Western Australian Planning Commission

Your Ref: 110/108
Our Ref: SPN/0680/1
Enquiries: Frances Page-Croft (Ph 6551 9290)

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

Attention: Lorenzo Santoriello

Dear Sir/Madam

LOT 6 (210) HAMMOND ROAD, SUCCESS STRUCTURE PLAN

I refer to your letter dated 03 June 2015 regarding the abovementioned matter.

The modifications requested in our letter of 13 April 2015 have been satisfactorily undertaken and the Western Australian Planning Commission has resolved to endorse the Lot 6 (No. 210) Hammond Road, Success Structure Plan.

One endorsed copy of the Structure Plan is enclosed and another has been forwarded to the applicant.

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

Yours faithfully

T Hillyard

Tim Hillyard
Secretary
Western Australian Planning Commission
26 June 2015

cc: TPG, Town Planning, Urban Design and Heritage
Level 7, 182 St Georges Terrace, Perth 6000

Enclosure: Structure Plan dated May 2015

140 William Street, Perth, Western Australia 6000, Locked Bag 2506 Perth, 6001
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Lot 6 (210) Hammond Road, Success

Structure Plan

May 2015

Prepared by TPG

Town Planning, Urban Design and Heritage

Lot 6 (210) Hammond Road, Success

Structure Plan

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Contents

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ENDORSEMENT PAGE

This structure plan is prepared under the provisions of the City of Cockburn Town Planning Scheme No. 3.

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

16 June 2015

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

Date of Expiry: **19 October 2031**

TABLE OF VARIATION(S) FROM STRUCTURE PLAN

Change or Variation No.	Description of Change or Variation	Date Adopted by the Council	Date Endorsed by the WAPC (if required)

EXECUTIVE SUMMARY

The site the subject of this Structure Plan is described as Lot 6 (210) Hammond Road, Success. The site is approximately 2 hectares in area, located on the western side of Hammond Road and partly comprises a Conservation Category Wetland associated with Beeliar Regional Park. The intent of the Structure Plan is to secure the tenure of the wetland by transferring it to the Crown whilst allowing sufficient development on the eastern portion to justify ceding the wetland, part of the buffer, a new road and road widening for Hammond Road all at no cost to the Crown.

The site is proposed to be subdivided into three lots for residential development purposes (total 6,519sqm) accessed via a proposed new road along the southern boundary, with the remainder of the site to be transferred to the Crown for the purposes of wetland conservation and management. 413sqm of the north-eastern portion of the site will be ceded to facilitate the future road widening of Hammond Road.

This Structure Plan takes into account the statutory and strategic planning framework applicable to the site, outlines development principles, and contains assessments as they relate to environmental, engineering and servicing, transport impact and bushfire management issues.

Item	**Data**	**Section number referenced within the Structure Plan Report**
Gross Structure Plan Area	2.0260 hectares	2.2 Legal Description Structure Plan Map
Area of each land use proposed <u>Zones</u> Residential R60 <u>Reserves</u> Parks and Recreation	 0.6519 hectares 1.1798 hectares	5.2 Land Use 5.4 Public Open Space Structure Plan Map Public Open Space Plan
Estimated Lot Yield	2 residential lots plus balance lot	6.1 Subdivision
Estimated Number of Dwellings	40-60 dwellings	5.3 Residential Density
Estimated Residential Density - dwellings per gross hectare *As per Directions 2031* - dwellings per site hectare *As per Liveable Neighbourhoods*	 20 dwellings per gross hectare 60 dwellings per site hectare	5.3 Residential Density
Estimated Population	88-132 people @ 2.2 people/household	5.3 Residential Density
Area Required for Road Widening	0.0413 hectares	Structure Plan Map

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Part One – Structure Plan Report

1.0 Structure Plan Area

The Structure Plan is identified as Lot 6 (210) Hammond Road, Success.

This Structure Plan shall apply to the land contained within the inner edge of the line denoting the structure plan boundary on the Structure Plan Map.

2.0 Structure Plan Content

The Structure Plan comprises the following sections:

(i) Part 1 – Statutory Section. This section includes the Structure Plan Map and any textual provisions, standards or requirements that require statutory effect.

(ii) Part 2 – Explanatory Section (Non-Statutory). This section provides the planning context and justification for the Structure Plan Map and the textual provisions contained in Part One of the Structure Plan. Part Two is to be used as a reference to guide interpretation and implementation of Part One.

(iii) Appendices, includes all specialist consultant reports and documentation used in the preparation of and to support the land use outcomes of the Structure Plan.

3.0 Interpretation and Relationship with City of Cockburn Town Planning Scheme No.3

3.1	Terms and Interpretations	As per Clause 6.2.6.3 of the City of Cockburn Town Planning Scheme No.3.
3.2	Relationship of the Structure Plan with City of Cockburn Town Planning Scheme No.3	This Structure Plan has been prepared under Clause 6.2 of the City of Cockburn Town Planning Scheme No.3 as the subject land is zoned 'Development' and contained within Development Area No. 13 which is shown on the Scheme Map and contained within Schedule No.11.
3.3	Provisions	Pursuant to Clause 6.2.6.3 and Clause 6.2.12.2 of the City of Cockburn Town Planning Scheme No.3.
3.4	Land Use Permissibility	As per Clause 4.3.2 of the City of Cockburn Town Planning Scheme No.3.

4.0 Operation

4.1	Operation Date	As per Clause 6.2.12 of the City of Cockburn Town Planning Scheme No.3.
4.2	Variation to Structure Plan	As per Clause 6.2.14 and Clause 6.2.15 of the City of Cockburn Town Planning Scheme No.3.

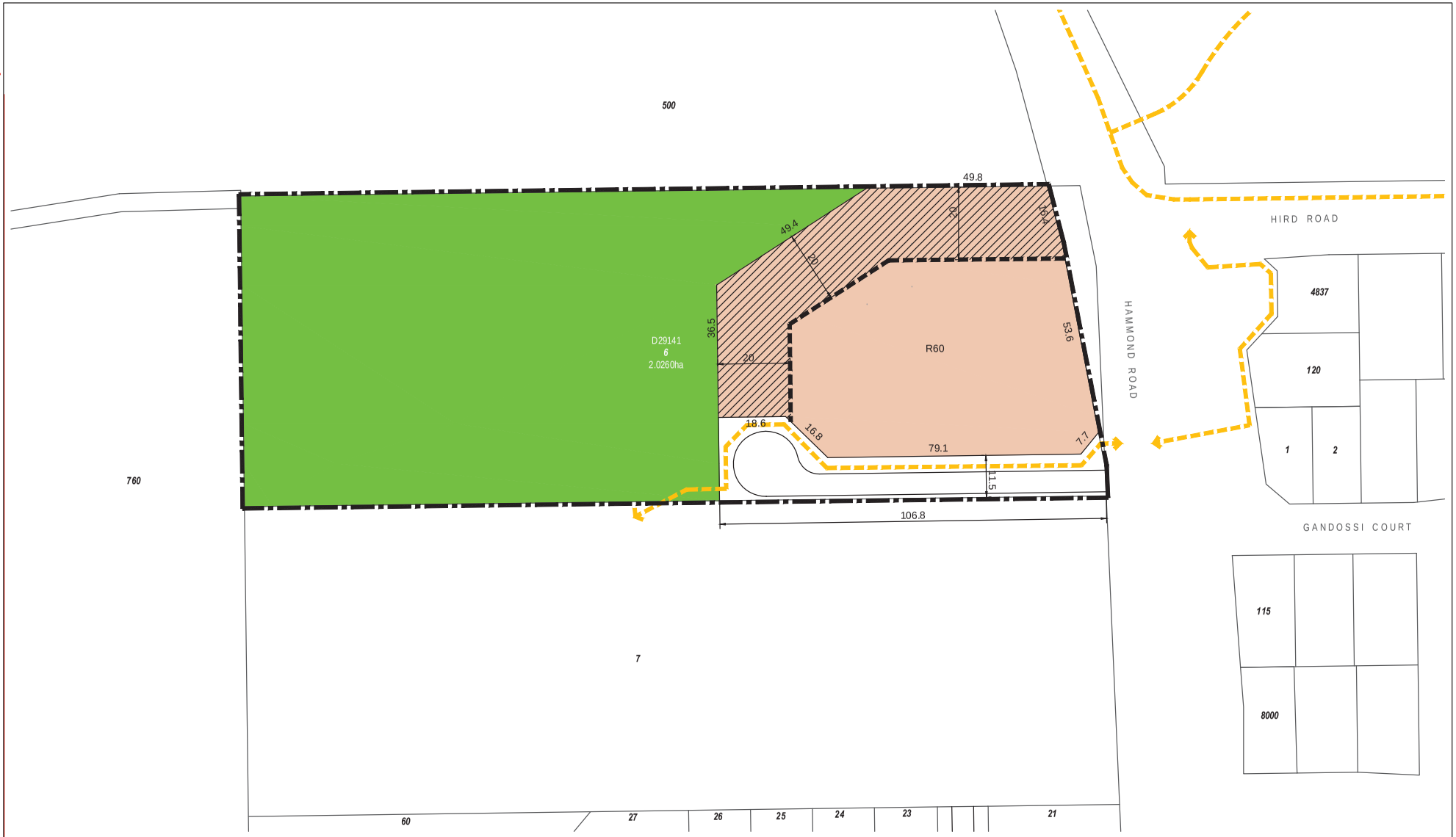
5.1	Residential Density	Residential densities applicable to the Structure Plan area shall be those residential densities shown on the Structure Plan Map.

6.0 Subdivision / Development

6.1	Notifications on Title	In respect of applications for the subdivision of land the Council shall recommend to the Western Australian Planning Commission that a condition be imposed on the grant of subdivision approval for a notification to be placed on the Certificate(s) of Title(s) to advise of the following: - 1. Land or lots deemed to be affected by a Bush Fire Hazard as identified within the Bushfire Management Plan (BMP) contained within Appendix 5. 2. Building setbacks and construction standards required to achieve a Bushfire Attack Level (BAL) 29 –or lower in accordance with Australian Standards (AS3959-2009): Construction of buildings in bushfire prone areas. 3. Land or lots deemed to be impacted by a risk of mosquito born disease in the area.
6.2	Detailed Area Plans (Local Development Plans)	1. Detailed Area Plans (DAP's) are required to be prepared and implemented pursuant to Clause 6.2.15 of the City of Cockburn Town Planning Scheme No.3 for lots comprising one or more of the following site attributes: (i) Lots with direct boundary frontage (primary or secondary) to an area of Parks and Recreation; (ii) Lots abutting Hammond Road where direct vehicle access is to be precluded; and (iii) Lots deemed to be affected by a recognised Bush Fire Hazard, as identified spatially in the accompanying BMP, under Appendix 5.
6.3	Designated Bushfire Prone Areas – Construction Standards	This Structure Plan is supported by a BMP located in Appendix 5 “Bushfire Prone Planning - Bushfire Management Plan Lot 6 (210) Hammond Road, Success Project number 14110”. Any land falling within 100 metres of a bushfire hazard identified in the BMP is designated as a Bushfire Prone Area for the purpose of the Building Code of Australia.

7.0 Other Requirements

7.1	Development Contribution Items and Arrangements	The developer is to make satisfactory arrangements with the City of Cockburn to provide proportional contributions towards those items of development infrastructure defined in the City of Cockburn Town Planning Scheme No. 3 for Developer Contribution Area No. 1 (DCA1) and DCA13. 1. Road Upgrades. The following roads are to be upgraded to dual carriageway standard: (a) Hammond Road as per DCA1, Schedule 12 of the City of Cockburn Town Planning Scheme No.3. 2. Infrastructure Upgrades. The following infrastructure contributions are to be made: (a) Contributions towards region-wide soft (community) infrastructure as per DCA13.
7.2	Other land use, development and subdivision requirements	1. In respect of applications for the subdivision of land the Council shall recommend to the Western Australian Planning Commission that a condition be imposed requiring the preparation and/or implementation of the following: (a) Wetland rehabilitation and landscaping strategy (b) Urban Water Management Plan (c) A Mosquito Management Plan 2. In respect of applications for the subdivision of land the Council shall recommend to the Western Australian Planning Commission that condition(s) be imposed requiring the implementation of the BMP (Appendix 5) which has been prepared as part of this Structure Plan. 3. No Class 1, 2, 3 or 10a structures (as defined by the Building Code of Australia) shall be approved or constructed within the area identified as 'No Building Zone' on the Structure Plan Map including minor projections and structures appurtenant to dwellings such as carports, garages, verandas, patios and outbuildings. But does not include barriers such as driveways, lawns or pathways as outlined in Appendix 5 BMP. Class 1, 2, 3 or 10a structures are to be wholly contained in the BAL 29, 19 and 12.5 areas as identified on figure 9 of Appendix 5 BMP. No Class 1, 2, 3 or 10a structures are permitted within the BAL 40 or FZ areas of figure 9.



