
Our ref: TPS/1460
Enquiries: Heather Brooks (6551 9436)

Chief Executive Officer
City of Cockburn
PO Box 1215
BIBRA LAKE WA 6965

Dear Sir

TOWN PLANNING SCHEME No. 3
AMENDMENT No. 106

MINISTERIAL DECISION FOR TOWN PLANNING SCHEME AMENDMENT - APPROVAL

Pursuant to clause 87(2) of the *Planning and Development Act 2005* (the Act), the Minister for Planning has granted final approval to amendment 106 to the City of Cockburn Town Planning Scheme No. 3 on 3 February 2016.

In accordance with clause 87(3) of the Act, the Western Australian Planning Commission (Commission) will cause the amendment to be published in the Government Gazette.

The Commission has forwarded the notice to State Law Publisher and it is the Council's responsibility to make arrangements for the payment of any publication costs. Council is required under clause 87(4B) of the Act, and clause 62(2) of the *Planning and Development (Local Planning Schemes) Regulations 2015,* to advertise and make copies of the amendment available to the public.

For all payment and purchase order queries, please contact State Law Publisher on (08) 6552 6012 or fax (08) 9321 7536. One signed set of the amending documents is returned herewith.

Yours sincerely

KM Blenkinsop

Kerrine Blenkinsop
Secretary
Western Australian Planning Commission

9 February 2016

wa.gov.au
Postal address: Locked Bag 2506 Perth WA Street address: 140 William Street Perth WA 6000
Tel: (08) 655 19000 Fax: (08) 655 19001 corporate@planning.wa.gov.au www.planning.wa.gov.au
ABN 35 482 341 493

PLANNING AND DEVELOPMENT ACT 2005

APPROVED TOWN PLANNING SCHEME AMENDMENT

CITY OF COCKBURN

TOWN PLANNING SCHEME No. 3 - AMENDMENT No. 106

Ref: TPS/1460

It is hereby notified for public information, in accordance with section 87 of the *Planning and Development Act 2005* that the Minister for Planning approved the City of Cockburn Town Planning Scheme amendment on 3 February 2016 for the purpose of:

1. Rezoning parts of Lot 545 Bartram Road, Success from 'Residential R20' to comprise the zones of 'Residential R30', 'Residential R40' and 'Residential R60' as depicted on the Scheme Amendment Map.

2. Reserving parts of Lot 545 Bartram Road, Success as 'Local Road' and 'Parks & Recreation' as depicted on the Scheme Amendment Map.

3. Remove Lot 545 Bartram Road from Development Area 14.

4. Amend the Scheme Map accordingly.

L HOWLETT
MAYOR

S CAIN
CHIEF EXECUTIVE OFFICER

Town Planning Scheme Amendment

Lot 545 (77) Bartram Road Success

PLANNING SOLUTIONS

URBAN & REGIONAL PLANNING

Prepared for
Allvivid Pty Ltd

May 2015

PLANNING AND DEVELOPMENT ACT, 2005

RESOLUTION TO AMEND A TOWN PLANNING SCHEME

CITY OF COCKBURN

TOWN PLANNING SCHEME NO 3

AMENDMENT NO. 106

RESOLVED that the Council, in pursuance of Section 75 of the Planning and Development Act 2005, amend the above Town Planning Scheme by:

1. Rezoning parts of Lot 545 Bartram Road, Success from 'Residential R20' to comprise the zones of 'Residential R30', 'Residential R40' and 'Residential R60' as depicted on the Scheme Amendment Map.
2. Reserving parts of Lot 545 Bartram Road, Success as 'Local Road' and 'Parks & Recreation' as depicted on the Scheme Amendment Map;
3. Remove Lot 545 Bartram Road from Development Area 14; and
4. Amend the Scheme Map accordingly.

CHIEF EXECUTIVE OFFICER

Direct all inquiries to:

PLANNING SOLUTIONS (AUST) PTY LTD
296 Fitzgerald Street
PERTH WA 6000

ALL CORRESPONDENCE TO:
PO Box 8701
PERTH BUSINESS CENTRE WA 6849

Phone: 08 9227 7970
Fax: 08 9227 7971
E-mail: admin@planningsolutions.com.au
Web: www.planningsolutions.com.au

Project details

Job number	3651	
Client	Allvivid Pty Ltd	
Prepared by	Planning Solutions	
Consultant Team	Traffic Engineering Environmental Bushfire Civil Engineering	Transcore Bowman & Partners Environmental FirePlan WA Development Engineering Consultants

Document control

Revision number	File name	Document date
Rev 0	140901 3651 Scheme Amendment Report	1 September 2014
Rev 1	141013 3651 Scheme Amendment Report - Rev 1	13 October 2014
Rev 2	150521 3651 Scheme Amendment Report - Rev 2	21 May 2015

Contents

Figures

Appendices

1 Preliminary

1.1 Introduction

Planning Solutions has prepared this report for John Chapman Town Planning Consultant, who acts on behalf of Allvivid Pty Ltd, the purchaser under contract of Lot 545 (77) Bartram Road, Success (**subject site**), in relation to a proposed amendment to the City of Cockburn's Town Planning Scheme No. 3 (**TPS3**).

This report has been prepared in support of a request to formally amend TPS3, as it applies to the subject site. It is proposed that TPS3 be amended to rezone the whole of the subject site for a mixture of residential densities, public open space and local roads, and remove it from Development Area 14.

This report will discuss various issues pertinent to the proposal, including:

- Site details.
- Detailed explanation of the Scheme Amendment request.
- Justification in support of the Scheme Amendment with consideration given to applicable statutory and strategic planning instruments.

An Explanatory Report has been prepared in support of the proposed scheme amendment, and is contained in **Appendix 3**. The Explanatory Report details the planning background, site conditions and constraints and proposed concept development plan for the subject site.

2 Site details

2.1 Land description

Refer to **Table 1** below for a description of the land subject to this development application.

Table 1 – Lot details

Lot	Plan/Diagram	Volume	Folio	Area (ha)
545	251029	2020	192	4.5401

Refer **Appendix 1** for a copy of the Certificate of Title.

2.2 Location

2.2.1 Regional context

The subject site is located approximately 21 kilometres south of the Perth Central Business District, and approximately 14 kilometres south-east of Fremantle.

The subject site is located in close proximity to the Kwinana Freeway, which connects to the wider metropolitan region.

The subject site is contained within the City of Cockburn (**City**).

Refer **Figure 1**, regional context.

2.2.2 Local context

The subject site is located within the suburb of Success, and is approximately 1 kilometre south of the Cockburn Gateway Shopping Centre, and 2 kilometres south of the Cockburn Central Train Station.

The site is bounded by Bartram Road to the south, Wentworth Parade to the east, and the Twin Bartram Local Structure Plan (**LSP**) area to the north and west. Twin Bartram Lakes is a Conservation Category Wetland (**CCW**) and is located immediately north of the subject site.

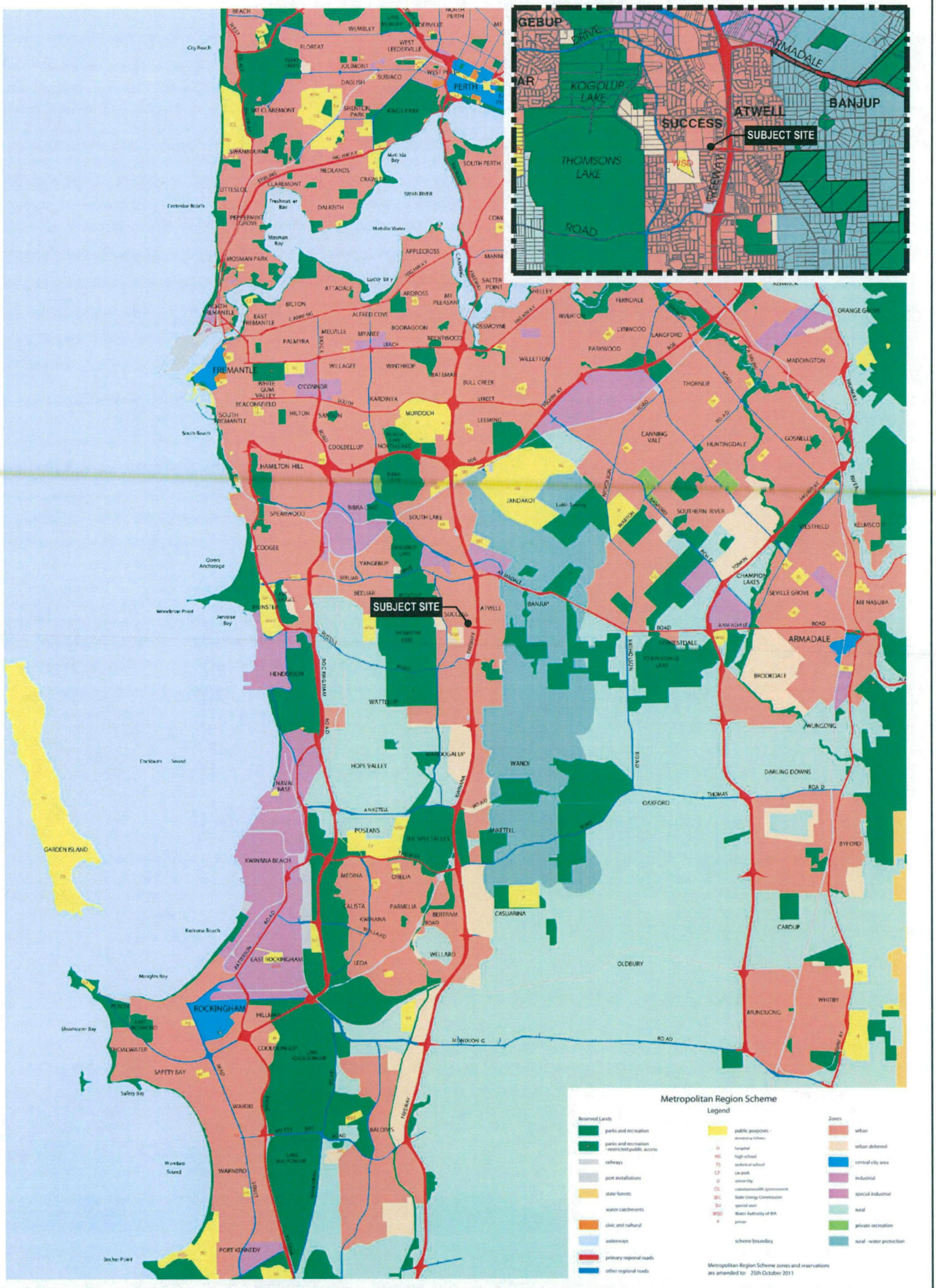
Refer **Figure 2**, local context.

2.3 Land use and topography

The subject site is currently used for rural residential purposes, and is predominantly cleared, with some remnant vegetation. Residential land uses are proposed for the immediately adjoining land to the west as part of the Twin Bartram LSP. Surrounding land uses to the south and east are predominantly low density residential.

The subject site is generally undulating, sloping down in a north-easterly direction from 30m AHD to 25m AHD.

Refer **Figure 3**, aerial photograph.



PLANNING SOLUTIONS URBAN & REGIONAL PLANNING

SCALE	1:200,000 @ A4
DATE	24 June 2014
FILE	01 140624 3651 Regional Context.dwg
REVISION	1/NK/First Draft/24.06.14

0 5,000

REGIONAL CONTEXT
LOT 545 (77) BARTRAM ROAD
SUCCESS
WESTERN AUSTRALIA

FIGURE 01

PLANNING SOLUTIONS URBAN & REGIONAL PLANNING

SCALE	1:5,000 @ A4
DATE	24 June 2014
FILE	02 140624 3651 Local Context.dwg
REVISION	1/INK/First Draft/24.06.2014

LOCAL CONTEXT
LOT 545 (77) BARTRAM ROAD
SUCCESS
WESTERN AUSTRALIA

FIGURE 02

PLANNING SOLUTIONS
URBAN & REGIONAL PLANNING

SCALE	1:4,000 @ A4
DATE	24 June 2014
FILE	03 140624 3610 Aerial Photo.dwg
REVISION	1/NK/First: Draft/24.06.2014

0 100

AERIAL PHOTOGRAPH
LOT 545 (77) BARTRAM ROAD
SUCCESS
WESTERN AUSTRALIA

FIGURE **03**

3 Proposed Scheme Amendment

This report and appended explanatory report provides justification supporting a request to amend TPS3 to rezone the subject site to a mixture of residential densities, parks and recreation, and local roads.

It is proposed to formally amend TPS3, as it applies to Lot 545 Bartram Road, Success as follows:

- Rezone Lot 545 Bartram Road, Success from 'Residential R20' to comprise the zones of 'Residential R30', 'Residential R40' and 'Residential R60' as depicted on the Scheme Amendment Map.
- Reserve Lot 545 Bartram Road, Success from 'Residential R20' to comprise the reserves of 'Local Road' and 'Parks & Recreation' as depicted on the Scheme Amendment Map;
- Remove Lot 545 Bartram Road from Development Area 14; and
- Amend the Scheme Map accordingly.

The subject site is currently within DA14 as shown on the TPS3 map. TPS3 identifies the purposes of Development Areas as follows:

a) Identify areas requiring comprehensive planning; and
b) Coordinate subdivision and development in areas requiring comprehensive planning.

Subdivision and development of land contained within a Development Area must comply with Schedule 11 (Development Areas), and is to generally be in accordance with any structure plan that applies to the land. Schedule 11 of TPS3 refers to the DA14 area as *"Beenyup Road (Development Zone)"*, which does not apply to the subject site. It is understood that the subject site's inclusion in DA14 has been carried over from the City's previous Town Planning Scheme No. 2 maps. There is no reference to the subject site within the TPS3 text, therefore no changes are required to the scheme text.

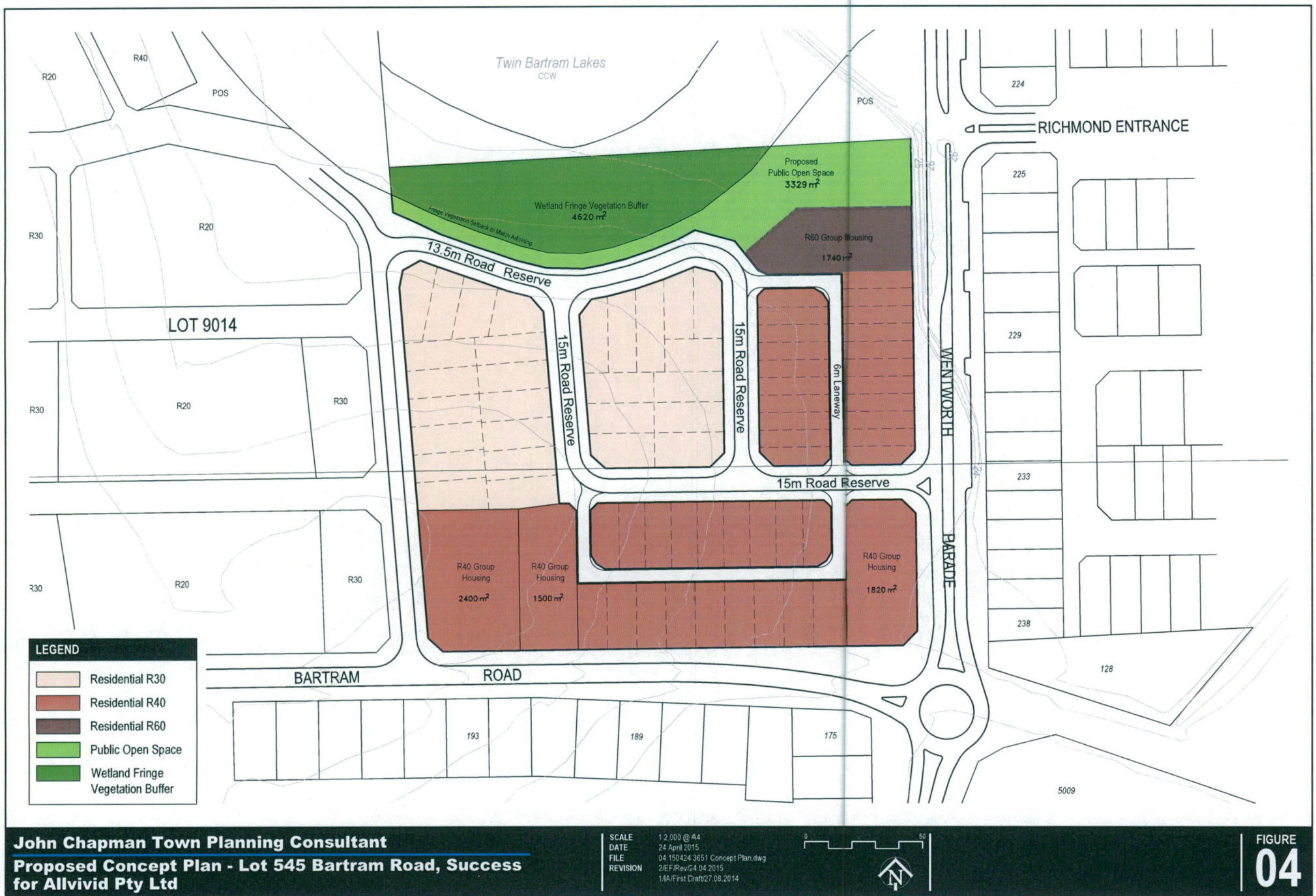
As stated in the City's Structure Plan Information Sheet, a structure plan is generally required for land that is comprised of fragmented land ownership patterns or other broader issues which need to be appropriately dealt with through a coordinated structure planning process.

The subject site is in single land ownership and is not considered to possess any issues necessitating a structure plan to guide future subdivision and development. Furthermore, TPS3 applies a density code of R20 to the subject site, therefore restricting any potential structure plan from proposing residential development at a density higher than R20.

It is therefore proposed that the subject site be removed from DA14 due to the abovementioned reasons, and rezoned to a range of residential densities, with associated public open space and local roads, to provide for a variety of housing types to be developed which cater to a diverse demographic and aid in accommodating the State's growing population.

Refer **Figure 5**, existing TPS3 zoning.

Refer **Appendix 2**, scheme amendment map to be adopted.



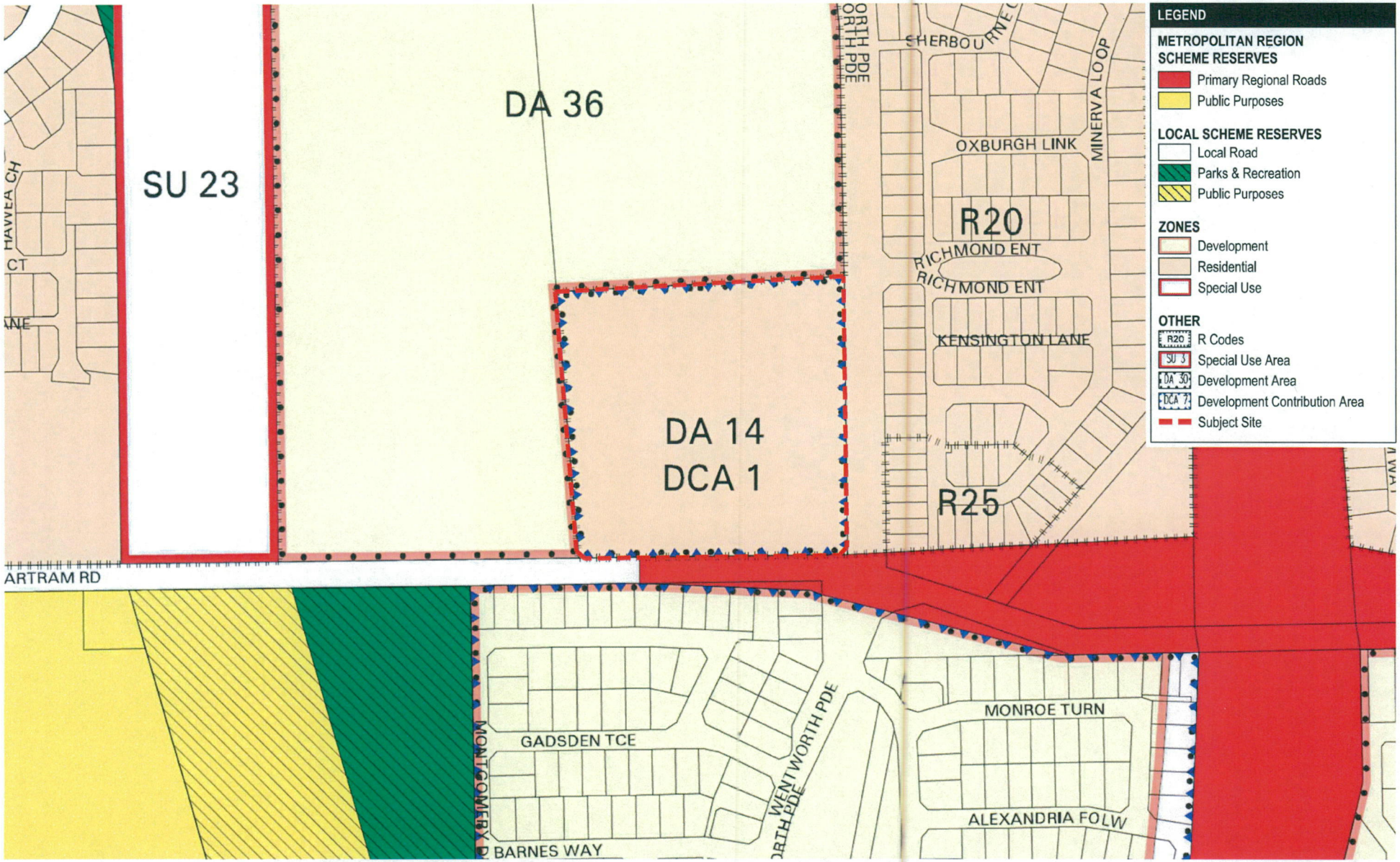
John Chapman Town Planning Consultant

Proposed Concept Plan - Lot 545 Bartram Road, Success for Allvivid Pty Ltd

SCALE 1:2,000 @ A4
DATE 24 April 2015
FILE 04 150424 3651 Concept Plan.dwg
REVISION 2/EF/Rev/24.04.2015
1/IA/First Draft/27.08.2014

0 50

FIGURE 04



PLANNING SOLUTIONS
URBAN & REGIONAL PLANNING

SCALE	1:2,000 @ A4
DATE	28 August 2014
FILE	05 140828 3651 Existing TPS.dwg
REVISION	1/IA/First Draft/28.08.2014

0 50

EXISTING TOWN PLANNING SCHEME NO. 3 ZONING

LOT 545 (77) BARTRAM ROAD
SUCCESS, WESTERN AUSTRALIA

FIGURE 05

3.1 Residential

The concept plan of subdivision (**Figure 4**) proposes the subject site be developed predominantly for single residential development, with three grouped housing sites. The densities proposed include R30, R40 and R60.