LEGEND

LOCAL PLANNING SCHEME ZONES / RESERVES

- Parks and Recreation
- Residential (R60)
- Local Road

OTHER

- Structure Plan Area
- Indicative Location for Shared Path
- No Building Zone

0 50m

This concept has been prepared for the purpose of meeting client specifications. The drawing does not constitute an invitation, agreement or contract (or any part thereof) of any kind whatsoever.

Although care has been taken in the compilation of this drawing by The Planning Group WA Pty Ltd, all parties associated with the proposed property development disclaim all responsibility for any errors or omissions. The right is reserved to change the plan at any time.

Liability is expressly disclaimed by The Planning Group WA Pty Ltd for any loss or damage which may be sustained by any person acting on any visual impression gained from this drawing.

All areas and dimensions are approximate and are subject to survey.

STRUCTURE PLAN MAP

Lot 6 (210) Hammond Road, Success

Date: 20 May 2015 Designer: DR

Scale: 1:1,000 @ A3 Drawn: GW

Drawing No. 714-320 ST Structure Plan.dwg

TOWN PLANNING AND URBAN DESIGN

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The Planning Group WA Pty Ltd ABN 36 097 273 222

Part Two – Explanatory Section

1. Introduction and Purpose

This Structure Plan has been prepared to define the land use and road access framework for the subject site, a significant part of which forms a portion of the Beeliar Regional Park and associated Conservation Category Wetlands.

Pursuant to Clause 6.2 of City of Cockburn Town Planning Scheme No. 3, approval of a Structure Plan is required to enable subdivision and development of the site.

The purpose and intent of the Structure Plan is to secure the tenure of the wetland by transferring it to the Crown whilst allowing sufficient development on the eastern portion to justify ceding the wetland, part of the buffer, a new road and road widening for Hammond Road all at no cost to the Crown.

2. Land Description

2.1 Location and Context

Lot 6 (210) Hammond Road (the subject site) is a 2 hectare site located between Hammond Road and the 'Bartram Road Buffer Lakes' in the suburb of Success, within the City of Cockburn. The subject site is located within proximity to a number of urban amenities including Jandakot Primary School, Emmanuel Catholic College and areas of public open space.

Located approximately 1.5 kilometres north-east of the subject site is Cockburn Central, which comprises high-order commercial, retail and mixed-use land uses as well the Cockburn Train Station all of which is directly accessible by Transperth Bus services located within 400m of the site. Regionally the site has access to the Perth-Mandurah Railway, Kwinana Freeway, Beeliar Drive and Armadale Road, which provide users of the subject site with accessibility to the wider Perth metropolitan area.

The subject site is also located adjacent to a number of valued natural resources including the City of Cockburn central chain of lakes that is encompassed by Beeliar Regional Park and Thomsons lake Nature Reserve. Advice from PGV Environmental following a search of the Department of Parks and Wildlife (DPaW) online wetland mapping and a site inspection revealed that a portion of the subject site lies within a wider Conservation Category Wetland (CCW), which typically carries a generic 50m buffer to protect its environmental qualities from development. In this instance however, it is noted that the existing dwelling and structures on the subject site are located entirely within this buffer zone and therefore erode its environmental value. Given the considerable size of the wetland and the buffer that is in private ownership, it is proposed to allow development in part of the buffer in order to secure the more important wetland into the care, control and management of the State.

Refer to Figure 1 - Context Plan

2.2 Legal Description

The relevant particulars of the subject site's Certificate of Title are summarised below:

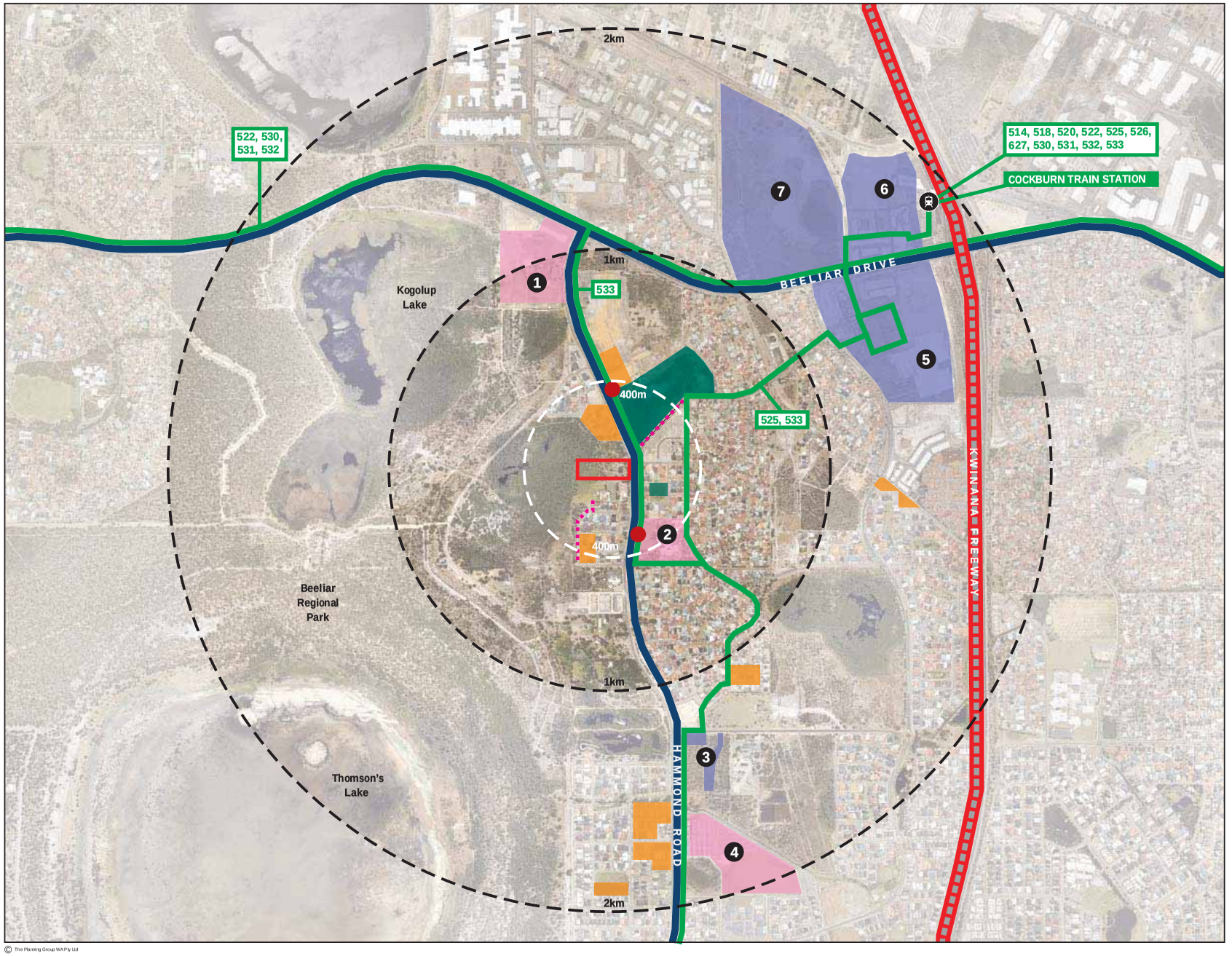
Lot	Address	Diagram	Vol/Fol	Area
6	210 Hammond Road, Success	29141	1386/939	2.026ha

2.3 Existing Development and Land Use

The 2 hectare site currently comprises a single residential dwelling located entirely within the 50 metre buffer to the CCW. The property also contains numerous outbuildings associated with the agistment of horses.

Two lots to the south of the subject site has recently been developed for low-medium residential density (R20) with a portion of that site provided as public open space adjoining the wetland and its buffer. Road layouts within Lot 8 indicate the extension of vehicular access north to Lot 7 (immediately south of the subject site), as well as the extension of a pedestrian footpath from the south-west joining through the subject site to the east side of Hammond Road.

Refer to Figure 2 – Site, Aerial and Conservation Assets Plan



CONTEXT PLAN

Lot 6 (210) Hammond Road, Success

Date: 22 Jul 2014
Scale: NTS @ A3
Project Manager: DR
Checked: AMH
Drawn: GW
Drawing No. 714-320 PL context.ai

source: nearmaps

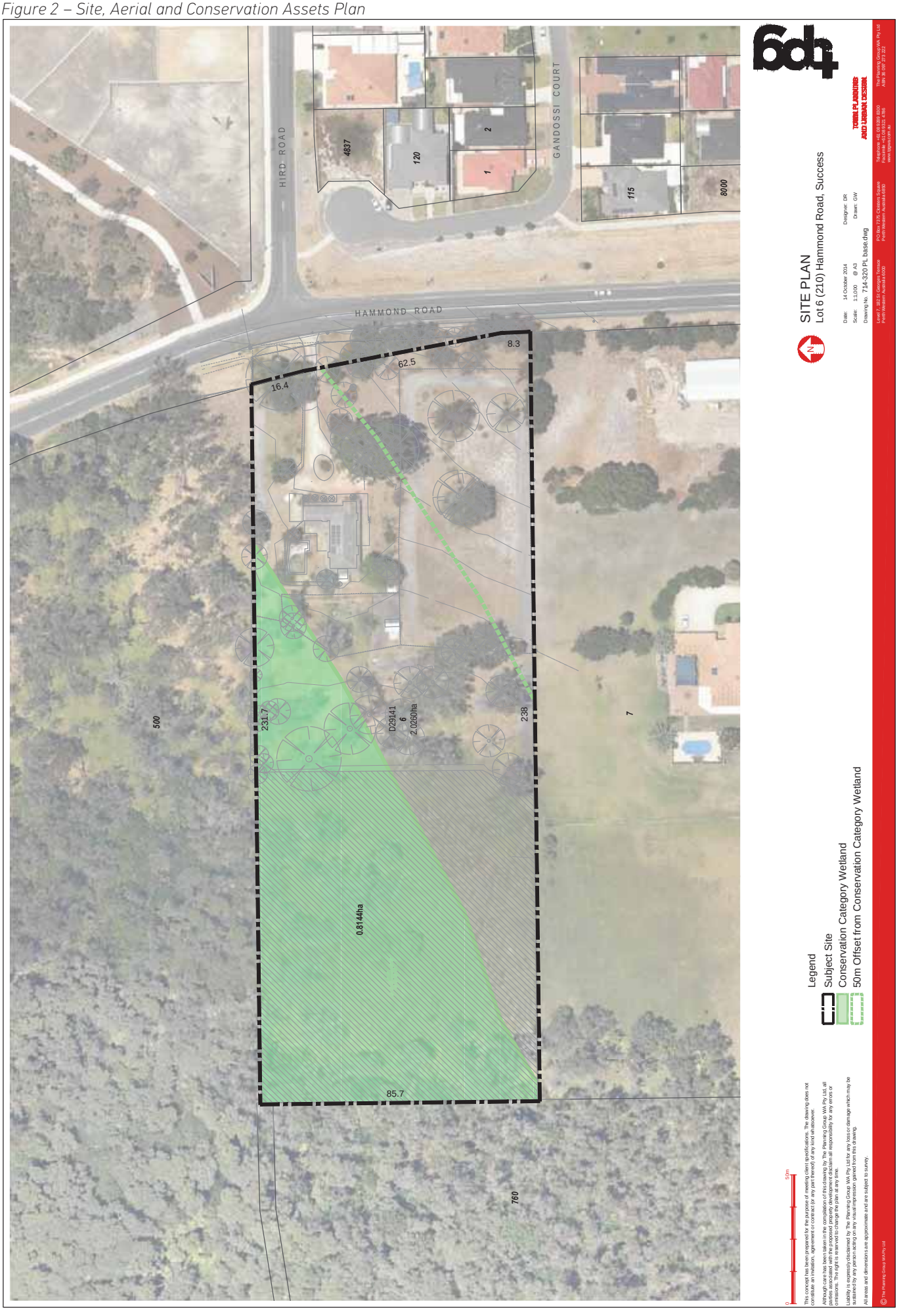
- Subject Site
- Freeway
- Key Roads
- Rail Line
- Bus Routes
- 1km radius
- 400m walkable catchment
- Cockburn Train Station
- Bus Stops in proximity to site
- Commercial / Retail / Mixed Use
- Community Facilitites
- Pockets of higher density
- Public Open Space
- Walk Trail

1. Emmanuel Catholic College
2. Jandakot Primary School & Educational Support
3. Future Local Centre & Mixed Business
4. Sports & Recreation Centre
5. Cockburn Central Shopping Centre
6. Cockburn Central Mixed Use
7. Cockburn Central West Development Area

TOWN PLANNING
URBAN DESIGN AND HERITAGE

Figure 1 - Context Plan

Figure 2 – Site, Aerial and Conservation Assets Plan



3. Planning Framework

3.1 City of Cockburn Town Planning Scheme No. 3

The subject site is zoned 'Development' under the City of Cockburn Town Planning Scheme No. 3 (TPS3 or Scheme) and is located in Development Area No. 13 (DA13) 'Hammond Road Development Zone'. The intended purpose of DA13 is to provide for residential development through coordinated subdivision and development.