The proposed increase in residential densities from the R20 density zoning currently applicable to the subject site is in accordance with the State's strategic planning documents, which advocate increase housing diversity, adaptability, affordability and choice. The provision of a range of densities will provide for a diverse range of housing and lot product.

3.2 Parks and Recreation

An area of public open space (**POS**) is provided in the north-eastern corner of the subject site, and extends along the northern boundary of the lot. The portion of POS will comprise a minimum 10% of the subject site, in accordance with the contribution requirement as specified in the Western Australian Planning Commission's (**WAPC**) *Liveable Neighbourhoods* Operational Policy. The proposed area of POS is proposed to be reserved as Parks and Recreation under TPS3.

A 50m Wetland Fringe Vegetation Buffer surrounds the Twin Bartram Lakes located to the north of the subject site. Portion of the wetland buffer is contained within the subject site, and is also proposed to be reserved as Parks and Recreation under TPS3.

3.3 Local Roads

Residential development within the subject site will be accessed via a network of Local Roads, to be reserved under TPS3.

The key Access Street to the site will be provided from Wentworth Parade, which will form the basis for the internal road network. An Access Street off Bartram Road is proposed as part of the Twin Bartram LSP, which will also provide access to the subject site.

4 Strategic planning framework

4.1 Directions 2031 and Beyond

Directions 2031 and Beyond (**Directions 2031**) is the overarching spatial framework and strategic plan that establishes a vision for the future growth of the Perth and Peel region. It provides the framework to guide detailed planning and delivery of housing, infrastructure and services for a variety of growth scenarios. A medium density 'Connected City' model is put forward as the preferred means to achieve a liveable, prosperous, accessible, sustainable and responsible city.

In relation to the proposed scheme amendment, Directions 2031 promotes a diversity of dwelling types and increases in choice, for residential areas. Directions 2031 seeks to address population growth scenarios and land use patterns for the medium to long-term increase of more than half a million people in Perth and Peel by 2031, as well as being prepared to provide for a city of 3.5 million people after 2050.

Due to the size and complexity of strategic planning for the metropolitan area, sub-regional strategies are prepared to provide guidance at the local level.

4.2 Draft Outer Metropolitan Perth and Peel Sub-regional Strategy

The Draft Outer Metropolitan Perth and Peel Sub-Regional Strategy (**Sub-Regional Strategy**) is a strategic planning document intended to guide the delivery of objectives of Directions 2031. The subject site is contained within the South-West sub-region identified within the Sub-Regional Strategy. The South-West sub-region is expected to supply 119,760 dwellings under the adopted 'Connected City' scenario, with the City of Cockburn contributing 18,280 dwellings through the development of Greenfield sites.

The subject site is identified as 'urban zoned undeveloped'. The proposed scheme amendment will facilitate the provision of a range of housing and lot product within the subject site, contributing to the City's required 18,280 additional dwellings from Greenfield sites. The range of densities proposed will provide a variety of housing options within the subject area, catering to a diverse demographic.

5 Statutory planning framework

5.1 Metropolitan Region Scheme

The subject site is zoned Urban under the provisions of the Metropolitan Region Scheme (**MRS**). The proposed development is consistent with the provisions of the MRS.

Refer **Figure 6**, MRS Zoning.

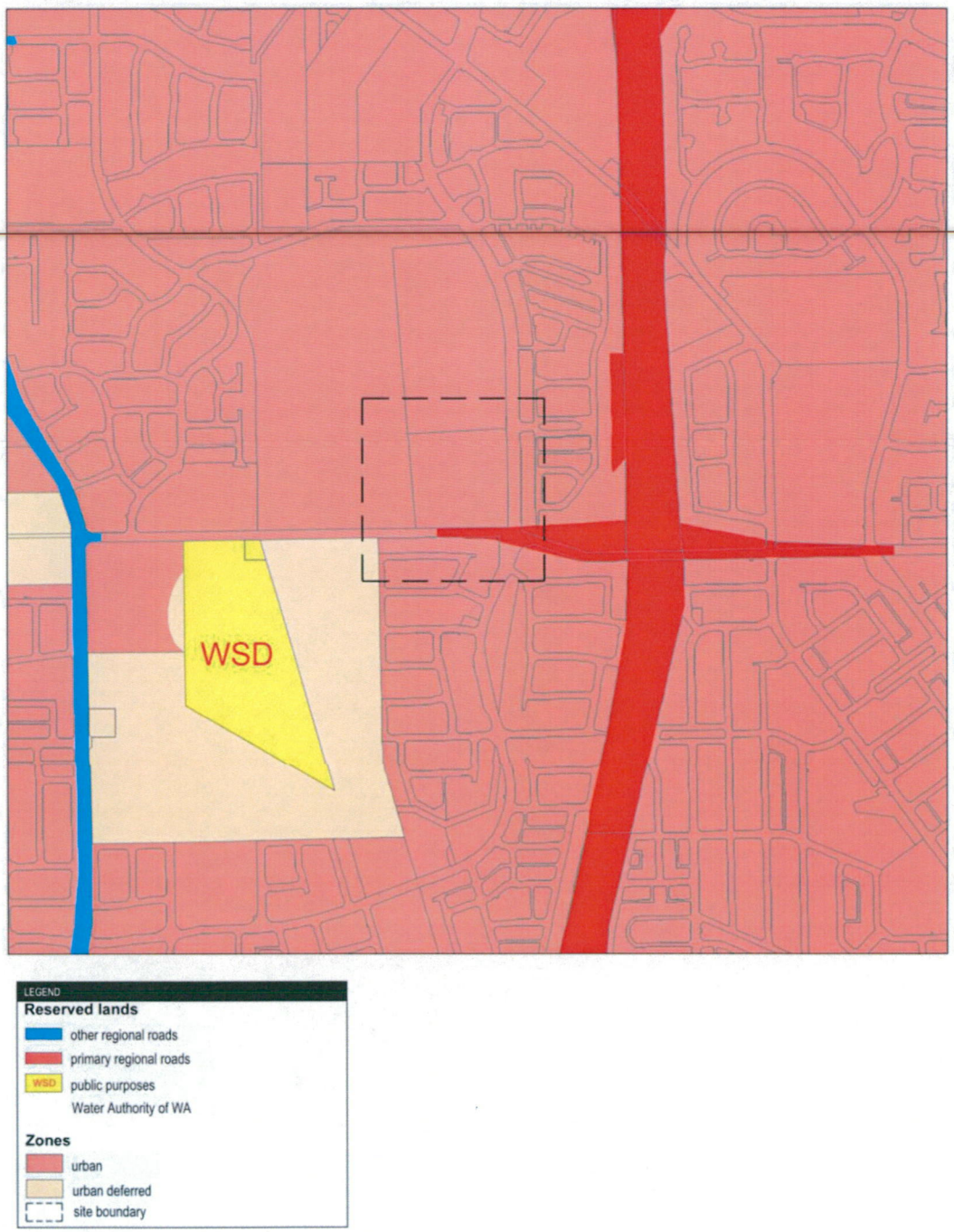


Figure 6 – MRS Zoning

5.2 City of Cockburn Town Planning Scheme No. 3

The subject site is currently zoned Residential R20 under the City's Town Planning Scheme No. 3 (**TPS3**), and is also contained within Development Area 14 (**DA14**). As previously discussed, the proposed Local Planning Scheme Amendment seeks to remove the subject site from DA14, with the site being zoned Residential with densities range from R30 to R60. A portion of the land will be reserved as Parks and Recreation for the provision of POS, and the remainder will be reserved Local Road.

Clause 4.2.1(a) of TPS3 states the objectives of the Residential zone to be:

> *To provide for **residential** development at a range of densities with a variety of housing to meet the needs of different household types through the application of the Residential Design Codes.*

The proposed development of the land for residential purposes at a range of densities will be facilitated through the proposed scheme amendment to rezone the land to the Residential zone. The subject site is to be developed with a mix of single houses and grouped dwellings, both of which are 'P' uses within the Residential zone, meaning they are permitted by TPS3 providing the use complies with the relevant development standards and requirements of the Scheme.

Refer **Figure 5**, existing TPS3 zoning.

The subject site also falls within the Success North Development Contribution Area No. 1 (**DCA1**). Schedule 12 of TPS3 establishes the provisions for Development Contribution Plans for each Development Contribution Area. A Development Contribution Plan will be prepared in due course in accordance with the requirements set out in TPS3.

6 Amendment Justification

The proposed rezoning will rectify an anomaly within TPS3, whereby the future subdivision and development of the site is to be guided by an agreed structure plan, however the structure plan may not propose any density above R20. It is considered that the subject site does not possess any issues requiring a structure plan to guide the coordinated development of the land, and it may be subdivided and developed in accordance with the proposed rezoning, allowing for a variety of lot and dwelling types to be provided for the growing population of the locality.

The proposed range of residential densities is consistent with the existing strategic planning framework which seeks to maximise the efficient use of land, particularly within existing urban areas and in close proximity to Activity Centres and rapid transit nodes (i.e. heavy passenger rail).

The proposed amendment will secure a buffer to the Twin Bartram Lakes conservation category wetland through the reservation of the land as part of the scheme amendment proposal. The proposed amendment is also consistent with the development of the adjoining site which is to be facilitated by the Twin Bartram LSP.

Preliminary liaison with the City of Cockburn and Department of Planning has indicated in-principle support for the proposed scheme amendment on the basis there does not appear to be any planning issues on the subject site that would need to be resolved through a detailed structure planning process.

Notwithstanding this, a detailed concept plan of subdivision (**Figure 4**) and explanatory report (**Appendix 3**) has been prepared in support of this scheme amendment request.

7 Conclusion

It is considered the proposed amendment to TPS3 should be initiated, recognising the proposed amendment will allow for the forward planning for future development of the subject site.

In summary, the proposed amendment is justified and considered appropriate for the following reasons:

1. The proposal is consistent with the strategic planning framework at both State and local levels.
2. The proposal rectifies an anomaly within the City's TPS3 whereby the subject site is contained within a Development Area and restricted by a density coding of R20.
3. The proposal will allow the land to be developed in a manner that will contribute positively to the locality.

In light of the information presented within this report and the attached Explanatory Report associated with the rezoning of the subject site under TPS3, it is respectfully requested that the City of Cockburn initiate the proposed scheme amendment for the purposes of public advertising and to subsequently grant final approval, without modification.

PLANNING AND DEVELOPMENT ACT, 2005

CITY OF COCKBURN

TOWN PLANNING SCHEME NO. 3

AMENDMENT NO. 106

The City of Cockburn under and by virtue of the powers conferred upon in that behalf by the Planning and Development Act 2005, hereby amend the above Town Planning Scheme by:

1. Rezoning parts of Lot 545 Bartram Road, Success from 'Residential R20' to comprise the zones of 'Residential R30', 'Residential R40' and 'Residential R60' as depicted on the Scheme Amendment Map.
2. Reserving parts of Lot 545 Bartram Road, Success as 'Local Road' and 'Parks & Recreation' as depicted on the Scheme Amendment Map.
3. Remove Lot 545 Bartram Road from Development Area 14.
4. Amend the Scheme Map accordingly.

ADOPTION

Adopted by resolution of the Council of the City of Cockburn at the ordinary meeting of the Council held on 13th day of November 2014 .

MAYOR

CHIEF EXECUTIVE OFFICER

FINAL APPROVAL

Adopted for final approval by resolution of the City of Cockburn at the ordinary meeting of Council held on the 14th day of May 2015 , and the Common Seal of the Municipality was pursuant to that resolution hereunto affixed in the presence of:

MAYOR

28/5/2015
DATE

CITY OF COCKBURN COMMON SEAL VIAS • TUTAS • CUPIMUS

(Seal)

CHIEF EXECUTIVE OFFICER

26/5/15
DATE

RECOMMENDED/SUBMITTED FOR FINAL APPROVAL BY THE WESTERN AUSTRALIAN PLANNING COMMISSION

DELEGATED UNDER s16 PLANNING AND DEVELOPMENT ACT 2005

DATE

FINAL APPROVAL GRANTED

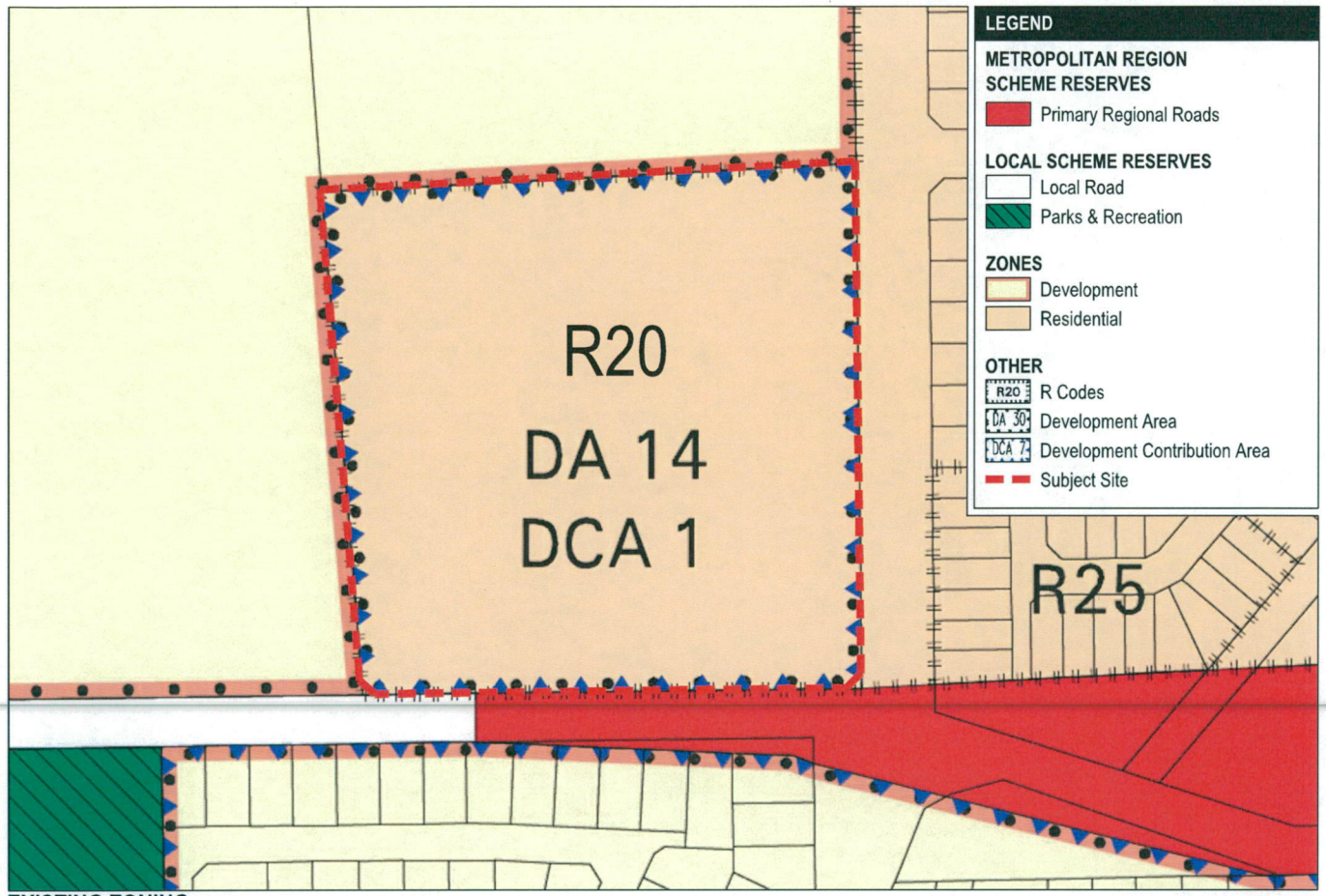
MINISTER FOR PLANNING

DATE

It is hereby certified that this is a true copy of the Scheme Amendment, final approval to which was endorsed by the Minister for Planning on 3/2/16.

Certified by .....

Officer of the Commission Duty authorised pursuant to Section 24 of the Planning and Development Act 2005 and Regulation 32(3) Scheme and Regulation 63(3) (Amendment) of the Planning and Development (Local Planning Scheme) Regulations 2015.



EXISTING ZONING

PROPOSED ZONING

PLANNING SOLUTIONS
URBAN & REGIONAL PLANNING

SCALE	1:3,000 @ A4
DATE	14 January 2016
FILE	160114 3651 Existing & Proposed Zoning Map.dwg
REVISION	3:EF/Rev/14.01.2016
	2:EF/Rev/24.04.2015
	1:IA/First Draft/27.08.2014

0 50 100

EXISTING & PROPOSED ZONING MAP

LOT 545 (77) BARTRAM ROAD
SUCCESS, WESTERN AUSTRALIA

 BASEPLAN SOURCE:

Appendix 1
Certificate of Title

WESTERN AUSTRALIA

REGISTER NUMBER	
545/DP251029	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
N/A	N/A

RECORD OF CERTIFICATE OF TITLE

UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 2020 FOLIO 192

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 545 ON DEPOSITED PLAN 251029

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

WILLIAM BEISLEY
JEANETTE ANN BEISLEY
BOTH OF BARTRAM ROAD, JANDAKOT
AS TENANTS IN COMMON IN EQUAL SHARES

(T F719080) REGISTERED 2 NOVEMBER 1994

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.

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----------

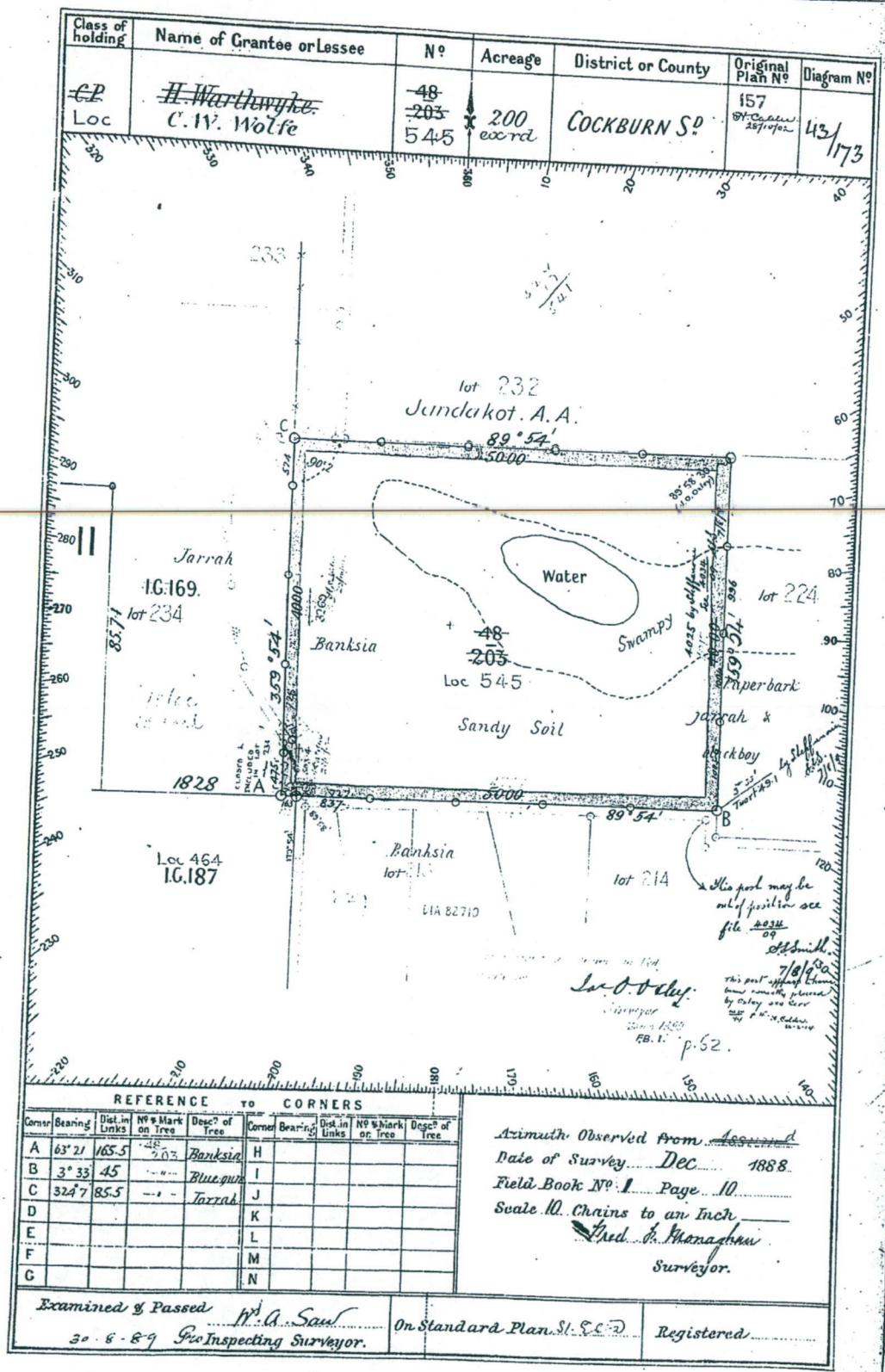
STATEMENTS:

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.