The subject site is situated on the western side of Hammond Road and is bound by a 'Parks and Recreation' reservation on its northern and western boundaries and a portion of its eastern boundary is reserved for the purposes of 'Other Regional Road'. The Structure Plan reflects this reservation to accommodate the future widening of Hammond Road.

The subject site is also subject to Developer Contribution Area 1 (DCA1) 'Success North', which requires a monetary contribution to be made per developable hectare to ensure that infrastructure requirements are provided, in this case the widening of Hammond Road. DCA13 (region-wide soft infrastructure) also affects the subject site, which ensures that all developers contribute towards community infrastructure within the City of Cockburn on a per new lot basis. Contribution requirements are imposed as conditions of subdivision or development approval.

3.2 Directions 2031 and Beyond

Directions 2031 and Beyond (Directions 2031) is a high-level spatial framework strategy to guide the detailed planning and delivery of housing, infrastructure and services necessary to accommodate the future growth of Perth and Peel in a way that maximises land efficiency.

The five key themes embodied by Directions 2031 area liveable city, a prosperous city, an accessible city, a sustainable city and a responsible city. Whilst the Structure Plan area itself is relatively small-scale, the following comments can be made against the five key themes of Directions 2031:

- The Structure Plan provides for residential living opportunities in close proximity to activity and employment centres and public transport corridors;
- The Structure Plan has the potential to contribute to the supply of strategically located affordable housing within the existing and developing urban fabric;
- The occupants and visitors of future development will enhance the economic activity of the lower order centres in the district;
- The proposal will increase the catchment for the Cockburn Train Station, enhance the economic efficiency of public transport, and has the potential to therefore reduce car dependency;
- The occupants and visitors of future development will be highly connected to employment, education, recreation and community services given the close proximity to Cockburn Central, Jandakot Primary School, Cockburn Train Station, and Kwinana Freeway and other regional roads;
- The proposal will ensure the efficiency of existing and proposal urban infrastructure; and
- The proposal will ensure that the value of adjoining environmentally sensitive areas is protected;

The site falls within the South-West Sub-region under Directions 2031 and Beyond, in which a total of 278,000 dwellings are required to meet housing demand for 2031. The City of Cockburn is identified to accommodate some 29,300 of these dwellings. Directions 2031 strongly encourages increased housing diversity, adaptability, affordability and choice. Key objectives of Directions 2031 relevant to the proposed Structure Plan include:

- Promote good urban design and development to enhance people's experience of the city;
- Design accessible, well-connected and sustainable urban communities; and
- Develop a coordinated approach to infrastructure and land use planning and development.

The proposed Structure Plan responds to the abovementioned objectives by introducing a planning framework to facilitate the orderly development of medium density multiple dwellings in close proximity to community infrastructure and that are well connected to efficient public transport.

On this basis, the proposal is considered to demonstrate State strategic planning merit.

3.3 Liveable Neighbourhoods

Liveable Neighbourhoods is an operational policy, adopted by the WAPC, for the design and assessment of structure plans and subdivisions. The elements of Liveable Neighbourhoods primarily relate to larger-scale structure plans and subdivisions, and accordingly a detailed

assessment of this structure plan against these elements is not considered necessary in this instance due to its small scale and simple nature.

However, it is acknowledged that the general intent and objectives of Liveable Neighbourhoods are considered relevant in terms of addressing such things as connectivity and walkability, public parkland, urban water management and utilities. To this end, a detailed description of the design rationale for the Structure Plan is provided in section 5 of this report.

3.4 City of Cockburn Local Planning Strategy

The City of Cockburn Local Planning Strategy was adopted in 2000 and is largely out of date, however contains some relevant principles as follows:

- Maximise development near public transport routes; and
- Ensure that wetlands are protected.

As outlined in this report, this Structure Plan will facilitate subdivision and development that is considered to meet these objectives of a liveable, connected and environmentally responsible proposal.

3.5 City of Cockburn Local Planning Policies

Future development of the subject site will be in accordance with this Structure Plan and any relevant local planning policies. The following local planning policies are considered relevant in this instance.

3.5.1 APD20 Incorporating Natural Areas in Public Open Space and/or Drainage Areas

Buffers to wetlands represent the important environmental, social, cultural and educational and aesthetic value of neighbouring natural areas. The purpose of APD20 'Incorporating Natural Areas in Public Open Space and/or Drainage Areas' is to ensure that public open space and drainage areas that are to include natural areas are located, designed and developed in accordance with principles which protect and enhance the area's environmental qualities and minimises the City's ongoing management and maintenance requirements.

This Structure Plan proposes to incorporate a portion of the wetland and its buffer which covers a portion of the subject site as restricted public open space. Environmental considerations such as weed management, nutrient filtering, reducing spread of rubbish and disturbance by human activity, among others, will be addressed at the detailed design stage of the proposal, with the requirement for a wetland rehabilitation and landscaping strategy to be prepared an implemented prior to development.

3.5.2 APD62 Vehicle Access

Policy APD62 'Vehicle Access' seeks to ensure that subdivision and development provide for safe and efficient movement of motorists, public transport users, pedestrians and cyclists, and waste management and other service vehicles, as well as providing for reasonable property access that is direct, convenient and safe. This is to be addressed by precluding direct vehicle access onto Hammond Road and instead creating a new road on the properties southern boundary where it can service the subject and future development.

A Transport Impact Statement has been prepared by KCTT and is discussed in section 5.5 and is attached as Appendix 2.

4. Site Conditions and Constraints

4.1 Environmental Assessment

PGV Environmental undertook investigations in June 2014 to assess the environmental impact of the proposed development in accordance with the attached Indicative Development Concept (prepared by TPG). The assessment considered environmental factors such as previous, current and surrounding land uses, soils, wetlands, groundwater and surface water, and flora and fauna.

The Environmental Assessment of the Indicative Development Concept resulted in the following conclusions:

- Surrounding land use will not be impacted by the proposed development;
- Geology and soil types are not an impediment to the development;
- Once detailed engineering design is complete any soil disturbance will need to be investigated and if required an ASS Management Plan prepared;
- Groundwater is highly unlikely to be impacted by the proposed development;

- Surface water will be managed in accordance with Department of Water requirements;
- The north-west half of the site contains a Conservation Category Wetland. The vegetation in the wetland has been significantly modified over time and is currently in Degraded to Completely Degraded condition. Nevertheless the proposed development retains the wetland in its entirety;
- A 0m to 50m modified wetland buffer is considered acceptable for this development as it excludes the existing house area, provides a low fuel zone outside the wetland area and will allow rehabilitation of the western part of the buffer to remove invasive weeds such as Arum Lily to better protect the wetland;
- The wetland values will be increased by weed control, removal of an existing structure and revegetation;
- Scattered native trees (Flooded Gum and Paperbark), shrubs and herbs occur in the wetland and adjacent areas. All native plants will be retained in the wetland area. Any trees lost in the buffer will be replaced in the rehabilitation of the degraded parts of the western buffer; and
- No significant fauna habitat will be impacted by the proposed development on the site.

In conclusion PGV Environmental considers the proposed development in accordance with the Indicative Development Concept will not impact on the environment and should result in enhanced environmental values due to rehabilitation of the wetland and buffer that would not be achievable if the standard 50m buffer were applied, rendering the site undevelopable.

Refer to Appendix 1 – Environmental Assessment

4.2 Acid Sulphate Soils

A desktop review of the Shared Land Information Platform indicates that the subject site and its surrounds have a medium to low risk of acid sulphate soils occurring within 3m of the ground surface.

4.3 Heritage

A search of the Heritage Council of Western Australia's Register of Heritage Places and Department of Aboriginal Affairs' Aboriginal Heritage Inquiry System revealed no known places of significance within or immediately surrounding the subject site.

5. Structure Plan

5.1 Design Rationale and Objectives

The proposed Structure Plan has been prepared to demonstrate the intended development pattern for the subject site. The objectives of the Structure Plan are as follows:

- Protect the environmental values of the Conservation Category Wetland;
- Provide diversity in housing choice and size;
- Orientate development to address both Hammond Road and the proposed new road and to take advantage of the adjoining wetland as an area of high amenity and outlook;
- Facilitate passive sustainable design approaches in terms of solar orientation of dwellings; and
- Provide for logical connections of pathways and road access.

5.2 Land Use

Town Planning Scheme No. 3 states that development and land use of land within a 'Development Zone' is to be in accordance with a Structure Plan. Part 1 of this Structure Plan states that the land use permissibility within the Structure Plan area shall be in accordance with the zones and reserves designated under the Structure Plan as if the zones and reserves were incorporated into the Scheme.

This Structure Plan identifies a 'Residential' zoning over the eastern portion of the site with a corresponding density of R60 (0.6519ha), and a Parks and Recreation Reserve over the western portion of the site (1.1798ha). On this basis, the Structure Plan once adopted will facilitate the development of residential dwellings, including the potential for multiple dwellings.

5.3 Residential Density

The Structure Plan proposes a residential density of R60. Based on the corresponding plot ratio for R60 development, a total of approximately 60 multiple dwellings can theoretically be accommodated in the 'Residential' zoned area. The Indicative Development Concept proposes to develop 54 multiple dwellings on proposed Lots 1 and 2. Any future development will be subject to the residential density of R60 and the provisions contained within Part One of the Structure Plan (including the need for a Detailed Area Plan where stated) and the Residential Design Codes.

5.4 Public Open Space

The provision of Public Open Space (POS) within new development areas is a key factor in the consideration of Structure Planning, particularly in terms of the extent of POS provision and of the dimensions and functions of the POS areas provided. There are several City policies that are relevant in terms of assessing the POS provision, however it is ultimately the Western Australian Planning Commission that determines the level of POS provision, having regard for Liveable Neighbourhoods or Development Control (DC) Policy 2.3 'Public Open Space in Residential Areas'.

Both DC Policy 2.3 and Liveable Neighbourhoods require a minimum contribution of 10% of the gross subdivisible area to be given up for public parkland. The City's Policy APD20 'Incorporating Natural Areas in Public Open Space and/or Drainage Areas' seeks to ensure that POS and drainage areas that include natural areas are located, designed and developed in accordance with principles which protect and enhance the areas' environmental qualities and minimise the City's ongoing management and maintenance requirements.

Discussions with the City of Cockburn have acknowledged the objectives of securing the right planning outcome for the site and understanding the principles of trade-offs with quite constrained sites. Due to the extent of the Conservation Category Wetland across the subject site, the developable area of the site is greatly diminished. Accordingly, this Structure Plan has taken the developability of the subject site and conservation of the wetland into consideration when determining the location and extent of POS whilst attempting to provide a consolidated area of POS. This Structure Plan provides 0.3654 hectares of restricted use POS, being the open space located within the wetland buffer and which represents approximately 18% of the site area, or 30% of the gross subdivisible area. An additional 0.8 hectares or 40% of the site area is set aside for the conservation of the wetland. Together, 1.1798 hectares of land is reserved for Parks and Recreation.

Whilst it is acknowledged that Liveable Neighbourhoods limits the amount of restricted POS which can contribute to the total (2% of the 10% required), it is considered that the variation is appropriate in this instance as:

- A substantial portion of encumbered POS is provided, being the equivalent of 18% of the overall site area;
- The land is surrounded by already substantial areas of open space including the Beeliar Regional Park, Bandar Park and Jubilee Avenue open space, which will provide adequate POS areas for residents within the subject site as well as ovals within the nearby Jandakot Primary School;
- Providing unencumbered POS in addition to the buffer within the site would render the site undevelopable and would not secure the wetland in the ownership and management of the Crown; and
- The POS located within the 50m wetland buffer will be designed and managed with the objective of securing and enhancing the environmental value of the wetland. The detailed design stage of future development will address considerations such as filtering nutrient rich runoff, reducing spread of midges, weed management, revegetation, reducing spread of rubbish and waste in the wetland area and reducing the outward disturbance of fauna by human activities. To this end, the Structure Plan requires that a wetland rehabilitation and landscaping strategy be prepared and implemented prior to development, to satisfy the requirements of the City's Policy APD20.

It is noted that the City may request cash-in-lieu of POS, however this is considered unreasonable given the comments above.

As the area of restricted POS is a natural area, it is also considered unreasonable to require the developer to develop or contribute to the development of the POS.

Refer to Figure 3 – Public Open Space Plan

5.5 Vehicular and Pedestrian Movement Networks and Access

Access to the site is provided via a 15m wide road reserve ('Road 1') along the southern boundary of the site, as shown on the Structure Plan Map.

KCTT prepared a Transport Impact Assessment and concluded that the intersection with Hammond Road should be limited to Left In Left Out movement only for the following reasons:

- Hammond Road has a significant volume of vehicles on a daily basis and allowing right turning traffic may not meet all Austroads Design Standards;
- The City intends to upgrade Hammond Road to have a dual carriageway and median, potentially by 2017/2018, thereby excluding right turn movements from the subject site within 3 years of starting development on the site;
- KCTT believe the dominant movement from the subject site will be to the south (less than 20%); and

Figure 3 – Public Open Space Plan

- There is insufficient distance between the intersection of the proposed new road and the intersection of Hird Road to generate two right turn deceleration lanes.

KCTT also believe that the peak vehicle volumes from the envisaged development are not high enough to warrant a left turn deceleration lane.

The Structure Plan and Indicative Development Concept remove the existing crossover to Hammond Road and shifts access to the proposed lots to the proposed cul-de-sac road. This hazard is therefore eliminated from this section of Hammond Road. The proposed road will also allow for the movement of service vehicles and makes provision for a footpath to extend along its length.

'Road 1' comprises a 15m wide road reserve in accordance with Liveable Neighbourhoods for short, low volume and low parking demand access streets. It is acknowledged that the proposed road has a reduced road reserve width contained on the subject site of 11.5m, which includes the road pavement of 6m and a footpath on the northern side, with the additional 3.5m contained on adjoining Lot 7. However it is considered that the arrangement can be justified in this circumstance as the proposed road will only be serving one side of the road in the short term and any future development of adjoining Lot 7 will have regard for the need for a 15m road reserve.

The Structure Plan also proposes to extend the existing pedestrian footpath which runs north-east and south of the subject site, in an orderly manner along the southern road that will allow for the eventual connection of the footpath through adjoining Lot 7, thereby improving the walkability and connectivity of the subject site and its future development with the surrounding existing movement network.

The subject site is serviced by public transport with bus stops for two bus routes located within 400m (5 minute walking distance). These bus stops provide connectivity to Cockburn Central Train Station, which is in 15 – 20 minutes walking distance from the subject site.

Refer to Appendix 2 - Transport Impact Assessment

5.6 Engineering Servicing and Utilities

Development Engineering Consultants Pty Ltd prepared an Engineering Servicing Report to address various servicing requirements for the indicative development concept.

The Engineering Servicing Report concludes that the development of the subject site can occur independently with servicing and infrastructure such as sewer, water supply, gas, electricity and telecommunications being within close proximity to the subject site and able to be extended without significant upgrades.

The Department of Water has advised that a formal Local Water Management Strategy is not required for the preparation of this Structure Plan, however water management issues should be addressed, detailing how stormwater is proposed to be disposed of on-site without interfering, altering or polluting the wetland which covers a portion of the subject site.

As the Development Concept is indicative only and subject to change through Development Applications, preliminary runoff calculations and management are included as part of this Structure Plan. To this end, an Urban Water Management Plan (UWMP) is required as a condition of subdivision.

It is anticipated that the levels of fill will be determined at the time of detailed development, road and drainage design in conjunction with the findings of geotechnical investigations and site survey. This will ensure that subdivision works and eventual development will not interfere, alter or pollute any wetland, watercourse, surface water expression or groundwater in the area, and will be implemented through the UWMP.

Refer to Appendix 3 - Engineering Servicing Report

5.7 Bushfire Management

Bushfire Prone Planning Pty Ltd prepared a Bushfire Management Plan (BMP) to identify the Bushfire Attack Level and provide guidance on how to plan for and manage the potential bushfire threat to the site and its development. The BMP addresses requirements of local government and the responsibilities for both the developers and property owners, and details the specific fire management requirements that will be implemented within the development and design.

Generally speaking, bushfire hazard management of the Structure Plan Area will be controlled by:

- Implementing and maintaining Hazard and Building Protection (low fuel) Zones;
- Maintaining appropriate fire breaks;
- Ensuring building structures comply with construction standards;
- Lodging a Section 70A Notification on the Certificates of Title to alert purchases of land and successors in title of the responsibilities of the BMP; and

- Dwellings will need to maintain a 20m setback to the northern and western lot boundaries as illustrated on the Structure Plan Map ('No Building Zone') to ensure an adequate distance from bushfire hazards.

The BMP concludes that the proposed design of structures and the modification to vegetation are such that with implementation of the BMP, the fire threat to persons and property within the development is reduced.

Refer to Appendix 4 – Bushfire Management Plan

6. Indicative Subdivision and Development Concept

An Indicative Subdivision and Development Concept has been prepared for the subject site and outlines one possible approach to developing the subject site in line with this Structure Plan.

6.1 Indicative Subdivision

The Indicative Subdivision Concept proposes a 2 lot green title subdivision for residential purposes on the eastern portion of the site (3,791sqm and 2,728sqm) and a balance lot for Parks and Recreation to the west of the developable area.

A new 15m wide road reserve is proposed along the southern boundary and a 413sqm portion of the site is set aside for the widening of Hammond Road. Due to the upgrading and widening of Hammond Road, all access to the proposed lots will be via the new road, and the existing crossover removed.

Refer to Figure 4 – Indicative Subdivision Concept

6.2 Indicative Development

The Indicative Development Concept has been prepared in consultation with the City of Cockburn and technical input to demonstrate that the subject site is capable of providing a built form layout that balances conflicting design elements such as orientation, access, parking, wetland conservation, and bushfire safety.

The Concept envisions a yield of 54 multiple dwellings and associated parking over 2 lots bound by the wetland to the north and west, and accessed via the new southern road. This is intended to facilitate the delivery of a range of dwellings positioned adjacent to and oriented towards the proposed area of Parks and Recreation, which will offer a high level of amenity for future occupants. Dwelling orientation also addresses Hammond Road and the new southern road, whilst optimising the capture of northern sunlight where possible. Areas of parking are limited to the central portion of the site where practical to maximise outlook and interaction with the wetland, with space identified for additional parking if required.

Development is envisaged over two storeys in accordance with the R-Codes for R60. A 4m setback is provided to Hammond Road and the new southern road, which is consistent with the prevailing setback in the area.

The built form layout demonstrates an acceptable bushfire risk by combining fire setbacks with enhanced construction standards. This has allowed the envisaged development to protect the integrity of the wetland by containing the Low Fuel Zone to within the wetland buffer, without requiring the clearing of vegetation within the wetland itself.

To further guide and control development within the Structure Plan area, Detailed Area Plans and an Urban Water Management Plan are required in accordance with Part One, with development giving due regard to the Bushfire Management Plan.

Refer to Figure 5 – Indicative Development Concept

6.3 Interface of Development with Open Space

The Indicative Development Concept shows dwellings oriented towards the open space with raised outdoor living terraces with open fencing and balconies overlooking the wetland to provide resident amenity and an interactive façade whilst maintaining resident safety and security.

Refer to Figure 6 – Open Space Interface Section

Figure 4 – Indicative Subdivision Concept

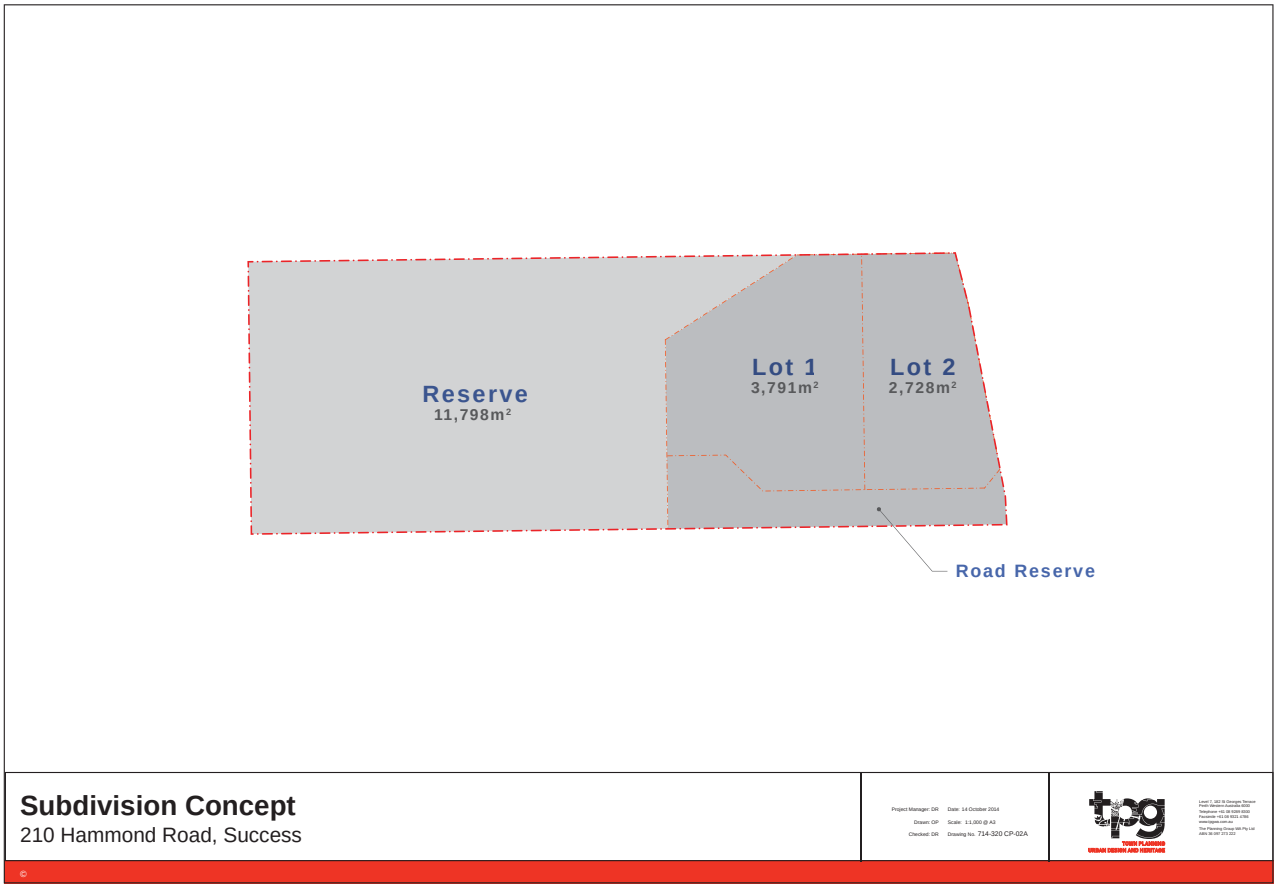
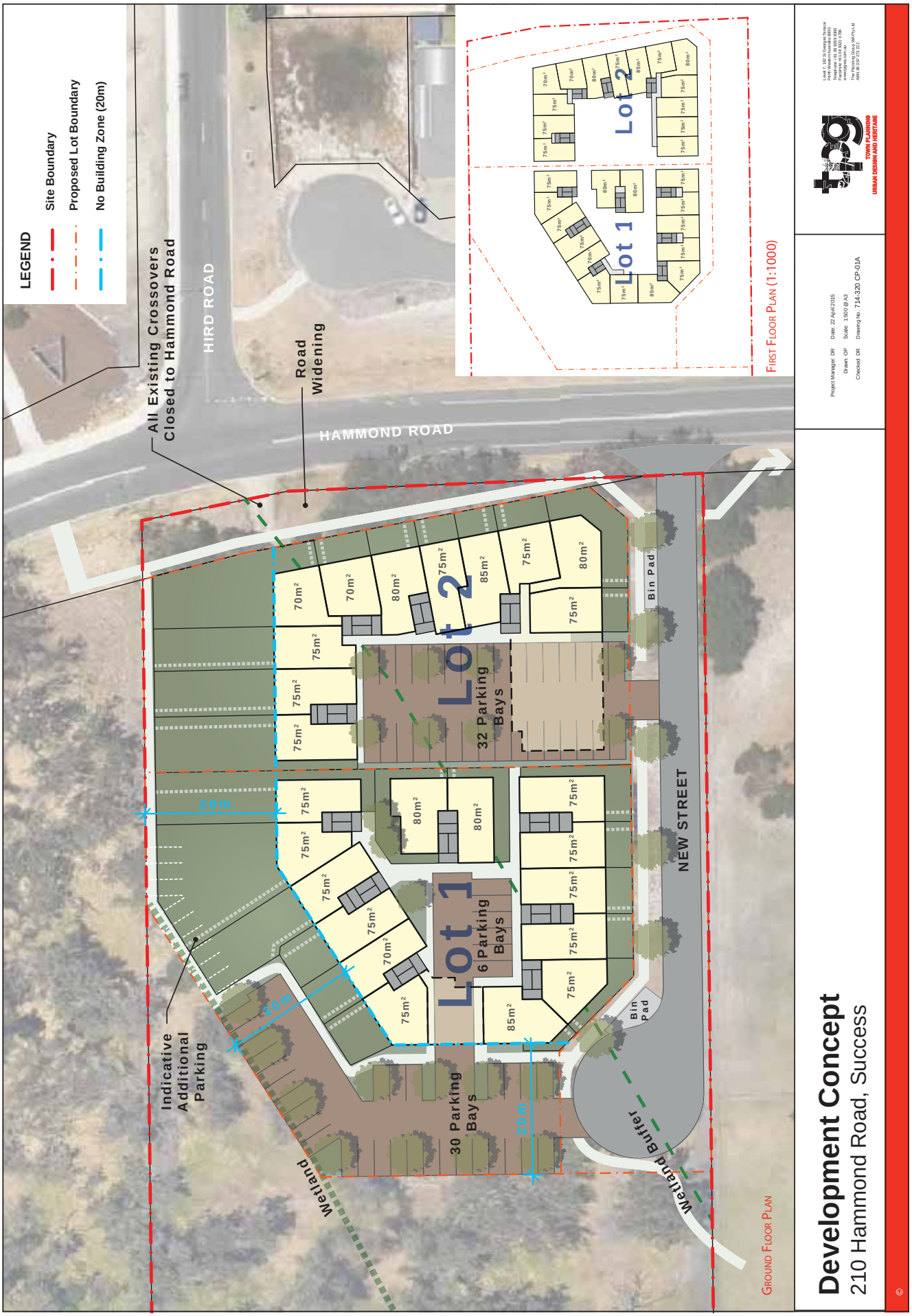
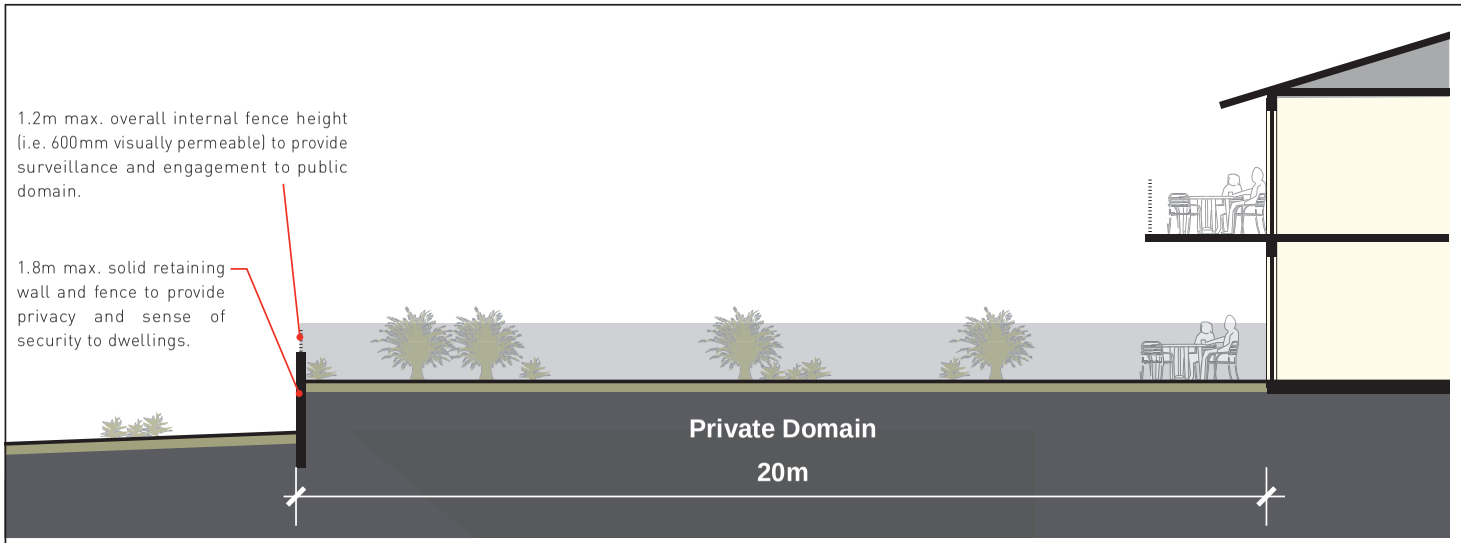
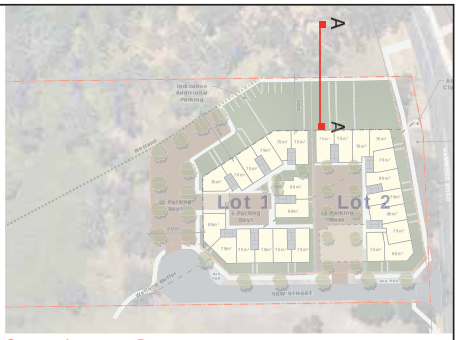