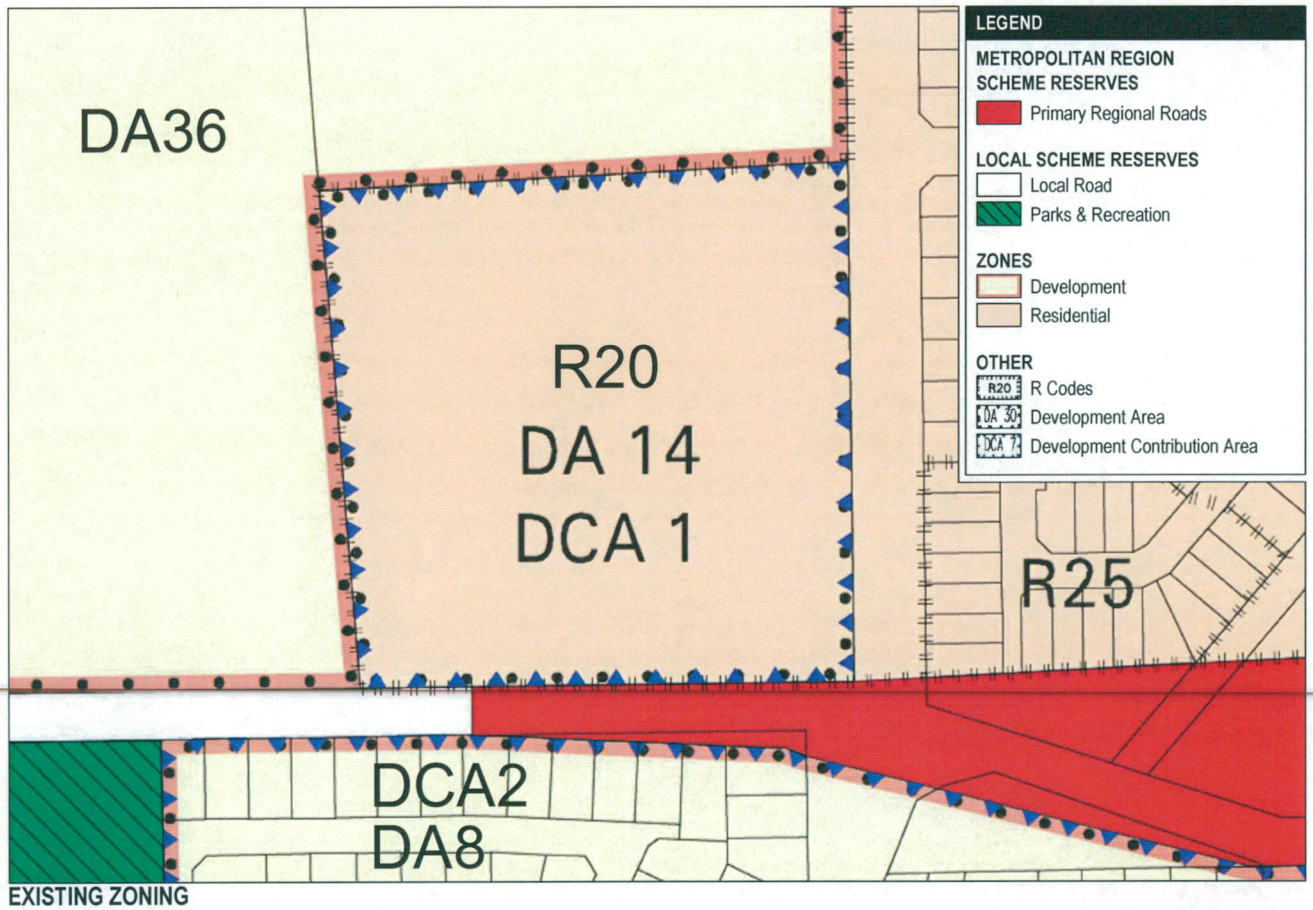
SKETCH OF LAND: 2020-192 (545/DP251029).
PREVIOUS TITLE: 1218-484.
PROPERTY STREET ADDRESS: 77 BARTRAM RD, SUCCESS.
LOCAL GOVERNMENT AREA: CITY OF COCKBURN.

NOTE 1: A000001A LAND PARCEL IDENTIFIER OF COCKBURN SOUND LOCATION 545 (OR THE PART THEREOF) ON SUPERSEDED PAPER TITLE CHANGED TO LOT 545 ON DEPOSITED PLAN 251029 ON 4.9.2002 TO ENABLE ISSUE OF A DIGITAL 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.



Appendix 2
Amendment plan



EXISTING ZONING

PROPOSED ZONING

PLANNING SOLUTIONS URBAN & REGIONAL PLANNING

SCALE	1:3,000 @ A4
DATE	06 October 2014
FILE	141006 3651 Existing & Proposed Zoning Map.dwg
REVISION	2/IA/Rev/06.10.2014 1/IA/First Draft/27.08.2014

0 50 100

EXISTING & PROPOSED ZONING MAP

LOT 545 (77) BARTRAM ROAD
SUCCESS, WESTERN AUSTRALIA

Appendix 3
Explanatory report in support of the proposed amendment

PLANNING SOLUTIONS

URBAN & REGIONAL PLANNING

Explanatory Report

Lot 545 (77) Bartram Road Success

Prepared for
Allvivid Pty Ltd

October 2014

Executive Summary

This Explanatory Report is prepared in support of the proposed local planning scheme amendment to the City of Cockburn's Town Planning Scheme No. 3 (**TPS3**), applying to Lot 545 Bartram Road, Success (**subject site**).

The justification and rationale for the proposed mix of residential densities, street block and road layout, positioning of Public Open Space and associated wetland buffers is contained within this Explanatory Report, with details provided on the planning background, site conditions and proposed concept plan. It provides the statutory planning mechanisms and supporting technical studies to facilitate a medium density residential community within the subject site.

The local planning scheme amendment will aid in fulfilling the State Government strategic direction in relation to housing supply. It will form a natural extension of residential housing proposed to the west, and existing to the south and east of the site, and will provide an appropriate interface with the Twin Bartram Swamp to the north.

The proposed local planning scheme amendment is intended to provide the statutory framework to achieve the subdivision and development of the subject site into approximately 70 single residential lots and 3 grouped housing lots. **Table (i)** below provides a summary of the proposed development of the subject site.

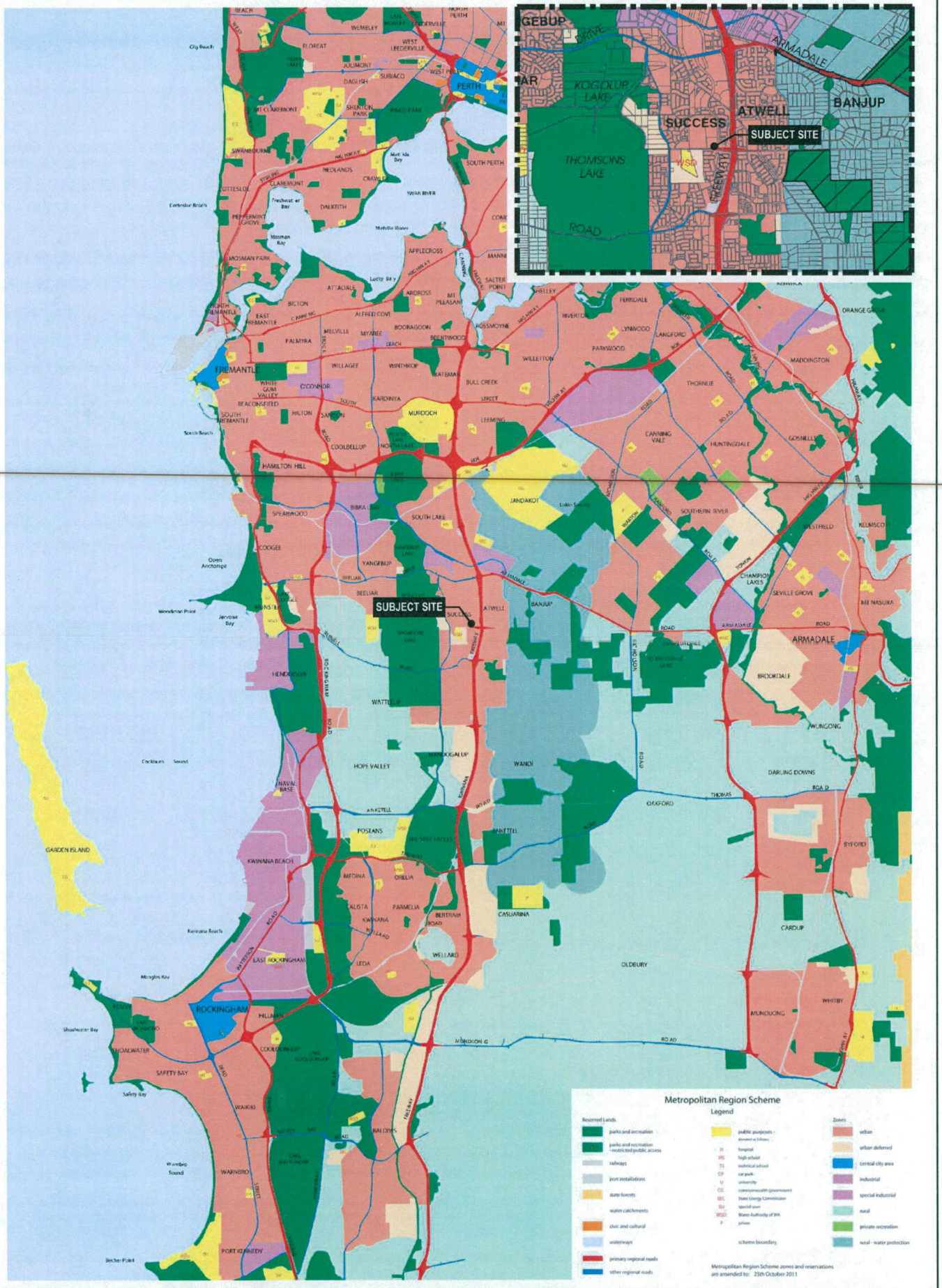
Table (i) – Scheme Amendment Explanatory Report Summary

Item	Data	Report reference
Total area covered by the local planning scheme amendment	4.5401 hectares	
Area of each land use proposed: • Residential • Parks and Recreation (includes Public Open Space and Wetland Fringe Vegetation Buffer) • Local Road	 2.98 hectares 0.79 hectares 0.77 hectares	
Estimated lot yield	75 lots	Section 3.3
Estimated number of dwellings	99 dwellings	Section 3.3
Estimated residential site density	25 dwellings per site hectare	Section 3.3
Estimated population (assumes 2.8 avg household size)	277 people approximately	Section 3.3
Number of high schools	0 high schools	N/A
Number of primary schools	0 primary schools	N/A
Estimated commercial floor space (for activity centres if appropriate)	0 net lettable area	N/A
Employment self sufficiency targets	0 jobs ÷ 0 workers = 0%	N/A
Estimated number and % of public open space: • Regional open space • District open space • Neighbourhood park • Restricted Open Space (Wetland Fringe Vegetation Buffer)	 0 hectares 0% 0 hectares 0% 0.3329 hectares (1 park) 0.4620 hectares	Section 3.2
Estimated number and area of natural area and biodiversity assets	0 sites, 0 hectares	N/A

Appendices

Project Details		
Job number	3651	
Client	Allvivid Pty Ltd c/o John Chapman Town Planning Consultant	
Prepared by	Planning Solutions	
Consultant Team	Traffic Engineering Environmental Bushfire Civil Engineering	Transcore Bowman & Partners Environmental FirePlan WA Development Engineering Consultants

Planning Solutions Document Control		
Revision number	File name	Document date
Rev 0	140901 3651 Explanatory Report (Appendix 3)	1 September 2014
Rev 1	141013 3651 Explanatory Report (Appendix 3) - Rev 1	13 October 2014



PLANNING SOLUTIONS URBAN & REGIONAL PLANNING

SCALE	1:200,000 @ A4
DATE	24 June 2014
FILE	01 140624 3651 Regional Context.dwg
REVISION	1/NK/First Draft/24.06.14

0 5,000

REGIONAL CONTEXT
LOT 545 (77) BARTRAM ROAD
SUCCESS
WESTERN AUSTRALIA

FIGURE 01

PLANNING SOLUTIONS URBAN & REGIONAL PLANNING

SCALE	1:4,000 @ A4
DATE	24 June 2014
FILE	03 140624 3610 Aerial Photo.dwg
REVISION	1/NK/First Draft/24.06.2014

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AERIAL PHOTOGRAPH
LOT 545 (77) BARTRAM ROAD
SUCCESS
WESTERN AUSTRALIA

FIGURE 03

City of Cockburn Town Planning Scheme No. 3

The subject site is currently zoned Residential R20 under the City's Town Planning Scheme No. 3 (**TPS3**), and is also contained within Development Area 14 (**DA14**). The proposed Local Planning Scheme Amendment seeks to remove the subject site from DA14, with the site being zoned Residential with densities ranging from R30 to R60. A portion of the land will be reserved for Public Open Space (**POS**).

Clause 4.2.1(a) of TPS3 states the objectives of the Residential zone to be:

> *To provide for **residential** development at a range of densities with a variety of housing to meet the needs of different household types through the application of the Residential Design Codes.*

The proposed development of the land for residential purposes at a range of densities will be facilitated through the proposed scheme amendment to rezone the land to the Residential zone. The subject site is to be developed with a mix of single houses and grouped dwellings, both of which are 'P' uses within the Residential zone, meaning they are permitted by TPS3 providing the use complies with the relevant development standards and requirements of the Scheme.

Refer **Figure 5**, existing TPS3 zoning.

The subject site also falls within the Success North Development Contribution Area No. 1 (**DCA1**). Schedule 12 of TPS3 establishes the provisions for Development Contribution Plans for each Development Contribution Area. A Development Contribution Plan will be prepared in due course in accordance with the requirements set out in TPS3.

1.3.2 Planning strategies

Directions 2031 and Beyond

Directions 2031 and Beyond (**Directions 2031**) is the overarching spatial framework and strategic plan that establishes a vision for the future growth of the Perth and Peel region. It provides the framework to guide detailed planning and delivery of housing, infrastructure and services for a variety of growth scenarios. A medium density 'Connected City' model is put forward as the preferred means to achieve a liveable, prosperous, accessible, sustainable and responsible city.

In relation to the proposed scheme amendment, Directions 2031 promotes a diversity of dwelling types, and increases in choice, for residential areas. Directions 2031 seeks to address population growth scenarios and land use patterns for the medium to long-term increase of more than half a million people in Perth and Peel by 2031, as well as being prepared to provide for a city of 3.5 million people after 2050.

Due to the size and complexity of strategic planning for the metropolitan area, sub-regional strategies are prepared to provide guidance at the local level.

Draft Outer Metropolitan Perth and Peel Sub-regional Strategy

The Draft Outer Metropolitan Perth and Peel Sub-Regional Strategy **(Sub-Regional Strategy)** is a strategic planning document intended to guide the delivery of objectives of Directions 2031. The subject site is contained within the South-West sub-region identified within the Sub-Regional Strategy. The South-West sub-region is expected to supply 119,760 dwellings under the adopted 'Connected City' scenario, with the City of Cockburn contributing 18,280 dwellings through the development of greenfield sites.

The subject site is identified as 'urban zoned undeveloped'. The proposed yield of approximately 100 dwellings within the subject site will contribute to the City's required 18,280 additional dwellings from greenfield sites. The range of densities proposed will provide a variety of housing options within the subject area, catering to a diverse demographic.

1.3.3 Policies

State Planning Policies

SPP 1 – State Planning Framework Policy

State Planning Policy 1 – State Planning Framework Policy (**SPP 1**) brings together existing State regional policies, strategies and guidelines within a central framework to provide the context for decision making on land use and development in Western Australia. The policy notes that the primary aim of planning is to provide for the sustainable use and development of land. Development of the subject site with a range of residential densities will aid in accommodating future population growth and provide housing choice and diversity to suit the needs of different households, contributing towards more sustainable communities. The proposed scheme amendment to rezone the subject site to Residential with a range of density coding is consistent with the intent of SPP1.

SPP 2 – Environment and Natural Resources Policy

State Planning Policy 2 – Environment and Natural Resources Policy (**SPP 2**) defines the principles and considerations that represent good and responsible planning in terms of environment and natural resource issues within the framework of the State Planning Strategy. Policy measures of particular relevance to the subject site include soil and land quality, biodiversity, landscapes, greenhouse gas emissions and energy efficiency.

SPP 2.9 – Water Resources

State Planning Policy 2.9 – Water Resources (**SPP 2.9**) is directly related to the overarching sector policy SPP 2 and provides clarification and additional guidance to planning decision-makers for consideration of water resources in land use planning strategy. An aim of SPP 2.9 is to prevent the removal of associated native vegetation important for long-term management of the water resource, particularly vegetation associated with wetlands and waterways. A 50m Wetland Fringe Vegetation Buffer is provided around the Twin Bartram Swamp to minimise the impact of proposed residential land uses on the wetland, in accordance with the WAPC's Guideline for the Determination of Wetland Buffer Requirements (Draft).

The proposed pedestrian path system seamlessly integrates with the existing path system and proposed path system of the adjoining landholding. Due to the low traffic volumes expected within the subject site it is reasonable to assume that cyclists and vehicles can safely share the road environment.

The concept plan is compliant with the requirements of Element 2.

Element 3 – Lot Layout

The concept plan proposes the creation of approximately 70 single residential lots and 3 grouped housing sites. The development of lots adjacent to proposed POS will be designed such that dwellings address and provide surveillance of the POS.

The concept plan proposes a range of lot sizes, with higher densities appropriately located adjacent to the natural amenity afforded by the POS and Twin Bartram Lakes. The proposed street network provides a high level of internal connectivity and good external linkages for vehicle, pedestrian and bike movements.

The concept plan complies with the requirements of Element 3.

Element 4 – Public Parkland

The land to be reserved for 'Parks & Recreation' under TPS3 abuts the Twin Bartram Lakes Wetland Fringe Vegetation Buffer, and portion of the POS proposed as part of the adjoining Twin Bartram LSP. The proposed POS will provide for the recreational and social needs of the local community, as well as protecting the Twin Bartram wetland.

The proposed POS will enhance the amenity of the local area and will be overlooked by proposed nearby residential development.

The concept plan complies with the requirements of Element 4.

Element 5 – Urban Water Management

Stormwater generated by impervious structures introduced to the land by residential development will be managed in accordance with the principles of *Better Urban Water Management (WAPC 2008)*.

It is intended that an Urban Water Management Plan (**UWMP**) will be prepared at the subdivisional stage in the usual manner.

Element 6 – Utilities

Future lots within the subject site will be serviced by power, water, sewer and telecommunications in accordance with the requirements of the service providers.

Local Planning Policies

The City has a number of Local Planning Policies (**LPP**) that are applicable to the future subdivision and development of the subject site. These LPP's include:

- LPP APD4: Public Open Space

2 Site conditions and constraints

2.1 Biodiversity and natural area assets

The subject site is the remaining parcel of land in the immediate locality to be planned and developed. Land to the east and south has bene developed for residential purposes some time ago. The land to the immediate west is subject to an existing planning proposal and its development for urban purposes is understood to be imminent.

As a result of this context the subject site is in a heavily degraded condition due to historical rural uses. The subject site has only limited environmental values, and its development to urban land use will not compromise, local, district and regional objectives for conservation.

The most important local environmental resources is Twin Bartram Swamp which is located to the immediate north of the subject site. Twin Bartram Swamp will be separated from urban development by a wetland buffer which has a boundary position and alignment within the subject site which is consistent with setbacks for adjacent land established in the endorsed Twin Bartram Swamps Local Structure Plan.

The land does not present any environmental constraints which cannot be satisfactorily managed.

Refer **Figure 6**, Vegetation condition.

Refer **Appendix B** for a full copy of the environmental report

2.2 Landform and soils

The land falls from its south-west corner to the north and north east and ranges in elevation from approximately 30m AHD to 26m AHD.

The land is located within the Bassendean Dune System of the Swan Coastal Plain, which comprises sand plains with low dunes and occasional swamps and iron or humus podzols.

The site is mapped as low to moderate risk of acid sulphate soils therefore investigation of surface soils in accordance with Department of Environmental Regulation guidelines will be established in the event that any dewatering for sewer or water service installation or other deep soil excavation below 3m is proposed.

Refer **Figure 7**, Topography.

2.3 Groundwater and surface water

Stormwater management in accordance with the principles of better urban water management will protect local water resources from potential impacts from urban development of the land. The historical use of the land for rural purposes associated with the keeping of stock, indicates that there is negligible risk that the site has any contamination within soil or groundwater.

The Perth Groundwater Atlas (Department of Environment, 2004) indicates that the water table of the superficial aquifer was located at 23.1 m AHD at May 2003 and that the local groundwater flow direction is in an approximate south–west direction. Comparison of this date to the surface topography indicates the water table is located at approximately 3 m below ground level in the north of the site and approximately 7 m below ground level in the south of the site.

2.4 Bushfire hazard

A Bushfire Management Plan (**BMP**) has been prepared for the subject site by FirePlan WA (refer **Appendix C** – Bushfire Management Plan). The methodology outlined in the *Planning for Bushfire Protection Guidelines* has been used for classifying the bushfire hazard for the subject site. Due to the swamp/wetland and woodland/shrubland type of vegetation being located within and adjoining the subject site, and the bushfire hazard rating for the site is rated as "Moderate-Extreme", the subject site is considered to be in a Bushfire Prone Area (**BPA**) and as such AS3959 *Construction of Buildings within a Bush Fire Prone Area* will apply to all new habitable buildings as defined in the Building Code of Australia and/or State Planning policy 3.7 or revised *Planning for Bush fire Protection Guidelines*.

The potential bushfire issues that have been identified for the subject site are:

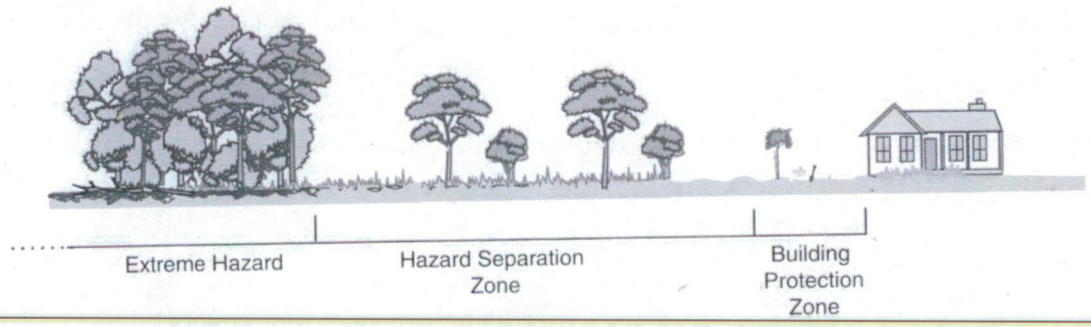
1. Fuel loads in the wetland/buffer vegetation within the site.
2. Maintaining the POS to the Building Protection Zone (**BPZ**) standard.
3. Increased construction standard in accordance with AS3959 for new habitable buildings.

Hazard Management on the lots will be controlled by:

1. Compliance with the annual City of Cockburn Fire Control Notice (Landowner responsibility).
2. The POS and Road Reserve to be managed to the BPZ standard.

3. Proposed new habitable buildings within 100m of the wetland buffer are to be constructed in accordance with AS3959 (Landowner responsibility).
4. A minimum 22m BPZ to include a 2m setback within the front setback of the lot, the road reserve and POS to the edge of the wetland buffer.

The diagram below provides an indicative layout of the interface between the wetland and dwellings, with the BPZ to fulfil the requirements set out in the attached BMP.



Where the setback including a 2m setback at the front of the proposed lots, the road reserve and the POS to the edge of the wetland buffer is between 22.1m and 31m, the building within the lot is to be constructed to AS3959-2009 Bushfire Attack Level (**BAL**) 19 standards. This includes lots 7-10 and 20-24.

Where the setback measured from the walls of the building to the edge of the wetland buffer is between 31.1m and 100m the building within the lot is to be constructed to AS3959-2009 BAL 12.5. This includes lots 2-6, 11-15, 17-19, 25-29 and 32-46.

Refer **Figure 8**, Indicative BAL ratings adjoining wetland buffer.

2.5 Heritage

The Department of Aboriginal Affairs online Aboriginal Heritage Inquiry System was investigated to reveal known heritage concerns in or surrounding the subject site. The results of the online heritage database searches revealed that the following 'Registered Aboriginal Sites' occur in the vicinity of the subject site:

- Site ID – 3429 – Bartram Road Swamps – Artefacts/Scatter, Mythological; and
- Side ID – 15934 – Thompsons Lake 01 – Type not disclosed.

The Bartram Road Swamps site is identified to the north-west of the subject site and the Thompsons Lake 01 site is located to the south-east of the subject site, and will not be impacted by development of the subject site.

A search of the State Heritage Office inHerit database indicates that there are no European heritage listed places within or surrounding the subject site.

3 Concept plan

3.1 Land use

The proposed scheme amendment will provide for residential land uses, consistent with the intent of the Urban MRS zoning of the subject site. The proposed amendment will facilitate the development of single houses and grouped dwellings across the subject site, designating the following zones, R-Codes densities and local scheme reserves to the subject site:

Zones and Residential Design Codes Densities

- Residential (R30)
- Residential (R40)
- Residential (R60)

Local Scheme Reserves

- Parks and Recreation
- Local Road

The proposed low and medium density residential zonings integrate and are consistent with the existing and future character of the locality.

The proposed area of POS to be reserved Parks and Recreation is located along the northern boundary of the subject site, and will form an extension of the POS proposed to be located on the adjoining lot as part of the Twin Bartram LSP. The location of this POS will allow residents to access the amenity of the Twin Bartram Swamp wetland environment to the north of the subject site.

The proposed lot layout and associated road network is responsive to the existing characteristics of the subject site and surrounding context. All lots proposed are of a suitable size to accommodate modern dwelling development and are generally rectangular in shape with a greater depth than width to maximise private space and economy of street frontage. Access to the subject site from the existing road network will be via new road connections off Wentworth Parade and Bartram Road.

Refer **Figure 9**, concept plan.

3.2 Open space

The Twin Bartram LSP proposes an area of POS in the south-eastern corner of adjoining Lot 9015. The area of POS proposed as part of this scheme amendment will integrate with the adjoining POS, creating a larger space suitable for passive and active recreational purposes. The proposed POS will integrate into the Wetland Fringe Vegetation Buffer along the northern boundary of the site, and provide access to the amenity of the wetland environment. The proposed POS will be reserved Parks and Recreation under TPS3.

The Wetland Fringe Vegetation Buffer surrounding the Twin Bartram Swamp will also be zoned Parks and Recreation under the provisions of TSP3. In accordance with LN, the wetland buffer shall be ceded to the Crown free of cost and without payment of compensation by the Crown in addition to the POS contribution. The area of the wetland buffer is deducted from the gross subdivisible area on which the POS contribution is determined.

The proposed concept development plan provides 3,329m^2 of POS, classed by LN as a Neighbourhood Park. As the proposed POS is adjacent to POS proposed in the Twin Bartram LSP, a total usable area of over 5,000m^2 may potentially be provided.

The total proportion of POS provided is 10% of the gross subdivisible area – refer **Table 2**, Public Open Space Schedule. This is in accordance with LN's minimum requirement for 10% of the gross subdivisible area being provided as POS.

Table 2 – Public Open Space Schedule

Subject site			**4.5401**
Less Deductions			
Surplus (non-creditable restricted POS)	0.3788		
Total Deductions		0.3788	
Gross Subdivisible Area			**4.1613**
Public Open Space @ 10%			**0.4161**
Public Open Space Contribution			
May comprise:			
Minimum 80% unrestricted POS		0.3329	
Maximum 20% restricted POS		0.0832	0.4161
Unrestricted Public Open Space			
Proposed POS		0.3329	
Total Unrestricted			**0.3329**
Restricted Public Open Space			
Wetland Vegetation Buffer (maximum 20% creditable restricted use)		0.0832	
Total Restricted			0.0832
Total Public Open Space Provision			**0.4161**
Public Open Space Percentage Contribution			**10.0%**

Assuming an average household size of approximately 2.8 based on current and future trends within Success, the estimated population within the subject site equates to approximately 277 people.

The increase in residential densities is in accordance with objectives of Directions 2031 and the Outer Metropolitan Perth and Peel Sub-Regional Strategy, which advocate increased housing diversity, adaptability, affordability and choice. The design is in accordance with the 'connected city' scenario which provides for the high population growth trending in the surrounding area. The concept development plan for the scheme amendment has been prepared in accordance with LN design principles and provides for increased residential densities in areas of high amenity. The total site area, excluding the wetland buffer is 4.0781 hectares, resulting in an overall density of 25 dwellings per hectare. This exceeds Directions 2031 Urban Density requirement of a minimum 15 dwellings per hectare in new development areas.

3.4 Movement networks

A Transport Assessment has been prepared by Transcore to address the transport implications of the proposed scheme amendment, including estimated traffic generation and resultant traffic patterns on the surrounding road network. The Transport Assessment also includes a capacity analysis of the proposed access system within the subject site, and the key local intersections, as well as providing recommendations for any traffic management measures that may be required to ensure satisfactory traffic operations.

Refer **Figure 10**, movement network.

Refer **Appendix D** for the complete Transport Assessment.

3.4.1 Road hierarchy

Traffic projections for the subject site show that, in accordance with LN, internal roads can be classified as Access Street D and Laneway.

The typical road reserve for Access Street D entails a width of 14.2m with 6.0m wide trafficable carriageway pavement and 4.1m wide verges on both sides. If fronting POS, the access street verge can be reduced to 1.0m, as is the case with the northernmost internal road fronting the proposed POS reserve. The maximum desirable traffic volume for this type of road is 1,000 vehicles per day (**vpd**). These roads are capable of accommodating embayed visitor parking. Public parking in the form of embayed bays is also recommended within the western side of Wentworth Parade along the subject site to mirror the existing parking on the eastern side of the road.

The typical road reserve for Laneways entails a 6m wide trafficable pavement sufficient to allow two-way movements, rubbish collection and vehicle access into garages located at the rear of properties. The maximum desirable traffic volume for a laneway is 300vpd.

3.4.2 Traffic projections

The subject site is expected to generate approximately 1,010 total daily vehicular trips for a typical weekday, based on a conservative trip rate of 9.5 trips per dwelling, per day. The total daily vehicular traffic includes both inbound and outbound trips. Similarly, trip generation during the AM and PM peak periods for the subject site is expected to be in the order of 101 trips per hour.

The total daily (weekday) traffic volumes including current daily volumes and additional traffic post development of the subject site are approximately 1,826vpd for Bartram Road and 9,224vpd for Wentworth Parade. This equates to an increase by approximately 4.5% on Wentworth Parade post-development, which is considered to be modest and within the physical capacity of the road. The post-development increase in daily traffic of Bartram Road is well within the recommended daily threshold for a single-carriageway, two-lane Access Street road (<3,000vpd). It is therefore concluded that the existing road network has the capacity to accommodate future development of the subject site.

3.4.3 External intersections

The proposed external access system for the subject site comprises a full-movement access intersection on Bartram Road, and a left-in/left-out only access intersection on Wentworth Parade. A detailed analysis of the intersection on Bartram Road is not warranted since the anticipated traffic volumes through this future access intersection are below the relevant thresholds. There are no anticipated capacity issues for the proposed access intersection on Wentworth Parade.

A capacity assessment of the key local intersections of Wentworth Parade/Bartram Road and Hammond Road/Bartram Road was undertaken to establish the level of service and overall operation in the post-development period, assuming the subject site is developed and occupied within 4 years (by 2018). The capacity assessment, in line with the WAPC's Transport Assessment Guidelines was also undertaken for the 10-year post-development time horizon (to 2028).

It is concluded that the proposed development of the subject site will not have an adverse impact on the operation of the Hammond Road/Bartram Road intersection, and the Wentworth Parade/Bartram Road intersection has the capacity to facilitate the proposed development, maintaining a high level of functionality and spare capacity going into the future.

The future traffic resulting from development of the subject site has no adverse impact on the surrounding road network which has the capacity to accommodate additional traffic without undermining safety and traffic operations.

3.4.4 Public transport

The subject site is served by two existing bus services operating along Wentworth Parade (service no. 526) and Baningan Avenue/Bartram Road/Hammond Road (service no. 525). The available bus services provide connectivity to Cockburn Central Train Station which provides access to the greater rail network.

The WAPC's *Transport Assessment Guidelines for Developments Volume 2 – Structure Plans (2006)* suggest that it is desirable for at least 90% of dwellings to be within 400m distance of a bus route. The subject site is entirely within the 400m catchment radius of the existing bus service no. 526 and its bus stops on Wentworth Parade. Additionally, bus route no. 525 with its stops on Baningan Avenue, located approximately 750m to the west of the subject site provides for an alternative public transport option. With the recommended upgrade of the missing section of Bartram Road shared path, the existing bus stops for both bus services will become fully accessible via the local pedestrian path system.

3.4.5 Pedestrian and cycling facilities

The proposed internal pedestrian path system is designed so to seamlessly integrate with the external path system. Considering the level of forecast daily traffic volumes on proposed internal roads, the

3.8.1 Power

The site is connected to power via an aerial low voltage line in Bartram Road extending from the west, which terminates at the western corner of the subject site. It is expected that this development will extend underground mains from the imminent development abutting the site on its western boundary.

3.8.2 Water supply

The site is expected to be adequately supplied with reticulated water by extending water pipes from those constructed by the abutting development, which will entail connection under Wentworth Parade.

Water Corporation trunk pressure mains for water and sewer are located along the northern side of Bartram Road, being 1400mm and 900mm steel mains respectively, with another 800mm bore main located on the southern side of the road. The 1400mm steel water main is located on the 4.3m alignment across the site boundary.

Site reticulation water supply will be installed on the normal alignment between the 1400mm steel main and the site boundary.

3.8.3 Sewer

The Water Corporation has advised that the site can be connected to an existing Water Corporation sewer located east of Wentworth Parade, entailing boring and sewer under Wentworth Parade.

The connection sewer will be constructed by agreement with the abutting developer under Wentworth Parade and through the proposed development within an easement.

A reticulation sewer will be carefully constructed along the northern verge of Bartram Road between the 1400mm steel water main and the boundary on a 3m alignment. It is expected that the depth of the sewer will be shallower than the trunk water main.

3.8.4 Drainage

The proposed drainage system for the site will be by on-site soakage into the Bassendean Sands with a strong focus on infiltration of the stormwater "close to source", with an underground storage facility proposed to be located within the road reserve adjacent to proposed POS.

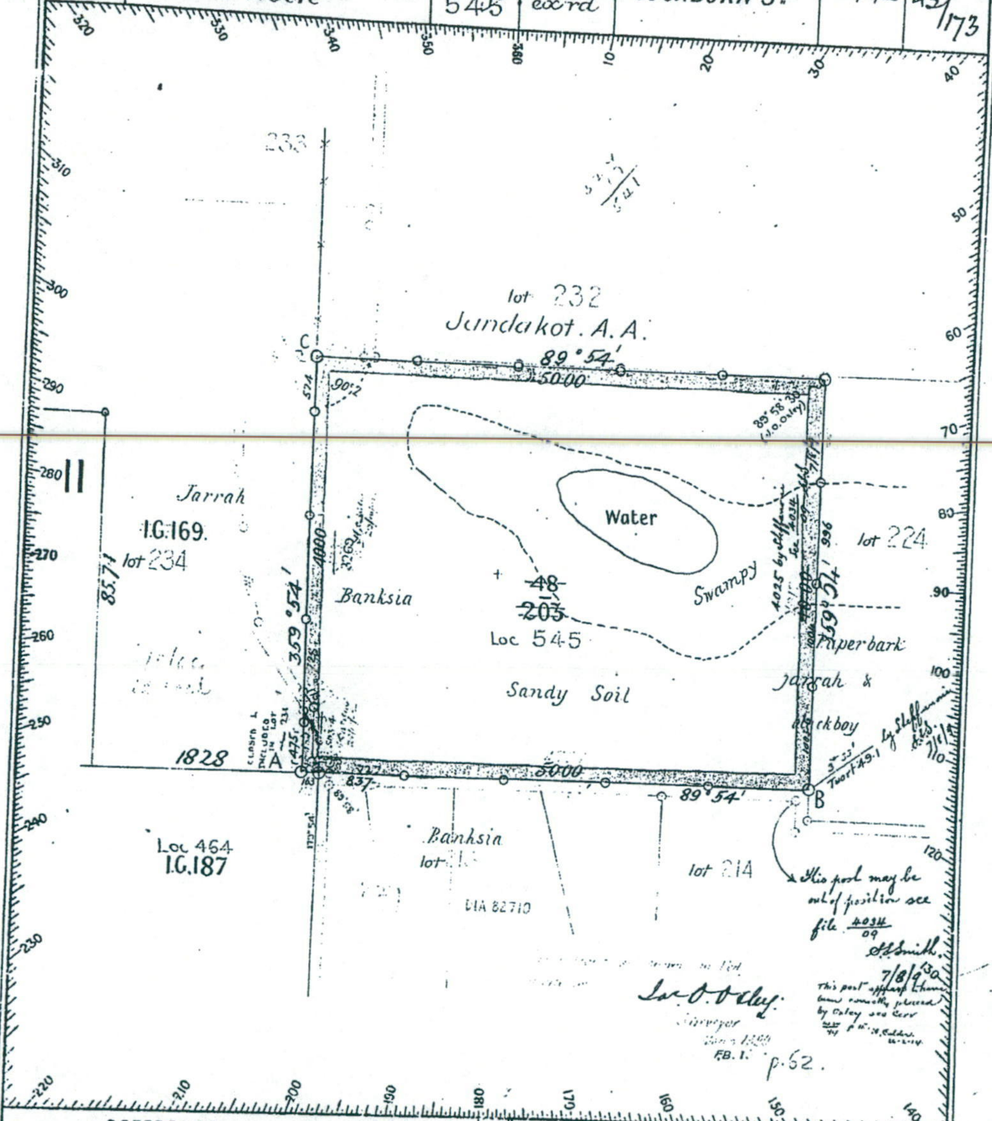
Water sensitive design features will be employed in the design of the drainage system which may entail as much roof run-off being retained on site via soakage wells or rainwater tanks. The ability of the land to utilise soak wells will be determined by detailed geotechnical site investigations, but at this stage the geological information is being taken as read.

The level of any fill required will be finally determined at the time of detailed road and drainage design in conjunction with findings of the geotechnical investigation and site survey.

Generally the site is contained with one drainage catchment, and roads will be designed to flood route stormwater to the underground drainage storage facility. The drainage design and construction will be to the City of Cockburn guidelines and approval.

Appendix A
Certificates of Title

Class of holding	Name of Grantee or Lessee	Nº	Acreage	District or County	Original Plan Nº	Diagram Nº
~~CP~~ Loc	~~H. Warthwyke.~~ C. W. Wolfe	~~48/203~~ 545	200 excrd	COCKBURN Sd	157 St. Calder 28/10/02	43/173



REFERENCE TO CORNERS

Corner	Bearing	Dist. in Links	Nº & Mark on Tree	Descn of Tree	Corner	Bearing	Dist. in Links	Nº & Mark on Tree	Descn of Tree
A	63° 21	165.5	48/203	Banksia	H				
B	3° 33	45	-"-	Blue gum	I				
C	324° 7	85.5	-"-	Jarrah	J				
D					K				
E					L				
F					M				
G					N				

Azimuth Observed from ~~Assumed~~

Date of Survey Dec 1888

Field Book Nº 1 Page 10

Scale 10 Chains to an Inch

Fred. F. Monaghan
Surveyor.

Examined & Passed W. A. Saw
30-6-89 Pro Inspecting Surveyor.

On Standard Plan St. ...

Registered ...

Environmental Report

Lot 545 Bartram Road,
Success WA 6164

Bowman & Partners
Environmental Scientists
Independent Verifiers

August 2014
Report Ref: BGP/002/2014 Rev 0

Prepared for:
Bluegold Project Management

B|&PE
BOWMAN & PARTNERS
ENVIRONMENTAL
ENVIRONMENTAL SCIENTISTS · INDEPENDENT VERIFIERS

TABLE OF CONTENTS

1 Introduction

Bluegold Project Management Pty Ltd is acting for Allvivid Pty Ltd, the owners of the land at Lot 545 Bartram Road Success who are seeking a re-coding of the land from R20 to R30/40 and approval to subdivide and develop the land for residential/urban purposes.

Figure 1 shows the location of the site in its local and district contexts while ***Figure 2*** presents a recent aerial photograph of the land.

Bowman and Partners Environmental Pty Ltd is acting as the environmental consultant to the project and submits this report covering relevant environmental factors in support of these planning applications.

The land at Lot 545 is the last portion of land in this locality to be planned and developed. Land to the immediate west of Lot 545 forms part of Gold Estates Australia's Thomsons Lake Stage 10 urban development project, and it is understood that the commencement of development of this land is imminent.

Therefore, in regard to environmental values and factors, for the land within Lot 545, being as it is heavily degraded by former agricultural use and located within a locality now almost fully developed to urban uses, there are only limited environmental matters which need to be accommodated through the structure planning and subdivision design process in regard to protection of environmental values in accordance with City of Cockburn policy and State and Commonwealth Government legislation and policy.

Notwithstanding that fact that the poor environmental condition of the land and its status within its local, district and regional contexts do not present any complex or significant constraints, this report has been prepared to ensure that environmental management initiatives relevant to the land which are capable of improving the environmental outcomes of urban development are indeed implemented.

The land is bounded to the south and east by Bartram Road and Wentworth Avenue respectively, beyond which there is developed land already occupied by residential land uses.

Lot 545 currently supports a single residence and associated ancillary sheds and outhouses located in the south-west corner of the land with the balance being fully or partially cleared land and pasture with remnant fences and infrastructure from its former rural uses in disrepair.

The existing house and ancillary buildings will be retained within a new lot to be created by the proposed subdivision.

2 Description of the Existing Environment

2.1 Climate

The site experiences a climate which is typical for the locality and the greater Perth Metropolitan area and is described as Mediterranean, with mild wet winters and warm to hot dry summers.

2.2 Topography

The land falls from its south-west corner to the north and north east and ranges in elevation from approximately 30 m AHD to 26 m AHD.

Figure 3 depicts topographic contours for the land.

2.3 Geology and Soils

The land is located within the Bassendean Dune System of the Swan Coastal Plain, which comprises sand plains with low dunes and occasional swamps and iron or humus podzols.

Within the site there are three mapped phases of the Bassendean System:

- The majority of the site, comprising the higher upland areas within its southern extent is mapped as Bassendean B1 phase, described as extremely low to very low relief dunes, undulating sand plain 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.
- The topographically lower portion of the land, along its northern and eastern boundaries are mapped as Bassendean B3 phase described as closed depressions and poorly define stream channels with a moderately deep, poorly to very poorly drained sands with an iron-organic pan, or clay subsoil. Surface Soils are dark grey sand or sandy loam.
- In the far south east corner of the site there is a small portion of land mapped as Bassendean B2 phase which is an upland variant of B1 phase.

In summary the soils are well drained sandy soils which are well suited to urban development, as demonstrated by surrounding residential land uses and associated infrastructure.

Figure 5 depicts the vegetation condition map for the site.

The vegetation complex type which the land originally supported is described as Bassendean Complex Central and South.

At the present time, there are few elements of the original vegetation or flora remaining. Reconnaissance field survey conducted during July 2014 found the ground level flora is effectively completely dominated by weeds and grasses. There are scattered remnant grass trees (*Xanthorrhoea priessii*) and occasional zamia palms (*Macrozamia reidlei*) and some areas of *Dasypogon bromeliifolius* and pigface (*Carpobrotus edulis*) emerging from the grass and weed infestations.

Scattered trees in a low woodland formation occur within areas not completely cleared. Typical species include *Banksia menziesii*, *B. attenuata*, *Allocasuarina fraseriana*, *Eucalyptus marginata*, *E. todtiana*, within the southern upland parts of the site, with some *Kunzea glabrescens* and *Adenanthos cygnorum* as shrub elements.

In the northern parts of the site there are isolated trees and copses of *Melaleuca rhaphiophylla* and *M. teretifolia* located within land which is otherwise completely cleared and supports weeds and pasture grasses.

Figure 6 presents a vegetation map for the land which shows the distribution of 4 vegetation mapping units for the site being described as:

- BmBaLW – Banksia menzesii, Banksia attenuata low woodland
- Mr – Melaleuca rhaphiophylla low woodland
- Et – *Eucalyptus todtiana* low woodland
- Planted non-indigenous Eucalyptus trees.

Review of available technical data for the locality indicates that there are no known populations of flora or ecological communities which have special conservation significance within the site or this local area.

2.8 Fauna

The degraded condition of the remnant vegetation indicates the site has very low potential to support any significant fauna populations.

Reconnaissance field survey found the following habitat types occur within the site:

- Low open woodland (30% of site)
- Tall shrubland (< 5% of site)
- Open grassland with scattered trees (70% of site).

3 Impact Assessment

3.1 Threatening Processes and Management Strategies

This section of the report provides an overview of how the low level threatening processes deriving from urban development of this particular parcel of land with its limited remnant environmental values will be managed.

In regard to the environmental context of the land, the most significant feature of the local environment is Twin Bartram Swamp which is located to the immediate north of Lot 545. This environmental feature is not part of this rezoning application and urban land will be separated from the wetland by an appropriate vegetated buffer as described in more detail in a subsequent section.

Twin Bartram Swamp is classed as a Conservation Category Wetland, is zoned public open space in the City of Cockburn Town Planning Scheme and is managed for the purpose of conservation in accordance with a Wetland Management Plan which has been adopted by the City of Cockburn.

Also, some 1 km to the west there is the Thomsons Lake Nature Reserve and Harry Waring Reserve which are both A Class reserves and preserve and protect wetland and upland ecosystems typical for the locality and region. They are managed by the Department of Parks and Wildlife and the University of WA respectively.

Conservation objectives for the locality district and region are met by these reserves, therefore urbanisation of this land does not it itself present an environmental constraint at these scales of reference.

3.1.1 Vegetation and flora

The site supports only limited areas of remnant vegetation, all of which has been partially cleared or impacted by stock such that ground flora consists almost completely of grasses and weeds.

There are no known rare or endangered or priority species of flora or ecological plant communities present within the site. The remnant vegetation is low woodland and isolated or small copses of trees all of which support plant species which are common to the district and region. The balance of the land comprises pasture, weed, and open sandy soil areas and has no vegetation or flora values.