Figure 5 – Indicative Development Concept





SECTION AA DETAIL (1:100)



SECTION LOCATION PLAN

SECTION AA

Indicative Open Space Interface Section

210 Hammond Road, Success

Project Manager: DR Date: 22 April 2015
Drawn: OP Scale: 1:1,000 @ A3
Checked: DR Drawing No. 714-320 CP-03A

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7. Conclusion

This Structure Plan has been prepared under Clause 6.2 of the City of Cockburn Town Planning Scheme No. 3 in order to facilitate the orderly and proper development of Lot 6 (210) Hammond Road, Success. Notable features of this Structure Plan include:

- Protection of the environmental values of the Conservation Category Wetland;
- Provision of diversity in housing choice and size;
- Orientation of development to address both Hammond Road and the southern road, and to take advantage of the adjoining wetland as an area of high amenity;
- Facilitation of passive sustainable design approaches in terms of solar orientation of dwellings;
- Provision for logical connections of pathways and road access;
- Peripheral building protection zones for fire management to the west and north of the dwellings;
- Requirement for localised planning of drainage to manage storm water events in accordance with water sensitive design principles; and
- Provision of large lots to accommodate development flexibility whilst upholding good urban design principles.

This Structure Plan has been prepared in conjunction with the preparation of technical reports referred to above and illustrates the appropriate development potential and land capability of the site.

Appendix 1

Table of Consultation

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TABLE OF CONSULTATION

Agency	Date of Consultation	Method of Consultation	Summary of Outcome
City of Cockburn	March 2014	Meeting	Discussion regarding site planning opportunities and constraints
City of Cockburn	June 2014	Meeting	Discussion of proposed development concept plan and implications for wetland
City of Cockburn	July 2014	Draft LSP Map and Report provided for review	Comments/ recommendations addressed and incorporated into final report
Public	August 2014	Invitation to comment	No public submissions received
Department of Water	August 2014	Invitation to comment	Comments noted to be addressed as part of Urban Water Management Plan
Department of Parks and Wildlife	September 2014	Meeting and invitation to comment	Discussion regarding development implication for wetland and Bushfire Management. Development concept plan revised accordingly
Western Australian Planning Commission	September 2014	LSP Map and Report provided for review	Comments/ recommendations addressed and incorporated into final report

Appendix 2

Environmental Assessment

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210 HAMMOND ROAD, SUCCESS

ENVIRONMENTAL ASSESSMENT

Prepared for:	Lacaid Property Pty Ltd
Report Date:	15 September 2014
Version:	5
Report No.	2014-148

pgv ENVIRONMENTAL

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LIST OF ATTACHMENTS

Tables

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1 INTRODUCTION

1.1 Background

210 Hammond Road, Success (the site) is located approximately 20km to the south of the Perth Central Business District (Figure 1). The site is approximately 2.0ha in size and is partially vegetated on the western half of the site (Figure 2). The site is zoned 'Urban' under the Perth Metropolitan Region Scheme (MRS) (Landgate, 2014a) and 'Development' under the City of Cockburn Town Planning Scheme No. 3 (WAPC, 2002).

1.2 Development Concept

Lot 210 is proposed to be subdivided into two residential lots consisting of 3,791 m^2, and 2,728m^2 and a road reserve with the remaining 1.179ha of the site being retained as a balance lot (Appendix 1). 413m^2 of the site will be ceded to facilitate the road widening of Hammond Road.

The proposed development on the site is for the eastern part to be developed for an apartment development (Appendix 2). Lot 1 contains the existing house on the site and will be retained in the short term with the ability to accommodate 30 apartments. Lot 2 as shown in the plan will have 24 apartments constructed on it. The development concept shows associated parking and infrastructure to be developed on the site and a cul-de-sac road to be constructed along the southern boundary if the site (Appendix 2). The balance of the site to the west is not proposed to be developed except for a walking trail to connect to existing paths. A low fuel zone will be maintained around the perimeter of the development and existing development (Appendix 2).

1.3 Scope of Works

This Environmental Assessment was commissioned by Illuminate Property to investigate the environmental impact of the proposed development in accordance with the Development Concept. The Environmental factors considered are:

- Previous, Current and Surrounding Land Use;
- Soils;
- Wetlands;
- Groundwater;
- Surface Water;
- Flora;
- Vegetation; and
- Fauna.

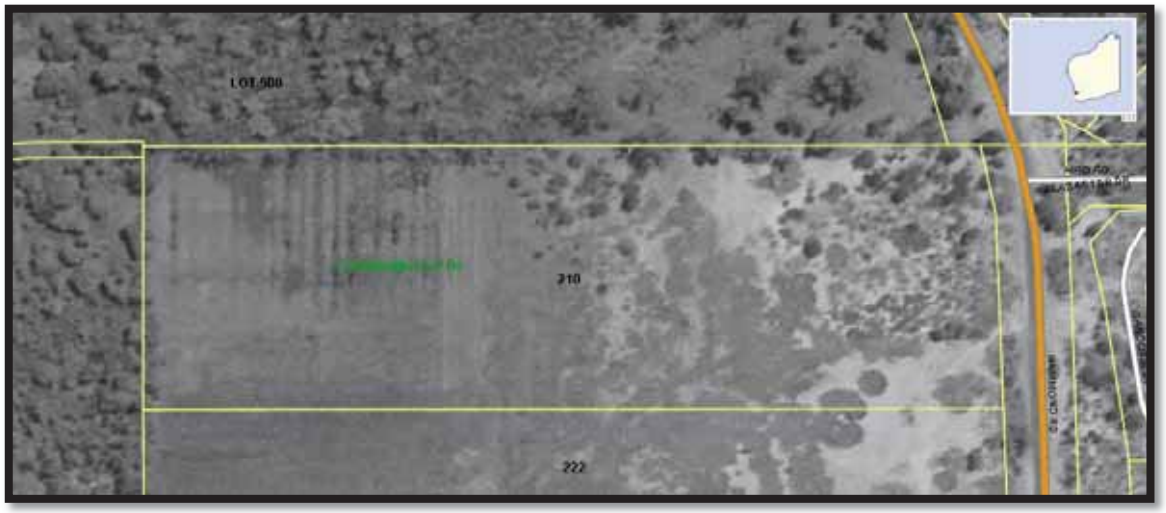
2 EXISTING ENVIRONMENT

2.1 Land Use

2.1.1 Historical Land Use

The site has been part of a rural subdivision for much of its history. Historical aerial photography from 1953 shows the site is partially vegetated in the east and cleared in the west.

Plate 1: Historical Aerial Photography from 1953 (Landgate, 2014b)



Between 1974 and 1977 a house was established on the site (Plate 2). The house is in the same location as the existing dwelling on the site. There has also been additional clearing on the eastern part of the site. Some native trees previously cut back have regrown on the northern boundary and in the centre of the site.

Plate 2: Historical Aerial Photography from 1977 (Landgate, 2014b)

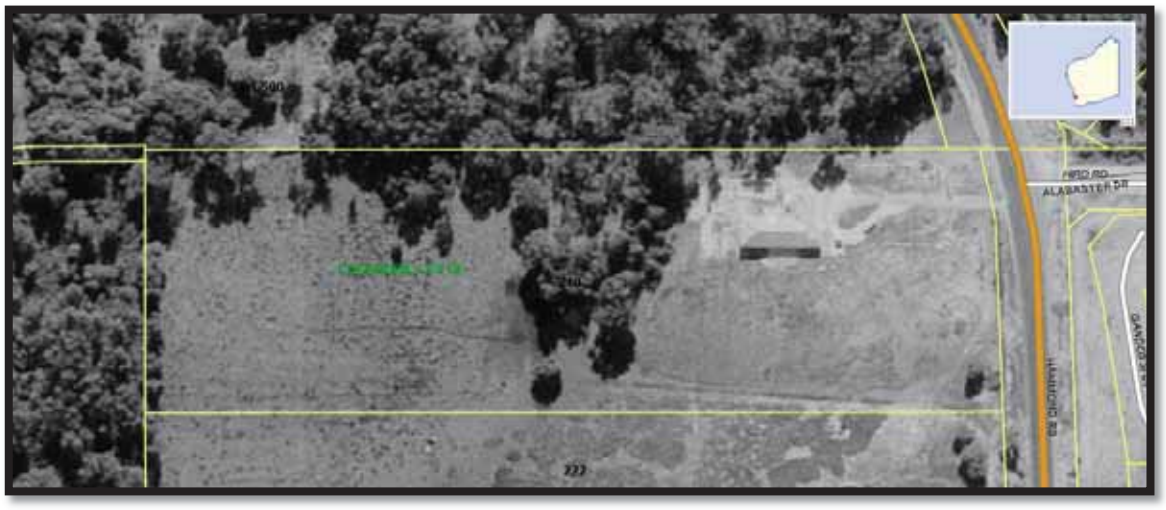


Plate 3 shows in 2002 the vegetation in the west of the site is still being slashed. Exotic trees have been planted around the house and on the eastern side of the site.