The conservation of vegetation in the Perth Metropolitan Area has been resolved at vegetation complex scale by the implementation of the Bush Forever initiative of the Government of Western Australian.

Groundwater level data collected from these sources will be used to calculate an appropriate Average Annual Maximum Groundwater Level (AAMGL), which will inform stormwater management design and development levels with the site. These plans will be prepared in accordance with an expected condition of subdivision and will be separately submitted to government.

Stormwater infiltration in accordance with Better Urban Water Management principles and design specifications will protect the environmental values of Twin Bartram Swamp from risk of contaminant entry through stormwater discharge.

3.1.3 Twin Bartram Swamp

Twin Bartram Swamp is the most important local environmental feature in the surrounding landscape. Protection of Twin Bartram Swamp from environmental processes deriving from development of Lot 545 will be achieved through two primary planning and engineering measures.

Firstly development within Lot 545 will be set back from the title boundary with Twin Bartram Swamp and this set-back area will be established as a wetland buffer.

Figure 7 depicts the position and alignment of the development boundary between the proposed urban development area and the mapped edge of Twin Bartram Swamp.

The location and alignment of the urban development setback has been adopted so as to conform to and be continuous with the development setback to Twin Bartram Swamp adopted in the City of Cockburn's endorsed Twin Bartram Swamps Local Structure Plan for the contiguous land to the immediate west of Lot 545 within Thomsons Lake Estate Stage 10, as well as the setback to POS recognised for the south east corner of the lot within which Twin Bartram Swamp is located.

The area of land within Lot 545 which is proposed to be set aside to protect Twin Bartram Swamp currently comprises cleared land supporting pasture grasses and weeds with a small number of *Melaleuca rhaphiophylla* trees as individuals and small copses.

In order to improve its function and value as a buffer to Twin Bartram Swamp this area will be replanted with trees, shrubs and ground level flora using species typical for the area and appropriate for the upland area adjacent to the wetland boundary. Further, it is proposed to investigate the opportunity to relocate grass trees within the development area which will require removal prior to earthworks to the wetland buffer area.

Landscape plans for the wetland buffer area are anticipated to be specified as a condition of subdivision approval and a landscape plan for the wetland buffer area will be submitted to the City of Cockburn in due course, to satisfy such a condition.

In addition a fauna biologist will be present on-site during the clearing process to actively capture and relocate any other vertebrate fauna found to be fleeing the site during clearing.

Whilst the remnant vegetation and habitats within the portion of the land to be developed will be removed by development, the establishment of new plantings of indigenous vegetation and flora within the area proposed to be the buffer zone to Twin Bartram Swamp will offset this local loss of fauna habitat in terms of breeding and foraging resources.

3.1.5 Potential Site Contamination and Acid Sulfate Soil Management

The present condition of the land and the rural improvements which have been implemented suggest that the land has never been used for any other purpose than rural use, primarily the keeping of stock, and therefore it is concluded that the risk that soil or groundwater supports any materials which would be classified as contaminants under the Contaminated Sites Act 2004 are negligible, and no further investigations are considered to be necessary.

Whilst the land the subject of development is mapped as low to moderate risk of supporting acid sulphate soils, appropriate investigations in accordance with DER guidelines for acid sulphate soil investigations will be conducted as required.

There is a possibility that the installation of sewer and water services along the northern development boundary may require some dewatering to take place, and in this event appropriate dewatering management planning will be conducted and submitted for approval to DER.

6. A landscape management plan is anticipated as a condition of subdivision for the land and this should be prepared in consultation with the City of Cockburn in order that revegetation and public amenity works and any further protection measures for Twin Bartram Swamp are both effective and consistent with current approved plans on adjacent land.

7. The proposal does not present any matters which require any formal statutory environmental assesssment under local ,state or commonwealth legislation.

Figures

Figures 1 - 7

BGP-002-2014-f02.cgn

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ENVIRONMENTAL ASSESSMENT REPORT
LOT 545 BARTRAM ROAD SUCCESS

AERIAL PHOTOGRAPH OF THE LOT 545

Drawn: M. Bowman
Date: 15 Aug 2014
Job: BGP-002-2014

Figure 2

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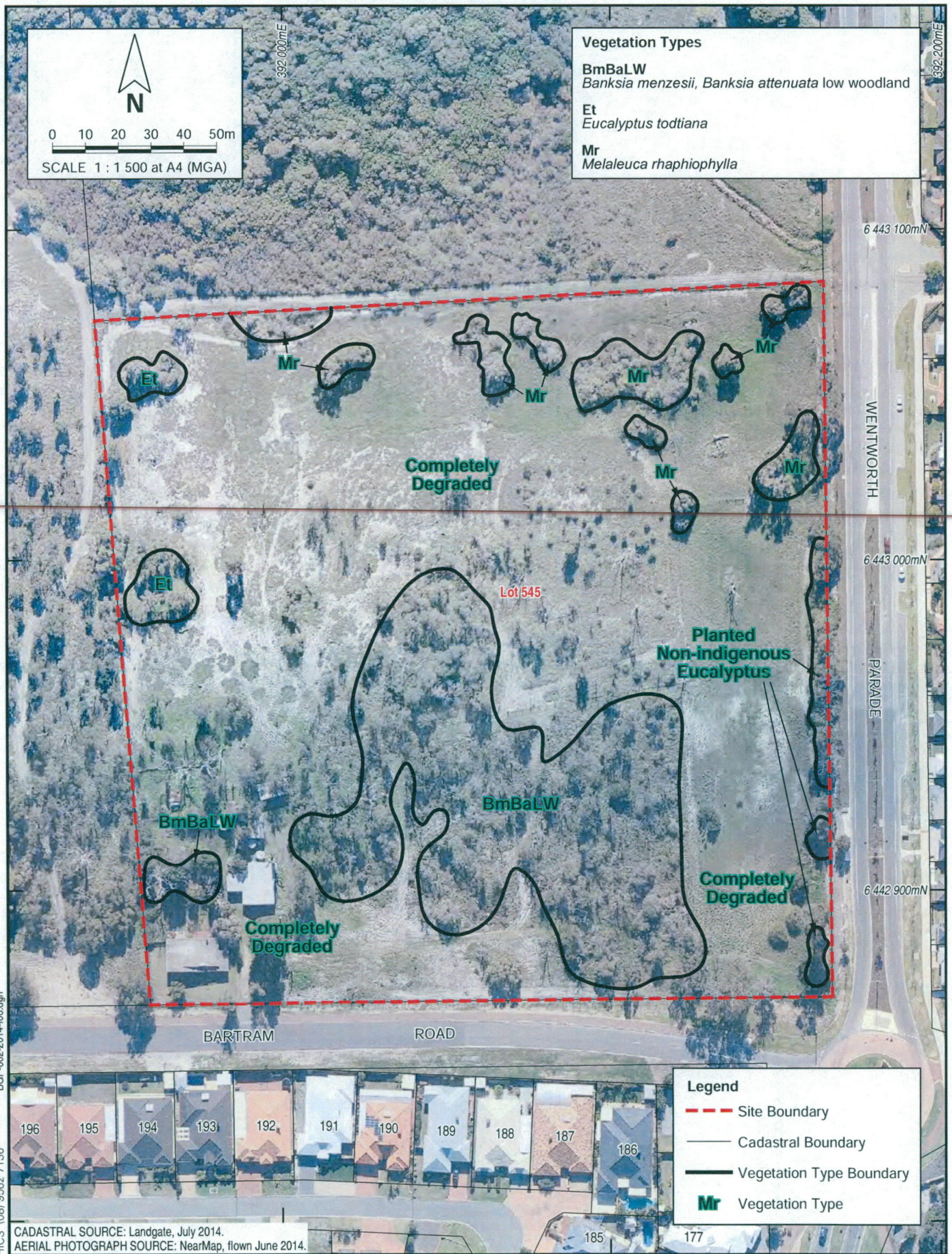
LOT 545 BARTRAM ROAD SUCCESS

ACID SULFATE SOILS RISK

Drawn: M. Bowman
Date: 15 Aug 2014
Job: BGP-002-2014

Figure 4



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LOT 545 BARTRAM ROAD SUCCESS

VEGETATION MAP

Drawn: M. Bowman
Date: 15 Aug 2014
Job: BGP-002-2014

Figure 6

Appendix 1

Fauna Relocation Management Strategy for Land at the Corner of Bartram and Wentworth Road Success

(Terrestrial Ecosystems August 2014)

Results

The project area is degraded (Plates 1 and 2), and has been used to graze livestock for many years (Plates 3 and 4). Fences are in disrepair (Plate 5), rubbish has accumulated in some areas (Plate 6), and weeds are abundant. There is an occupied house and out-buildings around the house in the south-west corner of the project area.

There are 14 Eucalypt trees with a DBH of 500mm or greater (Table 2, Figure 2). Of these, two trees (Plates 7 and 8) contain a hollow that may be suitable as a nesting site for Black-Cockatoos, although one of these trees contains a bee hive so it is unlikely to be used as a nesting site. There was no evidence to suggest that Black-Cockatoos had used any tree as a nesting site nor were they roosting regularly in the project area.

Table 2. Significant trees (Zone 50, GDA94)

Easting	Northing	Type	DBH (mm)	Height (m)	Hollow	Comment
391966	6442935	Dead	800	5		
391970	6442937	Dead	700	17		Lorikeet nest
391977	6442938	Dead	1000	16	Yes	Bees
392008	6442930	Jarrah	1000	11		
391998	6442914	Dead	1000	10	Yes	Artificial hollow
391997	6442889	Spotted gum	800	20		Galah chew marks
391984	6442900	Dead	1200	17		
391969	6442905	Dead	1200	16		
392130	6442875	Flooded Gum	900	17		
392135	6442873	Flooded Gum	1200	20		
392139	6442876	Flooded Gum	500	17		
392146	6442874	Flooded Gum	800	13		
392161	6442891	Flooded Gum	1000	20		
392163	6443047	Spotted Gum	800	17		

We found no evidence to indicate that Black-Cockatoos had foraged in the project area recently or historically. Southern Brown Bandicoot (*Isoodon obesulus fusciventer*) diggings were noted in multiple locations (Plate 9). It is likely there is an abundance of Southern Brown Bandicoots in the adjacent wetland to the north of the project area and they forage in the more open habitat in the project area.

A review of the EPBC Act (1999) online database and the Department of Parks and Wildlife NatureMap database of threatened species indicated that the species shown in Table 3 have the potential to be present in the project area. Marine and shore bird species have been excluded due to a lack of suitable habitat along with those species that have not occurred in the general area for many years (e.g. Malleefowl, Quokka and Western Ringtail Possum). A brief summary of the ecology and likelihood of these species being present in the project is provided below.

Table 3. Non-marine and wetland threatened species listed under the EPBC Act or the WA Wildlife Conservation Act as potentially present in the vicinity of the project area

Species	Common name	Status under the EPBC Act	Status under the Wildlife Conservation Act	DPaW threatened species list
Botaurus poiciloptilus	Australasian Bittern	Endangered	Schedule 1	
Calyptorhynchus latirostris	Carnaby's Black-Cockatoo	Endangered	Schedule 1	
Calyptorhynchus banksii naso	Forest Red-tailed Black-Cockatoo	Vulnerable	Schedule 1	
Calyptorhynchus baudinii	Baudin's Black-Cockatoo	Vulnerable	Schedule 1	
Phascogale tapoatafa	Brush-tailed Phascogale			
Leioproctus douglasiellus	a short-tongued bee	Critically endangered	Schedule 1	
Neopasiphae simplicior	a native bee	Critically endangered	Schedule 1	
Dasyurus geoffroii	Chuditch	Vulnerable	Schedule 1	

metropolitan area. It is also interesting that Carnaby's Black-Cockatoo will nest in the Moora town site (Davies 2005) but have not nested in the Perth metropolitan area. It is not known if they bred in the Perth area before European settlement.

Saunders (1980) reported that Carnaby's Black-Cockatoo at Coomallo Creek (breeding area) foraged mostly on native plants, with the only exception being *Erodium* sp.. Higgins (1999) reported the habitat of Carnaby's Black-Cockatoo was uncleared or remnant woodlands dominated by *Eucalyptus*, particularly Wandoo and Salmon Gum and often in shrubland or kwongan heathland dominated by *Hakea*, *Dryandra*, *Banksia* and *Grevillea* and seasonally in *Pinus* plantations and less often in Marri, Karri or Jarrah.

Since the 1930s, pine plantations have become an important feeding resource during the summer months (Perry 1948; Saunders 1974; Saunders 1980). The utilisation of pine plantations by cockatoos is likely to reflect the high energetic return of pine seeds, the concentrated food source and the loss of native habitat that has occurred on the Swan Coastal Plain since the 1930s.

No evidence of Carnaby's Black-Cockatoo foraging in the project area was found, although it is possible they could utilise small portions of the area to feed on the *Banksia* sp. as they are regularly seen in the vicinity of the project area.

Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) – Vulnerable under the *EPBC Act 1999* and Schedule 1 under the *Wildlife Conservation Act 1950*

The Forest Red-tailed Black-Cockatoo is one of three large black-cockatoos found in Western Australia. *Calyptorhynchus banksii naso* frequents the humid to sub-humid south-west of Western Australia from Gingin in the north, to Albany in the south and west to Cape Leeuwin and Bunbury (Department of Sustainability Environment Water Population and Communities 2011). It was mostly seen in the hilly interior, but small numbers of birds were seen at Mundijong, Baldivis, Karnup, Stakehill, Pinjarra, Coolup and in the Lake Clifton area (Johnstone and Kirkby 2011). In 2011, there was an increase in the number of Forest Red-tailed Black-Cockatoo on the coastal strip north from Rockingham to the northern metropolitan suburbs. The reason for the recent increase in abundance is unknown.

The Forest Red-tailed Black-Cockatoo nests in tree hollows with a depth of 1-5m that are predominately Marri, Jarrah and Karri. The nest entrance is 12-41 cm, and similar to other black-cockatoos, it lays two eggs on wood chips in October and November, but most often only one survives.

Johnstone and Kirkby (2011) reported the Forest Red-tailed Black-Cockatoos feed mostly on seeds from Marri, Jarrah, but also on Sheoak (*Allocasuarina fraseriana*), Snottygobble (*Persoonia longifolia*), Blackbutt (*Eucalyptus patens*) and introduced species such as Cape Lilac (*M. azedarach*) and Lemon-scented Gum (*Corymbia citriodora*).

Although there was no evidence of historical foraging by Forest Red-tailed Black-Cockatoos in the project area, based on this information, this species may occasionally forage on the *Allocasuarina* sp. in the project area.

Baudin's Black-Cockatoo (*Calyptorhynchus baudinii*) – Vulnerable under the *EPBC Act 1999* and Schedule 1 under the *Wildlife Conservation Act 1950*

Baudin's Black-Cockatoo occurs in the humid and sub-humid forests of Western Australia; an area within the 750mm isohyet (Chapman 2007). Its range extends from Gidgegannup and Clackline in the north to about 50km east of Albany and all the forest to the south-west coast (Chapman 2007). It is known to breed in the southern forests north to Collie and east to near Kojonup in large vertical hollows of Karri , Marri and Wando (Johnstone and Kirkby 2008). Johnstone and Storr (1998) reported eggs are laid in August to December, with a clutch of 1-2, but normally only a single chick is fledged. Only the female incubates and broods.

Baudin's Black-Cockatoo is typically found in vagrant flocks and utilises the taller, more open Jarrah, Marri and Karri forests, where it feeds mainly on Marri seeds and various Proteaceous species. Johnstone and Kirkby (2008) reported Baudin's Black-Cockatoo feeding on the seeds of Marri, Jarrah, Sheoak, *Banksia grandis, B. quercifolia, B. littoralis, B. ilicifolia, Hakea erinacea, H. prostrata, H. stenocarpa, H. trifurcata,*

Chuditch (*Dasyurus geoffroii*) - Vulnerable under the *EPBC Act 1999* and Schedule 1 under the *Wildlife Conservation Act 1950*

The Chuditch was originally found in over 70% of Australian woodlands; however, since European settlement its range has diminished to a patchy distribution throughout the Jarrah forest and mixed Karri-Marri-Jarrah forest of south-west WA. They have been known to occupy a wide range of habitats including woodlands, dry sclerophyll forests, riparian vegetation, beaches and deserts. The Chuditch creates its den in hollow logs or burrows and has also been recorded using tree hollows and cavities. They are opportunistic feeders, and forage on the ground at night, feeding on invertebrates, small mammals, birds and reptiles.

A Chuditch was recorded in the Wandi area in 2011; however, as there have been no other records of Chuditch in the area, it is unlikely that the Wandi area supports a viable population. Terrestrial Ecosystems' believes that it is unlikely the Chuditch occurs within the project area due to a lack of other individuals being recorded in the vicinity of the project area and the highly disturbed and open habitat present in the area.

Fork-tail Swift (*Apus pacificus*) - Migratory under the *EPBC Act 1999*

The Fork-tailed Swift breeds in north-east and mid-east Asia and winters in Australia and south New Guinea (Johnstone and Storr 1998). They arrive in the Kimberley in late September and in the Pilbara in November and the south-west in December, leaving late in April. Johnstone and Storr (1998) reported them as common in the Kimberley and uncommon to moderately common along the north-west, west and south-east coasts and scarce elsewhere. They are often seen in flocks and can be attracted to thunderstorms or cyclonic events in the northern parts of the state.

As this is a predominantly aerial migratory species, ground disturbance activities on a localised scale are unlikely to significantly impact on Fork-tailed Swifts. They could infrequently be seen flying over the project area.

White-bellied Sea-eagle (*Haliaeetus leucogaster*) - Migratory under the *EPBC Act 1999*

The White-bellied Sea-eagle is the second largest bird of prey found in Australia. This eagle has been seen in a variety of habitats and not always near the ocean, but they are more commonly seen in coastal areas. Birds form permanent pairs that inhabit territories throughout the year. These eagles are normally seen perched high in a tree, or soaring over waterways and adjacent land.

Terrestrial Ecosystems' assessment is that the White-bellied Sea-Eagle may infrequently be seen in the general area, but clearing the project area is unlikely to significantly impact on this species.

Rainbow Bee-eater (*Merops ornatus*) - Migratory under the *EPBC Act 1999*

Rainbow Bee-eaters are abundant in Australia, and found in many parts of Western Australia except the sandy deserts and dry arid interior. Johnstone and Storr (1998) described them as resident, breeding visitors and postnuptial nomads. They are generally migratory, moving south in late September and early October, having wintered from the Gascoyne to Indonesia.

Rainbow Bee-eaters are regularly seen across most of the wetter areas of Western Australia including the southern Swan Coastal Plain. Being widely abundant across its distribution and highly mobile, clearing of the vegetation in the project area is unlikely to significantly impact on this species.

Carpet Python (*Morelia spilota imbricata*) – Schedule 4 under the *Wildlife Conservation Act 1950*

This species is a large python found across the south west of Western Australia, north to Geraldton and Yalgoo, and east to Kalgoorlie, Fraser Range and Eyre. Carpet Pythons inhabit forest, heath, or wetland areas and shelter in the hollows of large trees. They occur in relatively high abundance on Garden Island and occasionally have been caught in the Rockingham area. It is unknown whether the individuals caught in Rockingham have come from Garden Island or the local area. This species is widespread within the south west, but is not in high density across its distribution. Carpet Pythons are rarely found on the coastal plain south of the Swan River close to urban developments, and there are no recent records in the vicinity of the project area.

Clearing of the vegetation is only likely to spread diseases such as *Phytophthora* spp., if appropriate standards of hygiene are not maintained in the equipment used to clear the vegetation. This aspect is able to be effectively managed and controlled by the land developer.

Based on this assessment, clearing of the vegetation is unlikely to have a significant impact on Black-Cockatoos.

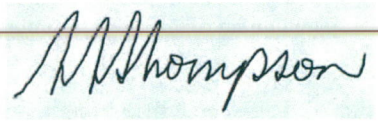
Summary

The quality of available foraging habitat for Black-Cockatoos was low (i.e. rated as 3) and covers an area of 0.86ha. There are two trees which contain a hollow that could provide a nesting site, but one of these trees supports a bee hive and the other showed no sign of being used for breeding purposes.

Other than the Southern Brown Bandicoot which forages in the project area, there was no evidence to indicate that clearing of the vegetation in the project area would significantly impact on a threatened species.

Please do not hesitate in contacting the undersigned (0407 385 239) if you require any further information.