Plate 3: Historical Aerial Photography from 2002 (Landgate, 2014b)

2.1.2 Existing Land Use

In 2013 the site has the same configuration of dwellings and clearing to the east of the site. The west of the site appears to have more grassy vegetation that has not been slashed.

Plate 4: Historical Aerial Photography from 2013 (Landgate, 2014b)

2.1.3 Surrounding Land Use

The land to the south of the site has been predominately developed for special rural living with large lots that have been mostly cleared. Urban development has been undertaken directly across Hammond Road to the east. Immediately to the north and west of the site is native bushland.

2.2 Topography

The site slopes gently down to the west. The maximum elevation is 23m Australian Height Datum (AHD) in the east and a minimum of 18mAHD to the west (Figure 2).

2.3 Geology and Soils

The site is located on the Swan Coastal Plain. The site is mapped as part of the Bassendean System, the oldest of the three dune systems on the Swan Coastal Plain (Bolland, 1998). The Bassendean System consists of very low relief, leached, grey siliceous Pleistocene sand dunes, intervening sandy and clayey swamps and gently undulating plains. These occur immediately west of, and partly overlie, the Pinjarra Plain. These soils are very leached, infertile and mildly acidic (DAFWA, 2014).

The description of the soil phases mapped by the Department of Agriculture and Food Western Australia (DAFWA) on the site are:

- Bassendean B2 Phase (212Bs__B2) which are described as soils occurring on flat to very gently undulating sandplain. The soil phase has well to moderately well drained deep bleached grey sands with a pale yellow B horizon or a weak iron-organic hardpan 1-2m (DAFWA, 2014).
- Bassendean B1 Phase (212Bs__B1) which are described as extremely low to very low relief dunes, undulating sandplain and discrete sand rises. The soils are deep bleached grey sands sometimes with a pale yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2m (DAFWA, 2014) (Figure 3).

Acid sulphate soils (ASS) are wetland soils and unconsolidated sediments that contain iron sulphides which, when exposed to atmospheric oxygen in the presence of water, form sulphuric acid. ASS form in protected low energy environments such as barrier estuaries and coastal lakes and commonly occurs in low-lying coastal lands such as Holocene marine muds and sands. When disturbed, these soils are prone to produce sulphuric acid and mobilise iron, aluminium, manganese and other heavy metals. The release of these reaction products can be detrimental to biota, human health and built infrastructure.

The ASS Risk on the site has been mapped by the Department of Environmental Regulation (DER) (Landgate, 2014a) as being Moderate to Low (<3m from the surface). The presence of wetland soils usually indicates that ASS is present.

2.4 Hydrology

2.4.1 Groundwater

The groundwater under the site has geological formations that have been grouped into three distinct aquifers:

- Superficial Aquifer (unconfined);
- Leederville Aquifer (confined); and
- Yarragadee north (confined) (DoW, 2014a)

The Superficial Aquifer is part of the Jandakot Mound and the Kardinya Shale Member of the Osborne Formation separates this from the Leederville Aquifer (DoW, 2014a).

Groundwater flows from east to west across the site. The Perth Groundwater Atlas (DoW, 2014b) shows a snapshot of groundwater levels as measured in May 2003 which are an indication of low groundwater levels and range from 19mAHD in the east to 18mAHD in the west of the site (Figure 3).

The depth to groundwater from the natural surface ranges from approximately 0 to 4.5m (DoW, 2014b).

2.4.2 Surface Water

Lot 210 Hammond Road is located in the Murray River basin, in the Bartram Road Catchment and the Lake Coogee sub-catchment (Landgate, 2014b).

The highly permeable sands on the site means that there is minimal direct surface run-off. In the event that there is overland flow the surface water will follow contours and drain into the wetland area to the west of the site.

2.5 Wetlands

2.5.1 Wetland Type

The Department of Parks and Wildlife (DPaW) *Geomorphic Wetlands of the Swan Coastal Plain* dataset map a Conservation Category Wetland (Landgate 2014a) in the north-western part of the site (Figure 4). The wetland is classified as a Conservation Category Sumpland (UFI 15740). Wetlands are categorised as Conservation Category, Resource Enhancement and Multiple Use (Hill *et al.*, 1996). The definitions of these categories are outlined in Table 1.

Table 1: Management Categories of Wetlands

Management Category	General Description	EPA Management Objectives (EPA, 2008)
Conservation Category Wetland (CCW)	Wetlands which support high levels of attributes and functions.	Highest priority wetlands. Objective is to preserve and protect the existing conservation values of the wetlands through various mechanisms including: • reservation in national parks, • crown reserves and State owned land, • protection under Environmental Protection Policies, and • wetland covenanting by landowners. No development or clearing is considered appropriate. These are the most valuable wetlands and any activity that may lead to further loss or degradation is inappropriate.
Resource Enhancement Wetland (REW)	Wetlands which may have been partially modified but still support substantial ecological attributes and functions.	Priority wetlands. Ultimate objective is to manage, restore and protect towards improving their conservation value. These wetlands have the potential to be restored to Conservation category. This can be achieved by restoring wetland function, structure and biodiversity. Protection is recommended through a number of mechanisms.
Multiple Use Wetland (MUW)	Wetlands with few attributes which still provide important wetland functions	Use, development and management should be considered in the context of ecologically sustainable development and best management practice catchment planning through landcare.

The wetland, as discussed previously, has been completely cleared in the past and has been repeatedly slashed until recently. A site inspection on 18 December 2013 was undertaken by PGV Environmental to assess the site. A detailed assessment of the accuracy of the wetland management categories was not part of the scope of this Environmental Assessment. However, some general comments on the wetland category follow.

It is unlikely that due to the clearing of the past that the wetland has a high level of attributes and functions. The wetland area mostly contains a dense stand of introduced weed species, particularly the tall grass *Paspalum dilatatum* (Golden Crown Grass). Other weed species common in this area included *Briza minor* (Shivery Grass), *Lotus subbiflorus, Plantago lanceolata* (Plantain), *Phalaris minor, Pennisetum clandestinum* (Kikuyu), *Zantedeschia aethiopica* (Arum Lily) and *Lythrum hyssopifolia*. Some native plants occur among the dense weeds in the western area including *Centella asiatica, Astartea fascicularis* and *Dampiera trigona.* Native trees around the western and northern boundaries included *Eucalyptus rudis* (Flooded Gum) and *Melaleuca rhaphiophylla* (Paperbark). Plate 5 shows the Completely Degraded part of the wetland.

Plate 5: Cleared area of the wetland

The wetland on the site is part of a larger Conservation Category wetland to the north and west in Bush Forever Site 391 that is in better condition. DPaW recognise that some wetlands may be mapped as a conservation category wetland but may have some areas that have been disturbed and no longer have the same environmental attributes and functions as the remainder of the CCW. In such cases DPaW may allow the wetland to be mapped as separate management categories.

DPaW has recently released a document called *A methodology for the evaluation of specific wetland types on the Swan Coastal Plain, Western Australia*. The methodology was released in August 2013 and is on trial for 12 months prior to review and finalisation. The report describes the situations where assigning a different management category to the one wetland may be acceptable. The report states that "where it is unequivocally evident that a portion of a wetland has been historically

cleared and the remnant portion is not reliant on the disturbed portion to maintain its natural attributes and functions, it may be evaluated and separated into portions". At first glance, given the long-term clearing of the wetland on the site at least since 1953 it would seem to fit this description. However, an example given in the report which is not dissimilar to the situation on the site where the portion of disturbed wetland is a small proportion of the overall wetland, the report states that the degree of disturbance is not likely to be detrimentally impacting on the main wetland and the size of the disturbance is relatively small therefore it is not considered appropriate to divide the wetland into separate management categories.

Based on the methodology described above for considering separate management categories for the one wetland PGV Environmental considers that it would be highly unlikely to get support from DPaW to change the management category down from Conservation Category to Multiple Use or Resource Enhancement. The presence of native wetland trees and shrubs on the northern and western boundaries of the wetland area also indicates gradual regeneration of the wetland since it was partially cleared and therefore, if it were to be downgraded, it would most likely be to the middle Resource Enhancement category. DPaW usually recommend the retention of Resource Enhancement wetland with minimum buffer widths the same as for Conservation Category wetlands. Therefore any potential downgrading would not have an impact on the development potential of the site.

2.5.2 Wetland Buffer

The Government non-statutory policy on wetland protection states that all Conservation Category Wetlands retained in and adjacent to developments should have a minimum dryland buffer of 50m (EPA, 2004). While the policy is not legally binding application of the 50m buffer occurs in nearly all Conservation Category Wetlands.

The 50m zone from the edge of the wetland currently contains the existing residential dwelling, a shed, several native Flooded Gums over Arum Lilies, non-native trees and grass around and to the east of the house and dense *Paspalum* in the western part. Discussions on modifying the standard 50m buffer for the proposed development are contained in Section 3.3.

2.6 Flora

A search of DPaW Naturemap (Appendix 3) and the EPBC Act Protected Matters Search Tool (Appendix 4) indicates ten species listed as Endangered, Threatened or Priority have been located within a 1km radius of the site. The results from the database searches are shown in Table 2.

Table 2: Conservation Significant Flora known to occur in the vicinity of the site

Species	Common Name	Status Under Wildlife Conservation Act 1950	Status Under EPBC Act 1999
Andersonia gracilis	Slender Andersonia	Threatened	Endangered
Caladenia huegelii	Grand Spider Orchid	Threatened	Endangered
Darwinia foetida	Muchea Bell	Threatened	Critically Endangered
Diuris micrantha	Dwarf Bee-orchid	Threatened	Vulnerable
Diuris purdiei	Wavy-leaved Smokebush	Threatened	Vulnerable
Drakaea elastica	Glossy-leaved Hammer Orchid	Threatened	Endangered
Drakaea micrantha	Dwarf Hammer Orchid	Threatened	Endangered

Species	Common Name	Status Under Wildlife Conservation Act 1950	Status Under EPBC Act 1999
Lepidosperma rostratum	Beaked Lepidosperma	Threatened	Endangered
Centrolepis caespitosa		Priority 4	Endangered
Dodonaea hackettiana	*Hackett's Hopbush*	Priority 4	

Definitions of the Conservation Codes are in Appendix 5. Table 3 examines the preferred habitat of each species and the likelihood of the species listed in Table 4 to occur on the site.

Table 3: Likelihood of Identified Significant Flora Species occurring on the Site

Scientific Name	Preferred Habitat*	Likelihood of Presence on site
Andersonia gracilis	White/grey sand, sandy clay, gravelly loam near winter wet swamps	Highly Unlikely
Caladenia huegelii	Sand or clay loam. Does not survive in disturbed areas.	Highly Unlikely
Darwinia foetida	Grey-white sand on swampy, seasonally wet sites	Highly Unlikely
Diuris micrantha	Brown loamy clay. Winter-wet swamps, in shallow water.	Highly Unlikely
Diuris purdiei	Grey or yellow-orange clayey sand.	Highly Unlikely
Drakaea elastica	Low-lying situations adjoining winter-wet swamps. Does not survive in disturbed areas	Highly Unlikely
Drakaea micrantha	Usually found on cleared firebreaks or open sandy patches that have been disturbed	Highly Unlikely
Lepidosperma rostratum	Sand, sandy loam. Winter-wet heath	Highly Unlikely
Centrolepis caespitosa	White sand, clay. Salt flats, wet areas	Highly Unlikely
Dodonaea hackettiana	Sand. Outcropping limestone.	Highly Unlikely

* sourced from Florabase (DPaW, 2014), DoE SPRAT Database (DoE, 2014)

Most of the species identified in the database searches prefer wetland areas however the disturbance to the site in the past makes it highly unlikely any of these species will be present on the site.

The eastern part of the site that is proposed to be developed as per the Development Concept (Appendix 2) has exotic tree species such as *Pinus radiata* (Pine Trees) and non-endemic Eucalypt species over weeds.