Yours sincerely



Dr Scott Thompson
Partner and Principal Zoologist

Plate 1. Disturbed habitat

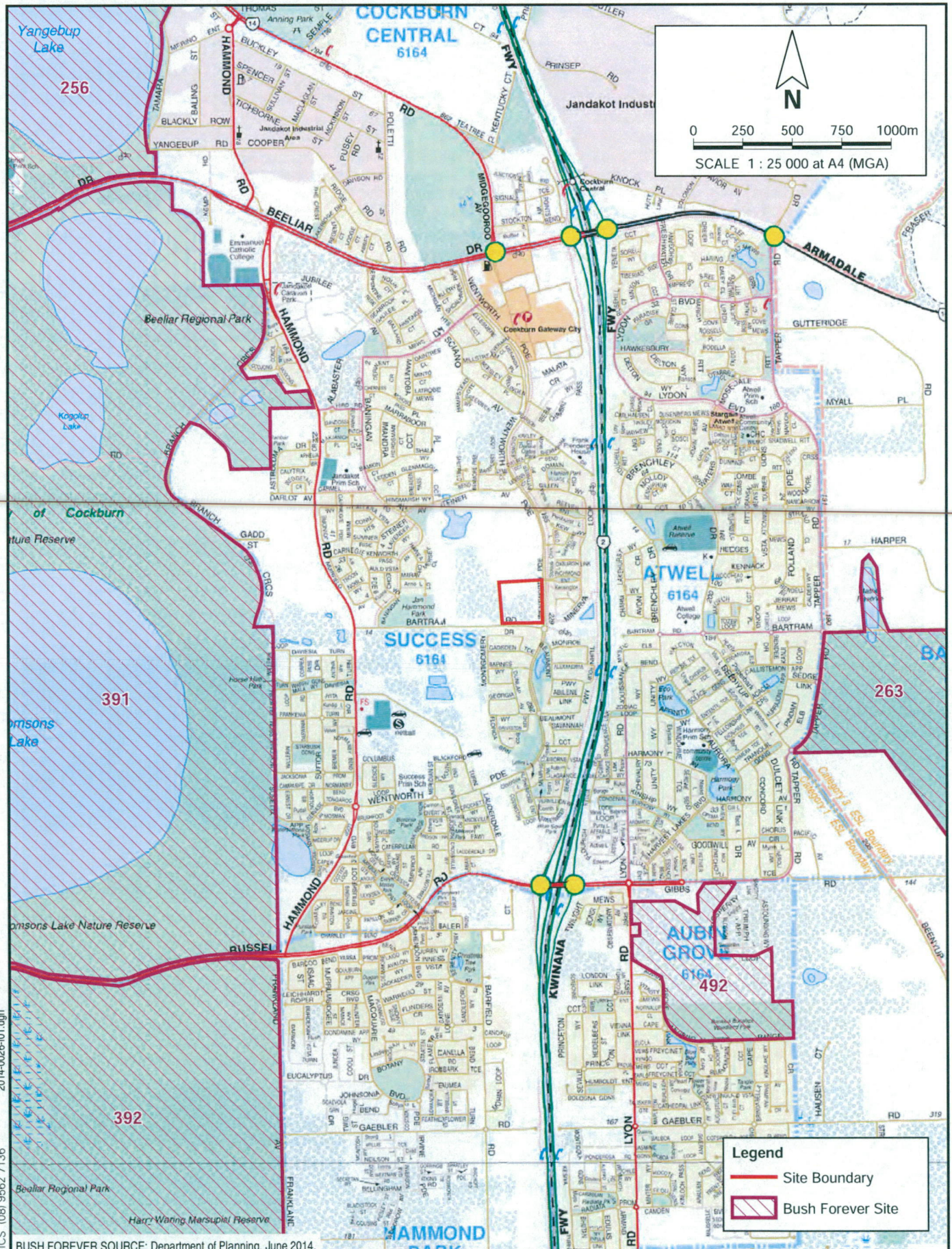
Plate 2. Banksia woodland

Plate 3. Paddock used to graze livestock

Plate 4. Paddock used to graze livestock

Plate 5. Fences in disrepair

Plate 6. Rubbish



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TERRESTRIAL ECOSYSTEMS

Bowman and Partners Environmental
FAUNA RISK ASSESSMENT
LOT 545 BARTRAM ROAD SUCCESS

REGIONAL LOCATION AND BUSH FOREVER SITES

Figure 1

Drawn: G. Thompson | Date: 4 Aug 2014 | Job: 2014-0026

Appendix 2

Site Photographs

Plate 2-3 | View over site from central eastern boundary looking north east (photograph taken July 2014)

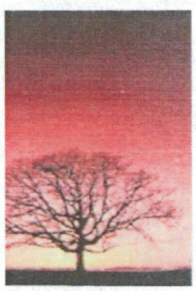
Plate 2-4 | View of degraded Banksia woodland in the central part of the site (photograph taken July 2014)

BUSHFIRE MANAGEMENT PLAN

Lot 545 Bartram Road

Success

City of Cockburn



FirePlan WA

August 2014

Bushfire Management Plan Lot 545 Bartram Road Success

Prepared For

Allvivid Pty Ltd
c/- John Chapman Town Planning Consultants
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Prepared By

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Document Status

Version	Comment	Reviewer	Review Date
Version 1		BWH	13.08.14

Disclaimer: The measures contained in this Bushfire Management Plan are considered to be minimum standards and they do not guarantee that a building will not be damaged in a bush fire. All surveys, forecasts, projections and recommendations made in this report associated with the project are made in good faith on the basis of information available to FirePlan WA at the time; and achievement of the level of implementation of fire precautions will depend among other things on the actions of the landowners or occupiers over which FirePlan WA has no control. Notwithstanding anything contained therein, FirePlan WA will not, except as the law may require, be liable for any loss or other consequences (whether or not due to the negligence of the consultants, their servants or agents) arising out of the services rendered by the consultants.

Figure 1: Location Plan

2.0 AIM

The aim of the Bushfire Management Plan is to reduce the occurrence of and minimise the impact of bush fires thereby reducing the threat to life, property and the environment.

The Bushfire Management Plan sets out to reduce this threat by:

1. Identifying the objectives of this Bushfire Management Plan (Section 3)
2. Describing the site's description, topography, cultural features and land use (Section 4);
3. Identifying the site's potential bush fire issues (Section 5); and
4. Outlining the fire mitigation strategies for the site that will reduce the risk of bush fires impacting on the proposed subdivision including the potential threat and impact of bushfire to residents, fire fighters and environmental values, including identifying the parties responsible for undertaking these fire mitigation strategies (Section 6).
5. Allow easy access and egress of fire fighters and residents if a fire does occur.

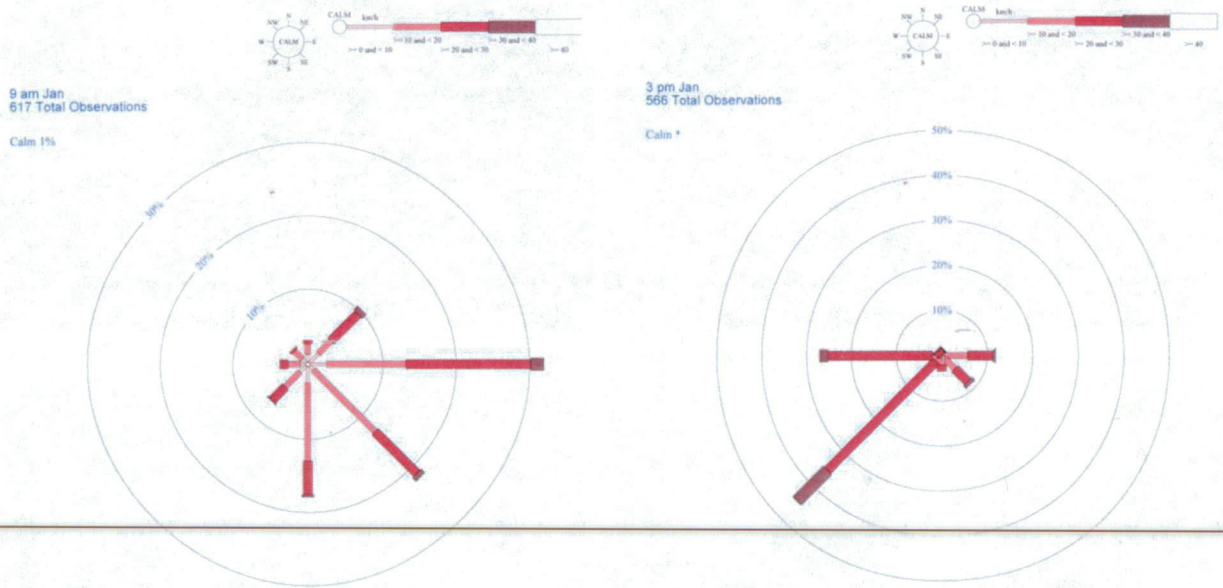
The City of Cockburn has the responsibility and powers under the Town Planning Scheme and the *Bush Fires Act 1954* to ensure that this Bushfire Management Plan, City of Cockburn Fire Control Order and any Special orders issued under the *Bush Fires Act 1954* are complied with.

3.0 OBJECTIVES

The objectives of this Bushfire Management Plan are to:-

1. Identify bushfire hazards and propose bush fire prevention measures for the site;
2. Identify access and egress for firefighting operations and residents;
3. Define the building construction standards where lots interface with vegetation within the site;
4. Identify current and future landowner, developer and City of Cockburn responsibilities for various components of this Bushfire Management Plan; and
5. Document in the Appendices section of this Bushfire Management Plan, the acceptable solutions adopted for the subdivision of Lot 545 Bartram Rd Success.

Figure 3 Sample Wind Roses showing Wind direction and Strength for January (1989-2010) Jandakot.



4.3 TOPOGRAPHY

The "Site" slopes to the north and varies between 0°-5° and will be used as a factor to calculate the BAL ratings for the Site.

4.4 BUSH FIRE FUELS

A portion of the wetland Buffer is located within site is Scrub Class D. Fuel Loads in buffer varies from 2-4 tonnes/ha in the cleared areas (subject to water inundation) and 25 tonnes/ha in the vegetated swamp Scrub Class D. The vegetation on the remainder of the site is cleared grassland (4.5 tonnes/ha) and degraded Banksia woodland (15-25 tonnes/ha).

The Twin Bartram Lake (CCW) will be retained in its natural state and a buffer is to be established around the wetland. The vegetation in the Twin Bartram Lakes is Closed Scrub Class D and Paper Bark and is subject to Water inundation during winter and into early Summer.

The Banksia woodland will be cleared for residential Lots as shown in Figure 2.

The Public Open Space separating the wetland and buffer from the road along the northern edge of the residential lots will be landscaped so as to comply with the Building Protection Zone Standards. See Section 6.3.

From Bartram Road Looking NE to woodland vegetation that will be cleared.

4.5 LAND USE

The urban lots will be used for residential purposes. The wetland and buffer will be retained in its natural state. The Public Open Space (POS) will be landscaped to comply with the Building Protection Zone standard detailed in Section 6.3.

4.6 ASSETS

Thc asscts in the general area of the Site are residential area, dwellings, group housing, fences, natural bushland, roads and power lines.

4.7 ACCESS

The site is bounded by Bartram Road along the southern boundary and Wentworth Parade along the eastern boundary. Both roads connect to other roads thus providing the required two aces/egress roads as required in Planning for Bush Fire Protection. Access to the new Lots will be via one external road system linked to Bartram Rd and Wentworth Parade.

4.8 WATER SUPPLIES

4.8.1 Water for Fire Fighting

The site will have reticulated water the Developer will install Fire Hydrants and road markings to the "*Water Corporations No. 63 Water Reticulation Standard*"

4.8.2 Domestic Water Supply

Each landowner will be connected to the Water Corporation's reticulated water supply.

There is a risk that buildings that have evaporative air conditioners installed without effective screening around the roof mounted unit have an increased risk of a building catching on fire due to embers starting a fire in the air conditioning unit.

All dwellings within 100 metres of the Wetland and buffer will be constructed to AS 3959. The POS and Road Reserve will be maintained to the Building Protection Zone standard detailed in Section 6.3.

5.3 BUSH FIRE HAZARD

In *Planning for Bush Fire Protection* Appendix 1 methodology for classifying bush fire levels is detailed. The methodology rates bush fire hazard using vegetation type. The methodology is also based on the underlying assumption that land in Western Australia is predominantly undulating. The methodology specifies three bush fire hazard levels "Low", "Moderate" and "Extreme".

This methodology has been used in this Bushfire Management Plan.

The assessment of fire risk takes into account existing site conditions which include:

- Topography with particular reference to ground slopes and accessibility;
- Vegetation cover – both remnant and likely revegetation; and
- Relationship to surrounding development.

The Bush Fire Hazard Assessment is:

Cleared Areas	-	Low
CCW/Wetland Buffer	-	Moderate
Banksia Woodland	-	Moderate – will be cleared for residential housing.

Revegetation within areas rated as low and the landscaping of the Public Open Space must be carried out so as not to increase the bush fire hazard and in accordance with the principles contained in the DFES document "*Plant Guide within the Building Protection Zone for the Swan Coastal Plain of Western Australia* DFES 2011".

Due to the bush fire hazard assessment for the site being rated as "Moderate" & "Extreme" the "Site" is a Bush Fire Prone Area.

5.4 BUSH FIRE THREAT

Due to the development that has taken place in the general area vegetation has been reduced to relative small areas such as the wetland. However due to the wetland/shrubland type of the vegetation bush fires will behave similar to grass fires in that they will be wind driven and fire spread will depend on the wind strength.

With the increased construction standard of habitable buildings in this site and the installation of Building Protection Zone and road reserve separating the wetland and proposed residential area the fire threat to the residential area will be reduced.

5.5 SUMMARY OF BUSH FIRE POTENTIAL ISSUES

The potential bush fire issues that have been identified for the site:-

1. Fuel loads in wetland/buffer vegetation within the site.
2. Maintaining the Public Open Space to the Building Protection Zone standard
3. Increased construction standard in accordance with AS 3959 for new habitable buildings.

6.0 FIRE MITIGATION

6.1 HAZARD MANAGEMENT

Hazard Management on the lots will be controlled by:-

1. Compliance with the annual City of Cockburn Fire Control Notice. Landowner responsibility.
2. The Public Open Space and Road Reserve are to be managed to the Building Protection Zone Standard.
3. Proposed new habitable buildings within 100 metres of the wetland buffer are to be constructed in accordance with AS 3959. Landowner responsibility.
4. A minimum 22 metre Building Protection Zone (BPZ) to include a 2 metre setback within the front setback of the lot, the road reserve and POS to the edge of the wetland buffer.

6.2 BUSH FIRE RISK MANAGEMENT

6.2.1 Total Fire Ban Days

A Total Fire Ban is declared because of the extreme weather conditions or when fires are seriously stretching fire fighting resources. A Total Fire Ban is declared by DFES following consultation with Local Governments.

When a Total Fire Ban is declared it prohibits the lighting of any fires in the open air and any activities that might start a fire. The ban includes all open fires for the purpose of cooking or camping. It also includes incinerators, welding, grinding soldering and gas cutting.

The Department of Fire and Emergency Services and the City of Cockburn are to continue to educate the public on what a Total Fire Ban means and what actions the public need to take.

6.2.2 Public Education Program

The City of Cockburn is to continue to provide the community with advice on bush fire prevention and preparedness through brochures, newspaper articles, the Fire Control Order issued to rate payers and on their web site.

- The crowns of trees within the BPZ should be separated where practical such that there is a clear separation distance between adjoining tree crowns.
- Prune lower branches of trees within the BPZ (up to 2 metres off the ground) to stop a surface fire spreading to the canopy of the trees.
- There are to be no tree crowns or branches overhanging the building or asset and a minimum horizontal clearance of 2 metres is required between tree branches and buildings or assets.
- Do not clump shrubs close to building. Ensure that there is a gap of at least 3 times the height (at maturity) of the shrub away from the building.
- Trees or shrubs in the BPZ are to be cleared of any dead material.
- Fences, sheds and structures within the BPZ should be constructed of non-flammable material and be clear of trees and shrubs as per building requirements.
- Roof gutters should be free of leaves and other combustible material.
- Roof mounted evaporative air coolers should be fitted with ember proof screens to the filter media to reduce the possibility of bushfire embers igniting the air cooler.

It is further recommended that property owners, where possible and practical, further extend the width of the defendable space around assets by reducing fuel loads and fire hazards.

NOTE:

- The purpose of the BPZ is to reduce flammable fuel in the immediate vicinity of structures and other assets to reduce the bushfire attack level in accord with Australian Standard AS3959 Section 2.
- The requirements for BPZ within Western Australia for new buildings are specified in "*Planning for Bushfire Protection guidelines edition 2" Element 4.*
- Maintained gardens are not classed as flammable for the defendable space.
- Areas such as pathways, drives, lawn, vegetable gardens, pools etc. all serve to reduce fire intensity and will form an integral part of any BPZ. The effectiveness of these in reducing the risk of fire damage to a building is enhanced if these areas are close to the building.

  Landowners are also required to install BPZ as part of Site works when constructing a dwelling on a Lot and maintain building protection zones in perpetuity in accordance with this Bushfire Management Plan.

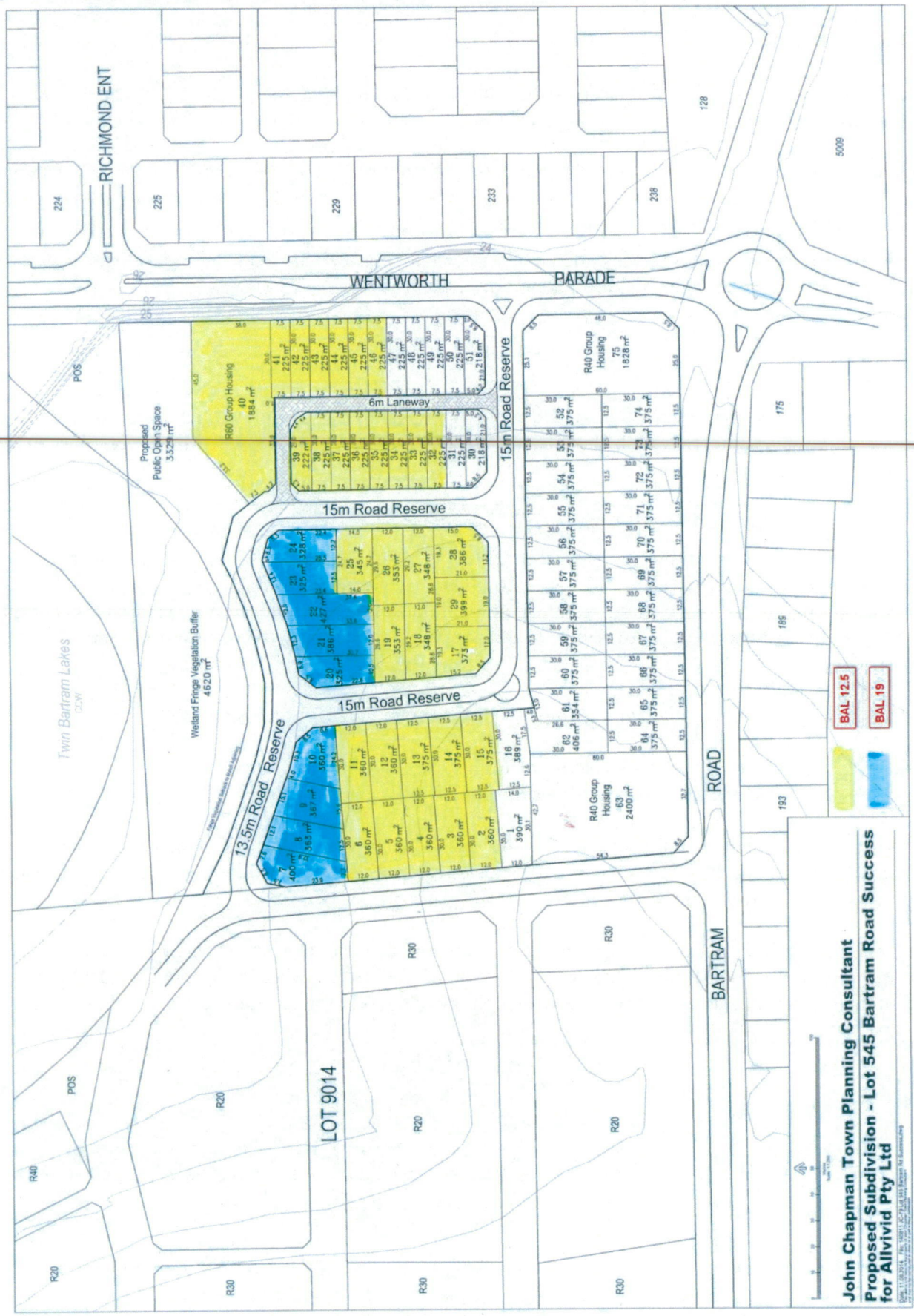
6.3.3 Building Construction

Individual dwellings on all lots shall be designed and built to conform with:

- The Building Code of Australia; and
- AS 3959 *Construction of Buildings in a Bushfire Prone Area*;

When the Bush Fire Prone Areas are declared for this site the minimum distance of 100 metres (from vegetation rated 'Moderate' or 'Extreme') may be reduced in compliance with AS 3959. Under AS 3959 as the distance from the vegetation is reduced, the construction standard must be increased. Table 2.4.3 AS 3959 sets out this relationship and Section 2 of AS 3959 details the methodology of determining the Bushfire Attack Level (BAL).

Figure 5. Indicative BAL Ratings Adjoining Wetland Buffer



6.7 IMPLEMENTATION OF THE BUSHFIRE MANAGEMENT PLAN.

This Bushfire Management Plan becomes operational as a condition of subdivision.

In implementing this Bushfire Management Plan, the following responsibilities have been determined.

6.7.1 Property Owner's Responsibilities

To maintain the reduced level of risk and threat of fire, the owners/occupiers of all lots created by this proposal will be responsible for undertaking, complying and implementing measures protecting their own assets from the threat and risk of bush fire:

1. Maintaining the property in good order to minimize potential bushfire fuels to mitigate the risk of fire on the property;
2. Ensuring that the lot complies with the City of Cockburn Fire Control Notice . To be carried out annually;
3. Lots that have been identified as requiring a dwelling to be constructed to AS 3959 are to install and maintain their Lot to the Building Protection Zone (annually) in perpetuity prior to occupancy of a dwelling on the land. Refer to Figure 5 and standards detailed in Section 6.3;
4. Ensuring that new dwellings are constructed in accordance with the Bushfire Management Plan and current AS 3959. There will be a Section 70A notification on the Certificate of Title for each Lot.
5. Complying with the instructions of DFES Fire Services, the City of Cockburn and/or volunteer fire services in maintaining the property or during the event of a bushfire;
6. Ensuring that in the event an evaporative air conditioner is installed at the property, suitable external ember screens are installed to roof mounted units and that they comply with AS 3959, check annually.

6.7.2 Developer's Responsibilities

As a condition of subdivision the developer shall be required to carry out works described in Section 6 of this Bushfire Management Plan to the satisfaction of the City of Cockburn and the Western Australian Planning Commission:

1. All driveway crossovers are to comply with the design requirements of the City of Cockburn;
2. Newly created lots are to comply with the City of Cockburn Fire Control Order prior to the issue of Land Titles. This is to be maintained until lots are sold;
3. Each lot that is to have an increase constructed standard in accordance with AS 3959 a notification pursuant to section 70A of the Transfer of Land Act 1893 is to be placed on the certificate(s) of title of the proposed lot(s). Notice of this notification is to be included on the diagram or plan of survey (deposited plan). The notification is to state as follows;
   '*The lots are subject to a fire management plan*'
4. Carry out bush fire fuel reduction in the Building Protection Zone in the road reserve and the POS standard prior to issue of Titles for each Lot and maintain until Lot is sold;
5. Supply a copy of this Bushfire Management Plan and *The Homeowners Bush Fire Survival Manual, Prepare Act Survive (or similar suitable documentation)* and the City of Cockburn Fire Control Notice to each affected property purchaser on sale of the allotment;

7.0 APPENDICES

7.1 WORKS PROGRAM

The works program required in this Bushfire Management Plan must be implemented by the developer as a condition of subdivision approval.

Landowners will be responsible for the annual maintenance required in the City of Cockburn Fire Control Order, annual works associated with maintaining Private Driveways, Building Protection Zones as detailed in this Bushfire Management Plan.

Prior to issue of Titles and Ongoing Maintenance

Activity	Responsibility	Maintenance	Responsibility
Installation of crossover Standards Section 7.2.3	Developer	Checking of quality of Roads	City of Cockburn
Install internal roads as detailed in Section 6.4	Developer	Initially developer until responsibilities for road is handed to Local Government	City of Cockburn
Compliance with Fire Control Notice. Details Section 6.4.	Developer	Compliance with Fire Control Notice annually	Landowner
Construction of new habitable buildings in accordance with AS 3959 as detailed in Table 3	Landowner	Ensure BPZ & HSZ standards are maintained as detailed in S6.3	Landowner
Modify fuels in BPZ in accordance Section 6.3	Developer	Annually Maintain BPZ in perpetuity	Developer until Lot is sold then City of Cockburn
Section 70 A notification on Tile of each Lot advising BMP applies to each Lot	Developer	Maintain Lot in accordance with Landowners responsibilities	Landowner
Provide a copy of following a sale of Lot:- Bushfire Management Plan Home Owners Survival Manual Prepare Act Survive Fire Control Notice	Developer	Landowners to familiarise themselves and annually update actions in the event of fire and annual maintenance of the above	Landowner
Install fire hydrants as detailed in Section 4.8	Developer	Annual maintained of hydrants	Water Corporation

7.3 GLOSSARY

Acceptable Solution
A statement describing an acceptable means of complying with the requirements of corresponding performance criteria.

Appliance or Fire Appliance
A fire fighting appliance (vehicle) with structural, grass and bush fire fighting capabilities, with either a 2000 litres water capacity (2.4 appliance) or a 3000 litre water capacity (3.4 appliance) and four (4) wheel drive.

BAL – (abb) Bushfire Attack Level.

Bushfire Attack Level – an assessed rating of a site's risk to a bushfire, based on vegetation type, slope of the land and its proximity to buildings.

Building Construction Standard Buffer - An area 100 metres wide Including a Building Protection Zone in which an increase in building construction standard in accordance with AS3959 will apply.

Building Protection Zone (BPZ)
Low fuel area immediately surrounding buildings. Minimum width 20 metres, increasing with slope. Maintained by the landowner.

Bush
Under the Bush Fires Act 1954 the term bush is defined to include trees, bushes, plants, stubble, scrub and undergrowth of a kind whatsoever whether dead or alive and whether standing or not standing.

Bush Fire or Wildfire
A general term used to describe fire in vegetation that is not under control.

Bush Fire Hazard.
The flammability, arrangement and quantity of vegetation, dead or alive, that can be burnt in a bush fire. Development is to be avoided in extreme bush fire hazard designated areas.

Bush fire prone area - for the purposes of this Bushfire Management Plan, a bush fire prone area is an area that has been declared as such by the relevant local government responsible for an area. Once an area is declared bush fire prone, then AS 3959 applies to new residential development in it.

Bush Fire Risk
The chance of a bush fire starting that will have harmful consequences on life and property. It is measured in terms of consequences and likelihood and arises from the interaction of hazards, communities and the environment.

Development Application
An application for approval to carry out a development under either a local planning scheme or regional planning scheme.

Dwelling setback – the horizontal distance between a wall of the dwelling at any point, and an adjacent lot boundary, measured at right angles (90 degrees) to the boundary.

DFES
The Department of Fire and Emergency Services of Western Australia previously FESA.

8.0 BUSHFIRE MANAGEMENT PLAN COMPLIANCE CHECKLIST FOR PERFORMANCE CRITERIA AND ACCEPTABLE SOLUTIONS

PROPERTY DETAILS: Lot 545 Bartram Road Success
Local Government: City of Cockburn

Element 1: Location

Does the proposal comply with the performance criteria by applying acceptable solution A1.1? Increased building construction and appropriate BPZ	**Yes**	✓	**No**	

Element 2: Vehicular Access

Does the proposal comply with the performance criteria by applying acceptable solution A2.1?	**Yes**	✓	**No**	
Does the proposal comply with performance criteria by applying acceptable solution A2.2?	**Yes**	✓	**No**	
Does the proposal comply with the performance criteria by applying acceptable solution A2.3? Not Applicable	**Yes**		**No**	
Does the proposal comply with the performance criteria by applying acceptable solution A2.4? **Not Applicable**	**Yes**		**No**	
Does the proposal comply with the performance criteria by applying acceptable solution A2.5? Not Applicable	**Yes**		**No**	
Does the proposal comply with the performance criteria by applying acceptable solution A2.6? **Not Applicable**	**Yes**		**No**	
Does the proposal comply with the performance criteria by applying acceptable solution A2.7? Not Applicable	**Yes**		**No**	
Does the proposal comply with the performance criteria by applying acceptable solution A2.8? Not Applicable	**Yes**		**No**	
Does the proposal comply with the performance criteria by applying acceptable solution A2.9? Complying with City of Cockburn Fire Control Notice	**Yes**	✓	**No**	
Does the proposal comply with the performance criteria by applying acceptable solution A2.10? Not Applicable	**Yes**		**No**	

Element 3: Water

Does the proposal comply with the performance criteria by applying acceptable solution A3.1?	**Yes**	✓	**No**	

Appendix D
Transport assessment

Document history and status

Author	Revision	Approved by	Date approved	Revision type
Vladimir Baltic	r01	B Bordbar	30/06/2014	Final

File name: t14.082.vb.r01.docx

Author: Vladimir Baltic

Project manager: Behnam Bordbar

Client: Allvivid P/L ATFT Bartram Road Land Trust

Project: Lot 545 Bartram Road, Success

Document revision: r01

Project number: t14.082

REPORT FIGURES

REPORT TABLES

1.0 Summary

This Transport Assessment (TA) has been prepared with respect to the proposed Lot 545 Bartram Road Local Structure Plan and the proposed rezoning application to increase density for the subject site from the existing R20. The subject site is generally situated west of Kwinana Freeway, south of Twin Bartram Lakes reserve and immediately northwest of the existing Wentworth Parade/Bartram Road roundabout intersection in Success, City of Cockburn.

The WAPC document *"Transport Assessment Guidelines for Developments, Vol 2 – Structure Plans"*, states that a supporting transport assessment is to be prepared for all structure plans as part of the structure planning process.

Accordingly, this Transport Assessment addresses the transport implications of the LSP proposal including estimating the traffic which will be generated by the LSP and the resultant traffic pattern on the surrounding road network. This TA also include the capacity analysis of the proposed LSP access system and the key local intersections as well as make recommendations for any traffic management measures that may be required to ensure satisfactory traffic operations.

3.0 Local Structure Plan Proposal

The location of the LSP area in its regional context within the *Metropolitan Region Scheme (MRS)* is illustrated in **Figure 2**.

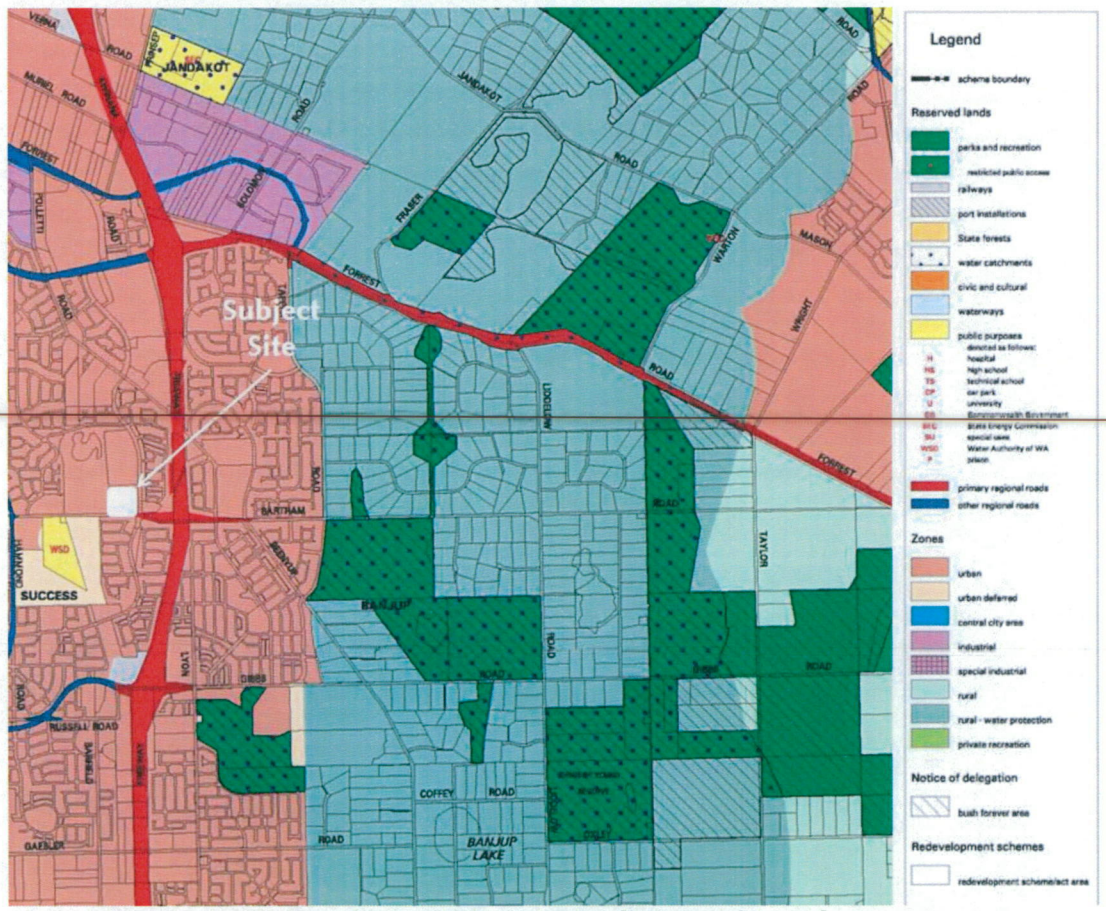


Figure 2: Site location within Metropolitan Region Scheme context

The LSP area is bounded by Bartram Road to the south and Wentworth Parade to the east. The subject site is presently zoned as "Urban" in *MRS*.

The LSP provides for in order of 107 residential dwellings through a mix of individual and group housing lots (R40 and R60 density) and a public open space (P.O.S.) area along the northern perimeter.

The proposed LSP road system facilitates internal subdivision distribution of vehicular, pedestrian and cyclist traffic. The internal LSP road system connects to perimeter roads through a full-movement access intersection on Bartram Road (approximately 200m west of Wentworth Parade) and a left-in/left-out only access intersection on Wentworth Parade (approximately 50m north of Bartram Road intersection).

4.0 Existing Situation

The LSP area is located approximately 22km south of the Perth CBD and approximately 20km northeast of Rockingham town centre.

The subject site is located at the northwest corner of the existing Bartram Road/Wentworth Parade roundabout intersection (refer **Figure 1** for more details). The subject site is located within predominantly residential setting.

4.1 Existing Road Network

Bartram Road is a single-carriageway, two-lane road running east-west from Hammond Road to the west to Wentworth Parade to the east.

Bartram Road is constructed to 8m wide trafficable carriageway with an intermittent 2.2m wide shared path along its northern side. The southern edge of the carriageway is only partially kerbed near the local intersections. Refer **Figure 3** and **Figure 4** for more details.

Figure 3: Eastbound view along Bartram Road

According to the traffic count information sourced from Main Roads WA, Bartram Road (approximately halfway between Hammond Road and Wentworth Parade) carried approximately 1,150 vehicles during typical weekday in June 2011. Based on these counts, the weekday morning peak hour occurred between 8:00AM and 9:00AM (84vph) whilst the afternoon peak period occurred between 5:00PM and 6:00PM (126vph).

Figure 5: Northbound view along Wentworth Parade from Bartram Road intersection

Figure 6: Southbound view along Wentworth Parade from Bartram Road intersection

Bartram Road and Hammond Road form a priority-controlled T-junction with Bartram Road terminating at its westbound approach to the intersection. This intersection is currently undergoing road works with Hammond Road being upgraded from two-lane single carriageway road to a four-lane road with left and right turn pockets at the intersection. Refer **Figure 7** and **Figure 8** for more details.

Table 1. Crash history for the Hammond Road/Bartram Road intersection

Intersection		State Frequency Rank	State Cost Rank	Total Crashes	Casualty
Hammond Road/ Bartram Road		7842	11514	1	0
Right Angle	**Rear End**	**Pedestrian**	**Cycle**	**Wet**	**Night**
0	0	0	0	0	1

Table 2. Crash history for the Wentworth Parade/Bartram Road intersection

Intersection		State Frequency Rank	State Cost Rank	Total Crashes	Casualty
Wentworth Parade/ Bartram Road		7842	13664	1	0
Right Angle	**Rear End**	**Pedestrian**	**Cycle**	**Wet**	**Night**
1	0	0	1	0	0

A review of the crash data for the Hammond Road/Bartram Road and Wentworth Parade/Bartram Road intersections indicates no major safety issues relating to the operation of these two intersections.

4.2 Public Transport Access

The subject site is served by two bus services operating along Wentworth Parade (service No. 526) and Baningan Avenue/Bartram Road/Hammond Road (service No. 525). The available bus services provide connectivity to Cockburn Central Train Station which provides access to the greater rail network.

The nearest pair of bus stops on Wentworth Parade is located in immediate vicinity of the site while the bus stops on 525 route are in place at the western side of Jan Hammond Park, approximately 700m walking distance west of the site. The bus stops are accessible via existing pedestrian paths.

The map of existing public transport services available in the vicinity of the subject site is provided in **Figure 9** overleaf with route details presented in **Table 3**.

Table 3. Bus services within locality

Bus Route	Route Details
525	Cockburn Central Train Station → Gaebler Road (via Baningan Avenue)
526	Cockburn Central Train Station → Gaebler Road (via Wentworth Parade)

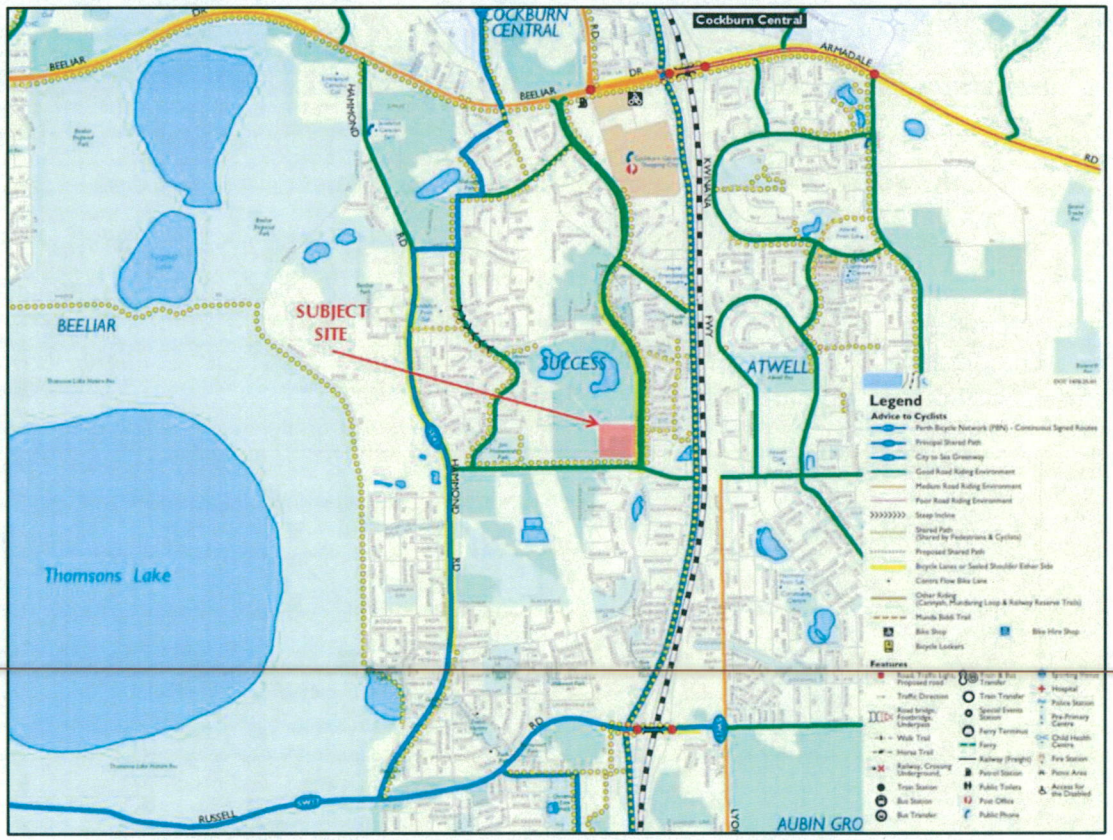


Figure 10. Bike map (source: Department of Transport)

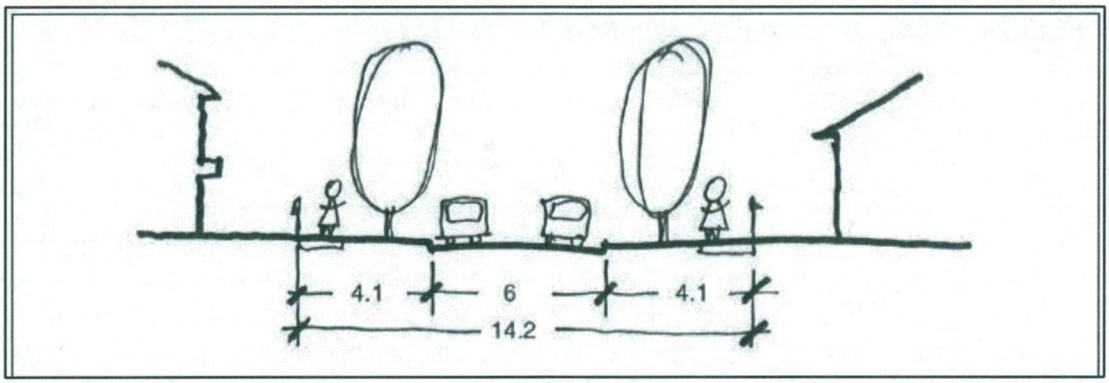


Figure 12. Access Street D – narrow yield (give way) street with target speed of 30 km/h (<1,000vpd)

The typical road reserve for *Laneways* entails a 6m wide trafficable pavement sufficient to allow two-way movements, rubbish collection and vehicle access into garages located on the rear of properties. Maximum desirable traffic volume for a laneway is 300vpd.

Visitor parking for rear loaded lots in the LSP are recommended to be provided on the *Access Streets'* frontage as previously discussed. The typical cross-section of the *Laneways* is illustrated in **Figure 13**.

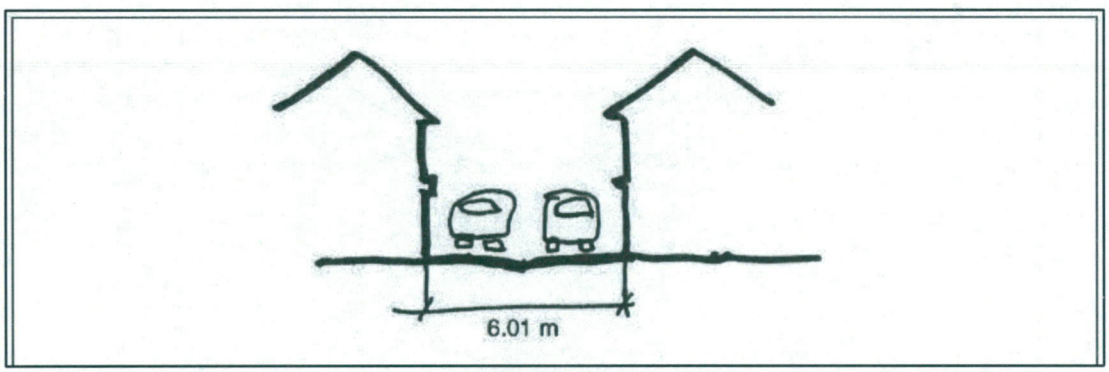


Figure 13. Laneways – for rear vehicle access with target speed of 15 km/h (<300vpd)

5.2 Public Transport

The existing bus services at this locality are described in great detail in section 4.2 of this report.

The proposed LSP can be serviced by the existing public transport services available in the immediate vicinity or within comfortable walking distance of the subject site.

6.0 Changes to External Transport Network

According to information provided by City of Cockburn with respect to planned road network upgrades in mid to long term period (refer City's *Regional and Major Roadworks 2013 - 2030* document), Bartram Road overpass connecting western and eastern sections of Bartram Road over Kwinana Freeway is proposed. This $18.0M project is planned to be constructed by year 2026/2028.

Further duplication of Hammond Road and upgrade of verge along the section from Branch Circus to Bartram Road is expected to continue in stages with final completion within next 4-year period.

No other changes to the local road network are planned.

8.0 Traffic Assessment

8.1 Trip Generation and distribution

The traffic generation rates for the LSP were primarily sourced from the Roads and Traffic Authority NSW, *"Guide to Traffic Generating Developments"* document. The residential traffic generation rates used range from 9 vehicles per day (vpd) per dwelling for the lower residential densities, 7 vpd for medium density dwellings and 5 vpd for high-density units close to transit.

However, for the purpose of this TA a conservative trip rate of 9.5 trips per dwelling was applied in order to establish the total traffic generation from the proposed residential subdivision.

Accordingly, the LSP area is estimated to generate approximately **1,010** total daily vehicular trips for a typical weekday. The total daily vehicular traffic includes both inbound and outbound trips. Similarly, trip generation during the AM and PM peak periods for the subject LSP is estimated to be in order of **101** trips per hour.

The distribution and assignment of the LSP-generated traffic was based on the actual location of the subject development, the existing local and regional road network and the location of various district attraction nodes. Accordingly, the following assumptions were made for the distribution and assignment of the generated traffic:

- Approximately 40% of the traffic generated from the subject site would travel to/from the Wentworth Parade north direction;
- Approximately 20% of the traffic generated from the subject site would travel to/from the Hammond Road north direction; and,
- Approximately 40% of the traffic generated from the subject site would travel to/from the Hammond Road south direction.

In line with the assumed directional traffic generation and distribution the forecast total daily traffic volume plan for the internal LSP road system is illustrated in **Figure 15**.

Table 4. Traffic volume thresholds warrants for detailed intersection analysis

Major Road Type	Major Road Flow (vph[1])	Minor Road Flow (vph)
Two-lane	400	250
	500	200
	600	100
Four-lane	1,000	100
	1,500	50
	2,000	25

8.3 Pedestrian/Bicycle Networks

The proposed network of footpaths for pedestrians is described in section 5.3 of this transport assessment. This network of paths will provide sufficient level of accessibility and connectivity for pedestrians within the structure plan area including connections to major external nodes. As previously discussed, it is anticipated that, due to the relatively low level of traffic forecast for internal LSP roads, cyclists and vehicles can be expected to safely share the LSP roads and as such no particular cyclist facilities are proposed for the LSP.