2.7 Vegetation

2.7.1 Vegetation Type

No intact native vegetation occurs on the site. Scattered native trees, shrubs and herbs occur in the wetland and adjacent area. As a result no Threatened Ecological Communities or priority Ecological Communities occur on the site.

2.7.2 Vegetation Condition

The vegetation on the site is considered Degraded to Completely Degraded. A small stand of parkland cleared Flooded Gums over Arum Lily occurs in the centre of the site (Plate 6).

Plate 6: Parkland Cleared Flooded Gums

There is a small area of vegetation in the northern central part of the site that has some native wetland vegetation present that is in Good condition (Plate 7).

Plate 7: Vegetation in Good Condition

2.7.3 Bush Forever

The site is immediately adjacent to Bush Forever Site 391 'Tompsons Lake Nature Reserve and Adjacent Bushland' (Figure 5).

2.8 Fauna

2.8.1 Fauna Habitat

The fauna habitat on the site in the parkland cleared areas are described as Open Woodland. The remainder of the site was described as Cleared area.

The quality of fauna habitat can be assessed using a number of factors including, the size of the habitat, the level of habitat connectivity, availability of specific resources (e.g. tree hollows) and overall vegetation quality. The habitat was assessed according to the following categories:

High quality fauna habitat – These areas closely approximate the vegetation mix and quality that would have been in the area prior to any disturbance. The habitat has connectivity with other habitats and is likely to contain the most natural vertebrate fauna assemblage.

Very good fauna habitat - These areas show minimal signs of disturbance (e.g. grazing, clearing, fragmentation, weeds) and generally retain many of the characteristics of the habitat if it had not been disturbed. The habitat has connectivity with other habitats and fauna assemblages in these areas are likely to be minimally effected by disturbance.

Good fauna habitat – These areas showed signs of disturbance (e.g. grazing, clearing, fragmentation, weeds) but generally retain many of the characteristics of the habitat if it had not been disturbed. The habitat has connectivity with other habitats and fauna assemblages in these areas are likely to be affected by disturbance.

Disturbed fauna habitat – These areas showed signs of significant disturbance. Many of the trees, shrubs and undergrowth are cleared. These areas may be in the early succession and regeneration stages. Areas may show signs of significant grazing, contain weeds or have been damaged by vehicle or machinery. Habitats are fragmented or have limited connectivity with other fauna habitats. Fauna assemblages in these areas are likely to differ significantly from what might be expected in the area had the disturbance not occurred.

Highly degraded fauna habitat – These areas often have a significant loss of vegetation, an abundance of weeds, and a large number of vehicle tracks or are completely cleared. Limited or no fauna habitat connectivity. Faunal assemblages in these areas are likely to be significantly different to what might have been in the area pre-disturbance.

The vegetation condition in the Woodland areas is rated as Disturbed Fauna Habitat and the understorey has been significantly altered with the majority of the species present being weeds. The site has some connectivity with habitats to the west and north but does not provide linkage to other areas of vegetation. The habitat on the remainder of the site is considered to be Highly Degraded Fauna Habitat.

2.8.2 Database Search Results

A search of the Naturemap database shows species have been recorded in the area (Appendix 3) and additional conservation significant species were identified in the Protected Matters Search Tool (Appendix 4). Table 4 lists the species identified in these database searches.

Table 4: List of Fauna Species Identified from Database Searches.

Scientific Name	Common Name	Status under Wildlife Cons. Act	Status under EPBC Act
Calidris ferruginea	Curlew Sandpiper	Schedule 1	Marine/ Migratory
Calyptorhynchus banksii subsp. *naso*	Forest Red-tailed Black-Cockatoo	Schedule 1	Endangered
Calyptorhynchus latirostris	Carnaby's Cockatoo short-billed black-cockatoo	Schedule 1	Vulnerable
Myrmecobius fasciatus	Numbat	Schedule 1	Vulnerable
Dasyurus geoffroii	Chuditch, Western Quoll	Schedule 1	Vulnerable
Leipoa ocellata	Malleefowl	Schedule 1	Vulnerable
Pseudocheirus occidentalis	Western Ringtail Possum	Schedule 1	Vulnerable
Rostratula benghalensis	Painted Snipe	Schedule 1	Vulnerable
Setonix brachyurus	Quokka	Schedule 1	Vulnerable
Sternula nereis	Australian Fairy Tern	Schedule 1	Vulnerable
Actitis hypoleucos	Common Sandpiper	Schedule 3	Migratory/ Wetland
Apus pacificus	Fork-tailed Swift	Schedule 3	Migratory
Ardea ibis	Cattle Egret	Schedule 3	Migratory/ Wetland
Ardea modesta	Eastern Great Egret	Schedule 3	Migratory/ Wetland
Calidris acuminata	Sharp-tailed Sandpiper	Schedule 3	Marine/ Migratory
Calidris ferruginea	Curlew Sandpiper	Schedule 3	Marine/ Migratory
Calidris melanotos	Pectoral Sandpiper	Schedule 3	Marine/ Migratory
Calidris ruficollis	Red-necked Stint	Schedule 3	Marine/ Migratory
Calidris subminuta	Long-toed Stint	Schedule 3	Marine/ Migratory
Charadrius dubius	Little Ringed Plover	Schedule 3	Marine/ Migratory
Charadrius ruficapillus	Red-capped Plover		Marine/ Migratory
Haliaeetus leucogaster	White-bellied Sea-eagle	Schedule 3	Migratory
Himantopus himantopus	Black-winged Stilt		Migratory
Limosa lapponica	Bar-tailed Godwit	Schedule 3	Migratory/ Marine
Limosa subsp. melanuroides	Black-tailed Godwit	Schedule 3	Migratory/ Marine
Merops ornatus	Rainbow Bee-eater	Schedule 3	Migratory
Pandion haliaetus	Osprey		Migratory/ Marine
Philomachus pugnax	Ruff	Schedule 3	Migratory/ Marine
Plegadis falcinellus	Glossy Ibis	Schedule 3	
Recurvirostra novaehollandiae	Red-necked Avocet		Marine/ Migratory
Rostratula australis	Australian Painted Snipe	Schedule 3	Vulnerable
Tringa glareola	Wood Sandpiper	Schedule 3	Marine/ Migratory
Tringa nebularia	Common Greenshank	Schedule 3	Marine/ Migratory
Tringa stagnatilis	Marsh Sandpiper	Schedule 3	Marine/ Migratory
Falco peregrinus	Peregrine Falcon	Schedule 4	Marine/ Migratory
Lerista lineata	Perth Slider, Lined Skink	Priority 3	
Neelaps calonotos	Black-striped Snake	Priority 3	
Isoodon obesulus subsp. *fusciventer*	Quenda, Southern Brown Bandicoot	Priority 5	

DPaW classifies fauna under five different Priority codes and rare and endangered fauna are classified under the *Wildlife Conservation (Specially Protected Fauna) Notice 2008* into four schedules of taxa (DEC, 2011b). These are outlined in Appendix 5.

2.8.3 Conservation Significant Species

Outlined below is a short description of each of the species that were identified in the DPaW database search and Protected Matters Search Tool search in Table 4. The preferred habitat has been compared to the habitats on the site and the likelihood of each species to be present on the site determined as shown in Table 5.

Table 5: Likelihood of Conservation Significant Species being Present on the Site

Scientific Name	Common Name	Habitat	Likelihood to occur on the site
Calidris ferruginea	Curlew Sandpiper	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms (DoE, 2014)	Highly Unlikely
Calyptorhynchus banksii subsp. *naso*	Forest Red-tailed Black-Cockatoo	Forest Red-tailed Black Cockatoos frequent 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 (DoE, 2014). It nests in tree hollows with a depth of 1-5m, that are predominately Marri (Corymbia calophylla), Jarrah (Eucalyptus marginata) and Karri (E. diversicolor) and it feeds primarily on the seeds of Marri.	Possible intermittent visitor
Calyptorhynchus latirostris	Carnaby's Cockatoo short-billed black-cockatoo	Carnaby's Cockatoo is found in the south-west of Australia from Kalbarri through to Ravensthorpe. It has a preference for feeding on the seeds of Banksia, Dryandra, Hakea, Eucalyptus, Grevillea, Pinus and Allocasuarina spp. It is nomadic often moving toward the coast after breeding. It breeds in tree hollows that are 2.5 – 12m above the ground and have an entrance 23-30cm with a depth of 1-2.5m. Nesting mostly occurs in smooth-barked trees (e.g. Salmon Gum, Wandoo, Red Morrell). Eggs are laid from July to October, with incubation lasting 29 days (DoE, 2014).	Possible intermittent visitor
Myrmecobius fasciatus	Numbat	The numbat is a small marsupial that feeds on termites. The small remaining populations of the Numbat are in eucalypt forests and woodlands dominated by Eucalyptus marginata, Corymbia calophylla and Eucalyptus wandoo (DoE, 2014).	Highly Unlikely
Dasyurus geoffroii	Chuditch, Western Quoll	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 (DoE, 2014).	Highly Unlikely
Leipoa ocellata	Mallee Fowl	Mallee fowl have been found in mallee regions of southern Australia (DoE, 2014)	Highly Unlikely
Pseudocheirus occidentalis	Western Ringtail Possum	The Western Ringtail Possum is a medium sized nocturnal marsupial. This species occurs in and near coastal Peppermint Tree (*Agonis flexuosa*) forest and Tuart (*Eucalyptus gomphocephala*) dominated forest with a Peppermint Tree understorey (DoE, 2014).	Highly Unlikely

Scientific Name	Common Name	Habitat	Likelihood to occur on the site
Rostratula benghalensis	Painted Snipe	The Painted Snipe predominately occurs on the eastern coast of Australia and inhabits inland and coastal shallow ephemeral and permanent freshwater wetlands particularly where there is a cover of vegetation, including grasses (DoE, 2014).	Highly Unlikely
Setonix brachyurus	Quokka	Quokkas were originally very common on the Swan Coastal Plain, however, their distribution is now limited to Rottnest Island and a few isolated areas in the south-west of WA. On the mainland, they prefer densely vegetated areas around wetlands and streams, whereas on Rottnest Island they inhabit low scrubby coastal vegetation where water is not readily available year-round. Quokkas breed once a year and produce a single joey. They are herbivorous, and feed on leaves, bark, succulent plants and grasses (DoE, 2014).	Highly Unlikely
Sternula nereis nereis	Australian Fairy Tern	The Australian Fairy Tern is a small fish eating bird that nests on sheltered sandy beaches, spits and banks above the high tide line and below vegetation (DoE, 2014).	Highly Unlikely
Actitis hypoleucos	Common Sandpiper	The Common Sandpiper is mostly found around muddy margins or rocky shores. Generally the species forages in shallow water and on bare soft mud at the edges of wetlands (DoE, 2014).	Highly Unlikely
Apus pacificus subsp. pacificus	Fork-tailed Swift	The Fork-tailed Swift is almost exclusively aerial and is not known to breed in Australia. They are seen in inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities (DoE, 2014).	Highly Unlikely
Ardea modesta/Ardea alba	Eastern Great Egret/White Egret	The Eastern Great Egret has been reported in a wide range of wetland habitats and usually frequents shallow waters (DoE, 2014). This species feeds on fish, insects, crustaceans, molluscs, frogs, lizards, snakes and small birds and mammals (DoE, 2014)	Highly Unlikely
Ardea ibis	Cattle Egret	The Cattle Egret occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands with breeding in Western Australia recorded in the far north in Wyndham in colonies in wooded swamps such as mangrove forests (DoE, 2014). This species forages away from water on low lying grasslands, improved pastures and croplands generally in areas that have livestock eating insects, frog, lizards and small mammals (DoE, 2014).	Possible intermittent visitor
Calidris alba	Sanderling	Sanderlings are almost always found is almost always found on the coast, mostly on open sandy beaches exposed to open sea-swell, and also on exposed sandbars and spits, and shingle banks, where they forage in the wave-wash zone and amongst rotting seaweed (DoE, 2014)	Highly Unlikely
Calidris ferruginea	Curlew Sandpiper	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms (DoE, 2014)	Highly Unlikely