The WAPC *Transport Assessment Guidelines for Developments Volume 2 – Structure Plans (2006)* provides guidance on the levels of traffic volumes that are likely to affect the ability for pedestrians to cross various types of road. Accordingly, an undivided two-lane road should be acceptable for pedestrians crossing traffic volumes of up to approximately 11,000vpd and this threshold can be increased to around 28,000vpd by adding a central median or pedestrian refuge islands. On a four-lane road, because of its greater carriageway width, this threshold is lower; even with a median island the threshold is only around 16,000vpd.

Since the forecast traffic volumes on internal LSP roads as well as external roads abutting the LSP area are nowhere near these levels, the ability of pedestrians and cyclists to cross these roads is not a concern.

However, as discussed in section 5.3, it is proposed that a pedestrian crossing facility with ramps be considered for Wentworth Parade, immediately north of its roundabout intersection with Bartram Road. This facility would facilitate safe pedestrian and cyclist crossing Wentworth Parade and at the same time provide connection to Bartram Road and Wentworth Parade shared paths. The details of the crossing will be finalised during the subdivision design stage.

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[1] *vph – vehicles per hour*

9.0 Analysis of External Transport Network

9.1 *Traffic Volumes on External Road Network*

The existing and post development daily (weekday) traffic volumes on the road abutting the LSP area are shown in **Table 5**.

Table 5. Existing and post development traffic on surrounding roads

Road	Estimated current daily volume	Additional LSP traffic	Total post LSP
Bartram Road	1,220vpd[2]	606vpd	1,826vpd
Wentworth Parade	8,820vpd[3]	404vpd	9,224vpd

The traffic projections for the post-development stage indicate that Wentworth Parade overall daily traffic would increase by approximately 4.5% as a result of the LSP traffic. This increase is considered to be modest and within the physical capacity of the road.

The post-development increase in daily traffic of Bartram Road is well within the recommended daily threshold for a single-carriageway, two-lane *Access Street* road (<3,000vpd).

It is therefore, concluded that the existing road network has the capacity to accommodate the anticipated LSP traffic.

9.2 *External Intersections*

In line with the discussion presented in section 8.2 of the report, a detailed capacity analysis of the LSP's access intersection on Bartram Road is not warranted since the anticipated traffic volumes through this future access intersection is below the relevant thresholds (refer **Table 4**).

Similarly, the future LSP access intersection on Wentworth Parade is proposed in the form of a left-in/left-out intersection and as such capacity issues for this access intersection are not anticipated. Hence, a detailed capacity assessment is not warranted for this intersection.

The capacity assessment of the key local intersections of Wentworth Parade/Bartram Road and Hammond Road/Bartram Road was undertaken to establish the level of service and overall operation in the post-development period. It

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[2] *The 2014 daily traffic volumes derived from 2011 records (2.0% annual traffic growth estimate)*
[3] *Based on Transcore's traffic survey data (daily peak hours represent 10% of total daily traffic volume)*

Figure 17. Traffic survey results for Wentworth Parade/Bartram Road intersection (AM/PM peak hour volumes)

With respect to the trip generation rates and traffic distribution assumed for the proposed LSP the estimated total post-development traffic at the two key intersection during the regular weekday AM and PM peak hour periods is shown in two figures on the following page. It is assumed that the proposed residential development will be fully developed and operating by year 2018. In order to approximate the year 2018 traffic on relevant roads a typical annual traffic growth of 2.0% p.a. was applied for all through traffic on Hammond Road and Wentworth Parade. Accordingly, the year 2018 traffic flows which include the development-generated traffic through the two key intersections are illustrated in **Figure 18** and **Figure 19**.

The estimated traffic flows for the future scenario (year 2028) at the two key intersections are also shown in these figures. The traffic flows on Hammond Road and Wentworth Parade are increased to approximate the anticipated 2028 traffic flows. Accordingly, the year 2028 traffic flows which include the development-generated traffic through the Hammond Road/Bartram Road intersection is shown in **Figure 18** while **Figure 19** illustrates the projected volumes for the Wentworth Parade/Bartram Road intersection.

Capacity analysis of the Hammond Road/Bartram Road intersection and Wentworth Parade/Bartram Road roundabout intersection for existing, post-development (year 2018) and 10-year post development time horizon (year 2028), was undertaken using the SIDRA computer software package. SIDRA is an intersection modelling tool commonly used by traffic engineers for all types of intersections. SIDRA outputs are presented in the form of Degree of Saturation, Level of Service, Average Delay and 95% Queue. These characteristics are defined as follows:

- **Degree of Saturation**: is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The Degree of Saturation ranges from close to zero for varied traffic flow up to one for saturated flow or capacity.
- **Level of Service**: is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. In general, there are 6 levels of services, designated from A to F, with Level of Service A representing the best operating condition (i.e. free flow) and Level of Service F the worst (i.e. forced or breakdown flow).
- **Average Delay**: is the average of all travel time delays for vehicles through the intersection.
- **95% Queue**: is the queue length below which 95% of all observed queue lengths fall.

The results of the AM and PM peak period SIDRA analysis for key intersection are summarised in **Appendix B**Error! Reference source not found. and discussed in the following paragraphs.

Hammond Road/Bartram Road intersection

The results of the capacity analysis of Hammond Road/Bartram Road intersection show that this intersection is presently operating satisfactorily with ample spare capacity. Overall level of service A/B (LoS A/B) was recorded for the intersection during both AM and PM peak periods with vehicle queues seldom exceeding one vehicle. On the Bartram Road approach LoS C is recorded only during the PM peak period. Refer **Table 6** and **Table 7** for more details.

The capacity assessment of Hammond Road/Bartram Road intersection for the post-development and future stages was undertaken to assess the impact of the LSP in the short and mid-term period. The result of the capacity assessment for both AM and PM peaks in both scenarios suggest that proportional but moderate impact on the operation of this intersection should be expected; however, the LoS for individual legs of the intersection remain unchanged in both scenarios with most pronounced queuing seldom exceeding two vehicles (Bartram Road left turn during AM peak period). Ample spare capacity remains available even in the future scenario (approximately 85%).

As such, it is concluded that the proposed LSP will not have an adverse impact on the operation of Hammond Road/Bartram Road intersection. The SIDRA results for the post-development and future scenarios during both AM and PM peaks are presented in **Table 8**, **Table 9**, **Table 10** and **Table 11**.

10.0 Conclusions

This Transport Assessment has been prepared for the proposed Local Structure Plan (LSP) for Lot 545 Bartram Road in Success, City of Cockburn. The subject site is located at the northwest corner of Wentworth Parade/Bartram Road intersection and immediately south of Twin Bartram Lakes reserve.

The proposed LSP yields a total of 107 residential dwellings through a mix of individual and group housing lots (R40 and R60). Internal road system consists of *Access Streets D* and *Laneways* designed to facilitate inter-LSP vehicular, cyclist and pedestrian movements and seamlessly integrate with the future residential developments to the immediate west.

The LSP is estimated to generate approximately 1,010 total daily vehicular trips with approximately 101 trips during AM and PM peak weekday periods. The total daily vehicular traffic includes both inbound and outbound trips.

The proposed external access system for the LSP comprises a full-movement access intersection on Bartram Road and a left-in/left-out only access intersection on Wentworth Parade.

The capacity assessments undertaken for the abutting roads and intersections indicates that the proposed LSP will not have an adverse impact on the local road network which has the capacity to accommodate the anticipated LSP-generated traffic.

The subject site is accessible by existing bus services connecting the site with Cockburn Central Train Station and with bus stops on Wentworth Parade in immediate vicinity of the site as well as on Baningan Avenue 5-10min walking distance to the west of the site.

The LSP traffic has no adverse impact on the surrounding road network which has the capacity to accommodate the LSP traffic without undermining safety and traffic operations.

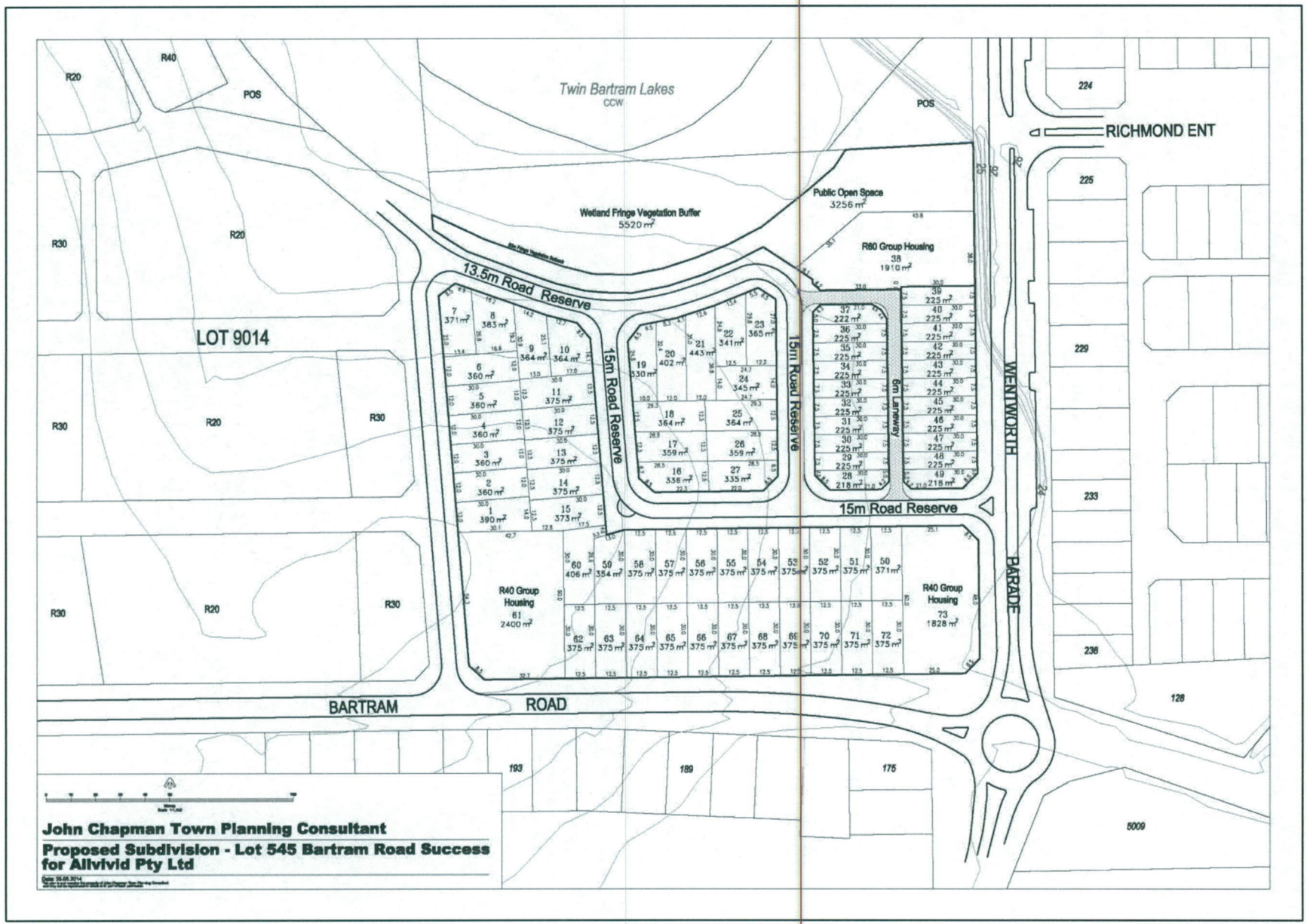

Table 6. SIDRA results for the Hammond Road/Bartram Road intersection – AM peak period (existing situation)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hammond Road South											
11	T	377	2.0	0.098	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	73	2.0	0.063	8.9	LOS A	0.3	1.8	0.32	0.62	47.7
Approach		450	2.0	0.098	1.4	NA	0.3	1.8	0.05	0.10	57.6
South East: Median (RT Stage 2)											
32	R	16	2.0	0.020	7.5	LOS A	0.1	0.4	0.42	0.87	23.3
Approach		16	2.0	0.020	7.5	LOS A	0.1	0.4	0.42	0.87	23.3
East: Bartram Road (RT Stage 1)											
1	L	27	2.0	0.028	11.8	LOS B	0.1	0.7	0.31	0.87	46.0
3	R	16	2.0	0.018	14.7	LOS B	0.1	0.4	0.36	0.86	47.4
Approach		43	2.0	0.028	12.8	LOS B	0.1	0.7	0.32	0.86	46.5
North: Hammond Road North											
4	L	24	2.0	0.013	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
5	T	203	2.0	0.053	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		227	2.0	0.053	0.9	NA	0.0	0.0	0.00	0.07	58.6
All Vehicles		736	2.0	0.098	2.1	NA	0.3	1.8	0.06	0.15	56.8

Table 7. SIDRA results for the Hammond Road/Bartram Road intersection – PM peak period (existing situation)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hammond Road South											
11	T	243	2.0	0.063	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	83	2.0	0.092	10.2	LOS B	0.4	2.6	0.48	0.72	47.0
Approach		326	2.0	0.092	2.6	NA	0.4	2.6	0.12	0.18	56.0
South East: Median (RT Stage 2)											
32	R	18	2.0	0.019	6.7	LOS A	0.1	0.4	0.33	0.86	24.2
Approach		18	2.0	0.019	6.7	LOS A	0.1	0.4	0.33	0.86	24.2
East: Bartram Road (RT Stage 1)											
1	L	84	2.0	0.113	13.4	LOS B	0.4	3.0	0.47	0.93	44.8
3	R	18	2.0	0.027	16.3	LOS C	0.1	0.7	0.49	0.89	45.8
Approach		102	2.0	0.113	13.9	LOS B	0.4	3.0	0.48	0.92	44.9
North: Hammond Road North											
4	L	44	2.0	0.024	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
5	T	431	2.0	0.112	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		475	2.0	0.112	0.8	NA	0.0	0.0	0.00	0.06	58.8
All Vehicles		921	2.0	0.113	3.0	NA	0.4	3.0	0.10	0.22	55.6

Table 10. SIDRA results for the Hammond Road/Bartram Road intersection – AM peak period (future scenario)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hammond Road South											
11	T	482	2.0	0.125	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	84	2.0	0.077	9.2	LOS A	0.3	2.2	0.37	0.65	47.5
Approach		566	2.0	0.125	1.4	NA	0.3	2.2	0.05	0.10	57.7
South East: Median (RT Stage 2)											
32	R	32	2.0	0.046	8.3	LOS A	0.2	1.0	0.48	0.91	22.4
Approach		32	2.0	0.046	8.3	LOS A	0.2	1.0	0.48	0.91	22.4
East: Bartram Road (RT Stage 1)											
1	L	57	2.0	0.063	12.1	LOS B	0.2	1.6	0.36	0.88	45.8
3	R	32	2.0	0.039	15.1	LOS C	0.1	1.0	0.40	0.88	46.9
Approach		89	2.0	0.063	13.2	LOS B	0.2	1.6	0.37	0.88	46.1
North: Hammond Road North											
4	L	28	2.0	0.015	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
5	T	260	2.0	0.068	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		288	2.0	0.068	0.8	NA	0.0	0.0	0.00	0.06	58.7
All Vehicles		975	2.0	0.125	2.5	NA	0.3	2.2	0.08	0.19	56.2

Table 11. SIDRA results for the Hammond Road/Bartram Road intersection – PM peak period (future scenario)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop Queued	Effective Stop Rate per veh	Average Speed km/h
South: Hammond Road South											
11	T	311	2.0	0.081	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R	109	2.0	0.140	11.1	LOS B	0.6	3.9	0.55	0.79	46.0
Approach		420	2.0	0.140	2.9	NA	0.6	3.9	0.14	0.20	55.6
South East: Median (RT Stage 2)											
32	R	26	2.0	0.030	7.1	LOS A	0.1	0.6	0.38	0.87	23.7
Approach		26	2.0	0.030	7.1	LOS A	0.1	0.6	0.38	0.87	23.7
East: Bartram Road (RT Stage 1)											
1	L	97	2.0	0.152	14.5	LOS B	0.6	4.0	0.54	0.98	43.9
3	R	26	2.0	0.047	17.7	LOS C	0.2	1.1	0.55	0.95	44.4
Approach		123	2.0	0.152	15.2	LOS C	0.6	4.0	0.54	0.97	44.0
North: Hammond Road North											
4	L	58	2.0	0.032	8.2	LOS A	0.0	0.0	0.00	0.67	49.0
5	T	552	2.0	0.143	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		610	2.0	0.143	0.8	NA	0.0	0.0	0.00	0.06	58.7
All Vehicles		1179	2.0	0.152	3.2	NA	0.6	4.0	0.12	0.23	55.4

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wentworth Pde South											
1	L	13	2.0	0.286	6.2	LOS A	1.7	12.3	0.12	0.54	50.8
2	T	448	2.0	0.286	5.2	LOS A	1.7	12.3	0.12	0.43	51.9
Approach		461	2.0	0.286	5.2	LOS A	1.7	12.3	0.12	0.43	51.8
North: Wentworth Pde North											
8	T	197	2.0	0.141	5.2	LOS A	0.8	5.9	0.11	0.42	51.8
9	R	22	2.0	0.141	12.1	LOS B	0.8	5.9	0.11	0.90	45.9
Approach		219	2.0	0.141	5.8	LOS A	0.8	5.9	0.11	0.47	51.1
West: Bartram Rd West											
10	L	82	2.0	0.103	8.3	LOS A	0.5	3.9	0.53	0.63	48.0
12	R	22	2.0	0.103	13.4	LOS B	0.5	3.9	0.53	0.77	45.0
Approach		104	2.0	0.103	9.4	LOS A	0.5	3.9	0.53	0.66	47.3
All Vehicles		784	2.0	0.286	5.9	LOS A	1.7	12.3	0.17	0.47	51.0

Table 15. SIDRA results for the Wentworth Parade/Bartram Road intersection – PM peak period (post-development scenario)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wentworth Pde South											
1	L	15	2.0	0.190	6.6	LOS A	1.0	7.4	0.26	0.54	50.0
2	T	245	2.0	0.190	5.5	LOS A	1.0	7.4	0.26	0.45	50.8
Approach		260	2.0	0.190	5.6	LOS A	1.0	7.4	0.26	0.46	50.7
North: Wentworth Pde North											
8	T	565	2.0	0.405	5.2	LOS A	3.1	22.1	0.14	0.41	51.6
9	R	98	2.0	0.405	11.7	LOS B	3.1	22.1	0.14	0.85	46.1
Approach		663	2.0	0.405	6.2	LOS A	3.1	22.1	0.14	0.48	50.7
West: Bartram Rd West											
10	L	80	2.0	0.089	7.3	LOS A	0.5	3.3	0.41	0.56	48.7
12	R	22	2.0	0.089	12.4	LOS B	0.5	3.3	0.41	0.74	45.6
Approach		102	2.0	0.089	8.4	LOS A	0.5	3.3	0.41	0.59	48.0
All Vehicles		1025	2.0	0.405	6.2	LOS A	3.1	22.1	0.20	0.48	50.4

Table 16. SIDRA results for the Wentworth Parade/Bartram Road intersection – AM peak period (future scenario)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wentworth Pde South											
1	L	22	2.0	0.340	6.2	LOS A	2.2	15.6	0.12	0.53	50.8
2	T	531	2.0	0.340	5.2	LOS A	2.2	15.6	0.12	0.43	51.8
Approach		553	2.0	0.340	5.2	LOS A	2.2	15.6	0.12	0.43	51.8
North: Wentworth Pde North											
8	T	233	2.0	0.163	5.2	LOS A	1.0	7.0	0.12	0.42	51.8
9	R	22	2.0	0.163	12.1	LOS B	1.0	7.0	0.12	0.90	46.0
Approach		255	2.0	0.163	5.8	LOS A	1.0	7.0	0.12	0.46	51.2
West: Bartram Rd West											
10	L	82	2.0	0.110	8.8	LOS A	0.6	4.2	0.58	0.66	47.7
12	R	22	2.0	0.110	13.9	LOS B	0.6	4.2	0.58	0.79	44.6
Approach		104	2.0	0.110	9.9	LOS A	0.6	4.2	0.58	0.68	47.0
All Vehicles		912	2.0	0.340	5.9	LOS A	2.2	15.6	0.17	0.47	51.0

Appendix E
Engineering servicing report

It is currently anticipated that fill will only be required in the north east corner of the site where the Guildford formation soils are encountered, and along the eastern edge adjacent to Wentworth Parade where the land is lower than Wentworth Parade, in order to provide the necessary clearance to the AAMGL and to enhance lot on site drainage, and allow proper road entry to Wentworth.

Roads & Traffic

The site is readily accessible from the abutting road Bartram Rd, but no access currently exists from Wentworth Parade.

Wentworth Parade is a local distributor road, and is constructed as a dual carriageway along the eastern boundary of the land. It has restricted access for roads and no direct lot access.

Bartram Road is a recently sealed 8 metre wide carriageway without kerbing and formal drainage across most of the site frontage, although the easternmost 120 metres connecting to the roundabout is kerbed and drained. A 2.4m Dual Use Path (DUP) is located along the northern verge adjacent to the carriageway.

All subdivisional road design and construction will be to be to current WAPC and City of Cockburn standards. It is proposed that all internal roads will be constructed with 6m wide carriageways. Entry to the development will be via a road off Bartram Rd in an abutting development and one off Wentworth Parade. A second road connection, to Wentworth Parade, will only provide for left in, left out traffic movement and there will be no median opening.

Power

The site is connected to Power via an aerial low voltage line in Bartram Rd from the west, which terminates at the western corner of the land. It is expected that this development will extend underground mains from the imminent development abutting the site on its western boundary.

Water Supply

The site is expected to be adequately supplied with reticulated water by extending water pipes from those constructed by the abutting development, which will entail connection across Wentworth Parade, and extension along Bartram Road adjacent to the site..

Water Corporation trunk pressure mains for water and sewer are located along the northern side of Bartram Rd, being 1400mm and 900mm steel mains respectively, with another 800mm bore main located on the southern side of the road. The 1400mm steel water main is located on the 4.3 metre alignment across the site boundary.

Site reticulation water supply will be installed on the normal alignment within subdivisional road reserves.

Sewers

The Water Corporation has advised that the site can be connected to existing Water Corporation sewer located east of Wentworth Parade, entailing boring the sewer under Wentworth.

The connection sewer will be constructed by agreement with the abutting developer under Wentworth and through this proposed development within an easement.

A reticulation sewer will be carefully constructed along the northern verge of Bartram Rd between the 1400mm steel water main and the new 150mm water main installed by the abutting developer (see above) on a 3metre alignment. It is expected that the depth of the sewer will be shallower than the trunk water main.

Drainage

The proposed drainage system for the subdivision is by on-site soakage into the Bassendean Sands with a strong focus on infiltration of the storm water "close to source", with an underground storage facility proposed to be located within the road reserve adjacent to the proposed POS area along the northern boundary of the site.