Scientific Name	Common Name	Habitat	Likelihood to occur on the site
Calidris melanotos	Pectoral Sandpiper	The Pectoral Sandpiper prefers shallow fresh to saline wetlands and is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands (DoE, 2014)	Highly Unlikely
Calidris ruficollis	Red-necked Stint	the Red-necked Stint is mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores (DoE, 2014)	Highly Unlikely
Calidris subminuta	Long-toed Stint	The Long-toed Stint prefers shallow freshwater or brackish wetlands including lakes, swamps, river floodplains, streams, lagoons and sewage ponds. The species is also fond of areas of muddy shoreline, growths of short grass, weeds, sedges, low or floating aquatic vegetation, reeds, rushes and occasionally stunted samphire (DoE, 2014)	Highly Unlikely
Charadrius dubius	Little Ringed Plover	This species prefers bare areas including river islands, dry, stony riverbeds, sand, shingle or silt flats and feeds on insects (Birdlife International, 2014a).	Highly Unlikely
Charadrius ruficapillus	Red-capped Plover	The Red-capped Plover is found in wetlands, especially in arid areas, and prefers saline and brackish waters (Birdlife, 2014b)	Highly Unlikely
Haliaeetus leucogaster	White-bellied Sea-Eagle	The White-bellied Sea-Eagle is found in coastal habitats with large areas of open water, especially those close to the sea-shore. This species feeds opportunistically on a variety of fish, birds, reptiles, mammals and crustaceans, and on carrion and offal (DoE, 2014).	Highly Unlikely
Himantopus himantopus	Black-winged Stilt	The Black-winged Stilt is found near coastal lagoons and shallow freshwater or brackish pools with extensive areas of mudflats, salt meadows, saltpans, coastal marshes and swamps (Birdlife International, 2014c)	Highly Unlikely
Limosa lapponica	Bar-tailed Godwit	The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh (DoE, 2014)	Highly Unlikely
Limosa limosa subsp. melanuroides	Black-tailed Godwit	The Black-tailed Godwit has a primarily coastal habitat environment. The species is commonly found in sheltered bays, estuaries and lagoons with large intertidal mudflats or sandflats, or spits and banks of mud, sand or shell-grit; occasionally recorded on rocky coasts or coral islets (DoE, 2014)	Highly Unlikely
Merops ornatus	Rainbow Bee-eater	Populations that breed in northern Australia are considered to be resident, and in many northern localities the Rainbow Bee-eater is present throughout the year (DoE, 2014). The Rainbow Bee-eater nests in a burrow dug in the ground. It is found across the better-watered parts of WA including islands preferring lightly wooded, sandy country near water (DoE, 2014). This species has been recorded to the south (Bamford, 2004) however no typical burrows were sighted during the site visit.	Possible intermittent visitor

Scientific Name	Common Name	Habitat	Likelihood to occur on the site
Pandion haliaetus	Osprey	Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They feed on fish, especially mullet where available, and rarely take molluscs, crustaceans, insects, reptiles, birds and mammals (DoE, 2014).	Highly Unlikely
Philomachus pugnax	Ruff	The Ruff is found on generally fresh, brackish of saline wetlands with exposed mudflats at the edges and is found in terrestrial wetlands including lakes, swamps, pools, lagoons, tidal rivers, swampy fields and floodlands (DoE, 2014).	Highly Unlikely
Plegadis falcinellus	Glossy Ibis	The preferred habitat of this species for foraging and breeding are fresh water marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. The species is occasionally found in coastal locations such as estuaries, deltas, saltmarshes and coastal lagoons and feeds on feed mainly on aquatic invertebrates/insects (DoE, 2014).	Highly Unlikely
Recurvirostra novaehollandiae	Red-necked Avocet	The Red-necked Avocet occurs in wetland areas including bogs, marshes, swamps and Permanent Saline, Brackish or Alkaline Lakes (Birdlife International, 2014d).	Highly Unlikely
Rostratula australis	Australian Painted Snipe	The Australian Painted Snipe is a stocky wading bird that generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans (DoE, 2014).	Highly Unlikely
Thinornis rubricollis	Hooded Plover	The Hooded Plover occurs in coastal areas, on or near high energy sandy beaches and feeds on marine invertebrates (DoE, 2014).	Highly Unlikely
Tringa glareola	Wood Sandpiper	The Wood Sandpiper uses well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes. They are typically associated with emergent, aquatic plants or grass, and dominated by taller fringing vegetation, such as dense stands of rushes or reeds, shrubs, or dead or live trees, especially Melaleuca and River Red Gums Eucalyptus camaldulensis and often with fallen timber (DoE, 2014)	Highly Unlikely
Tringa nebularia	Common Greenshank	The Common Greenshank is a wader and does not breed in Australia. This species can be found in many types of wetlands and has the widest distribution of any shorebird in Australia. This species typically feeds on molluscs, crustaceans, insects, and occasionally fish and frogs (DoE, 2013)	Highly Unlikely
Tringa stagnatilis	Marsh Sandpiper	The Marsh Sandpiper lives in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks (DoE, 2014)	Highly Unlikely
Falco peregrinus	Peregrine Falcon	The Peregrine Falcon is found in a variety of habitats from woodlands to open grasslands and coastal cliffs. It feeds almost entirely on other birds and sometimes rabbits and other moderate sized mammals, bats and reptiles (DEC, 2012).	Highly Unlikely

Scientific Name	Common Name	Habitat	Likelihood to occur on the site
Lerista lineata	Lined Skink	The Lined Skink is a burrowing species that occurs in pale sandy soils with coastal heath and shrubland areas in isolated populations in the south-west and mid-west coast of Western Australia. It feeds on termites and other small insects (Wilson and Swan, 2008).	Highly Unlikely
Neelaps calonotos	Black-striped Snake	The Lined Skink is a burrowing species that occurs in pale sandy soils with coastal heath and shrubland areas in isolated populations in the south-west and mid-west coast of Western Australia (Nevill, 2005; Storr et al, 1999). It feeds on termites and other small insects (DEC, 2012).	Highly Unlikely
Isoodon obesulus subsp. fusciventer	Southern Brown Bandicoot	Southern Brown Bandicoots are small grey marsupials that prefer dense scrub (up to one metre high), often in or near swampy vegetation. Their diet includes invertebrates (including earthworms, adult beetles and their larvae), underground fungi, subterranean plant material, and very occasionally, small vertebrates (DEC, 2002).	Highly Unlikely

2.8.4 Species Likely to Occur on the Site

There is limited feeding habitat and some roosting habitat (Flooded Gums) on the site that could be utilised by Forest Red-tailed Black Cockatoos and Carnaby's Black Cockatoos. Cattle Egrets and Rainbow Bee-eaters are possibly intermittently present on the site but are unlikely to rely on the site for survival. The remainder of the species identified in the database searches are not likely to occur on the site.

3 IMPACT OF DEVELOPMENT

3.1 Geology and Soils

The soils on the site do not impact on the proposed land use. The development footprint is generally located on the area that is greater than 2m above the watertable. Advice from the Department of Water (emailed 29 May 2014) indicates that there is a risk of waterlogging which will need to be addressed in the engineering plans for the site.

The ASS Risk on the site is mapped as being Moderate to Low (<3m from the surface). WAPC *Acid Sulphate Soils Planning Guidelines* (WAPC, 2009) indicate that "*acid sulphate soils are technically manageable in the majority of cases*" which would be applicable to the areas mapped Moderate to Low risk.

The presence of wetland soils nearby and the shallow depth above the water table indicates ASS may be an issue for excavation for the installation of services. ASS Investigation and, if required, Management Plan should be prepared once the detailed design of the site and areas of soil disturbance are finalised. This should be undertaken in accordance with the *Acid Sulphate Soils Guideline Series: Identification and Investigation of Acid Sulphate Soils and Acidic Landscapes* (DEC, 2009) and *Treatment and Management of Soils and Water in Acid Sulphate Soil Landscapes* (DEC, 2011a).

3.2 Hydrology

3.2.1 Groundwater

The small scale of the development is highly unlikely to have an impact on groundwater levels or water quality.

It is recommended that groundwater modelling be undertaken for the final design and management be in accordance with *Better Urban Water Management* (WAPC, 2008). This will include the preparation of an Urban Water Management Plan (UWMP) as part of the Engineering Report for the development.

3.2.2 Surface Water

The final design and management of stormwater should be in accordance with *Better Urban Water Management* (WAPC, 2008) and outlined in an Urban Water Management Plan (UWMP).

Advice from the Department of Water states:

The following information should be contained in the Engineering Report:

- *Runoff from the site for a 1 year 1 hour, 5 and 100 ARI storm events – this is to ensure the proposed "drainage area" is adequately sized in your LSP;*
- *Design concept of drainage area including batters, inverts and depth to groundwater (basin invert to be a minimum 0.3m from maximum groundwater level);*

- *1 year 1 hour ARI to drain to bioretention areas, to be included in the parking areas, and/or drainage area;*
- *Finish floor levels to be 0.3m above 100 year flood levels (only confirmation required, design for finish floor levels will come at later stages of planning).*

3.3 Wetlands

A Conservation Category wetland has been mapped in the north-west half of the site according to the Geomorphic Wetlands of the Swan Coastal Plain Dataset (Landgate, 2014a). This environmental assessment report considers that the wetland is highly degraded and modified and does not have the ecological characteristics of a Conservation Category Wetland. As the wetland on site is part of a much larger wetland in better condition in the adjoining Bush Forever site downgrading to a Resource Enhancement or Multiple Use Wetland is unlikely to be supported by DPaW using their current guidelines.

Regardless of the overall poor quality of the wetland on site the proposed design shown in the Development Concept retains the wetland area in its entirety. A beneficial outcome of the development in the eastern part of the lot would be the rehabilitation of the wetland. This would include removal of dense patches of weeds and rehabilitation with native wetland species.

The proposed development is partially within 50m of the wetland. The 50m setback area is Completely Degraded and contains a dwelling that will be retained in the short term. Including the existing dwelling within the buffer would provide difficulty in the long-term management of the buffer so Lot 1 will be created to the wetland boundary. Therefore, a modified buffer is proposed for the development area. The buffer ranges from 0-50m wide (Appendix 2).

The invasive weeds present in the buffer area will be managed to reduce or eliminate their occurrence to improve the wetland condition. The inclusion of a wetland buffer together with management of the invasive weeds such as Arum Lily will further enhance the wetland attributes and functions.

Improvements in the Conservation Category Wetland mapped on the site cannot be achieved if the standard 50m buffer was imposed as no development is likely to occur on the site in such circumstances.

The hydrology of the wetland will also be managed as outlined in Section 3.3.

3.4 Flora

No conservation significant flora species are expected to occur on the site due to its degraded condition. Management of the wetland and buffer will improve the flora species on the site.

3.5 Vegetation

The vegetation on the site is generally Completely Degraded with a very small area of Good vegetation in the northern-central part of the site within the wetland. The development in accordance with the Development Concept does not impact on any native vegetation. All areas to

be cleared do not have native species present therefore the vegetation on the site is not an impediment to development.

3.6 Fauna

The fauna habitat on the site is Highly Degraded Fauna Habitat with some Disturbed Fauna Habitat. Two conservation significant bird species, the Forest Red-tailed Black Cockatoo and Carnaby's Black Cockatoo, may intermittently roost on the site. The Rainbow Bee-eater and the Cattle Egret may also be intermittently present on the site. The isolated native trees and shrubs in the wetland and buffer will be retained. Therefore the development on the site will not impact on any conservation significant fauna. Rehabilitation of the wetland and buffer should enhance the fauna habitat values on the site.

4 CONCLUSIONS

The assessment of the Development Concept against the environmental factors that are potentially impacted on the site results in the following conclusions:

- Surrounding land use will not be impacted by the proposed development;
- Geology and soil types are not an impediment to the development;
- Once detailed engineering design is complete any soil disturbance will need to be investigated and if required an ASS Management Plan prepared;
- Groundwater is highly unlikely to be impacted by the proposed development;
- Surface water will be managed in accordance with Department of Water requirements;
- The north-west half of the site contains a Conservation Category Wetland. The vegetation in the wetland has been significantly modified over time and is currently in Degraded to Completely Degraded condition. Nevertheless the proposed development retains the wetland in its entirety;
- A 0m to 50m modified wetland buffer is considered acceptable for this development as it excludes the existing house area, provides a low fuel zone outside the wetland area and will enable rehabilitation of the western part of the buffer to remove invasive weeds such as Arum Lily thereby providing better protection for the wetland;
- The wetland values will be increased by weed control, removal of an existing structure and revegetation within the lot;
- Scattered native trees (Flooded Gum and Paperbark), shrubs and herbs occur in the wetland and adjacent areas. All native plants will be retained in the wetland area. Any trees lost in the buffer will be replaced in the rehabilitation of the degraded parts of the western buffer; and
- No significant fauna habitat will be impacted by the proposed development on the site.

In conclusion PGV Environmental considers the proposed development in accordance with the Development Concept will not impact on the environment and should result in enhanced environmental values due to rehabilitation of the wetland and buffer that would not be achievable if the standard 50m buffer were applied, rendering the site undevelopable.

5 REFERENCES

Birdlife Australia (2014a) Red Capped Plover Species Profile Accessed January 2014 http://www.birdlife.org.au/bird-profile/red-capped-plover Australia

Birdlife International (2014a) Little Ringer Plover (*Charadrius dubius*) Species Profile Accessed January 2014 http://www.birdlife.org/datazone/speciesfactsheet.php?id=3119

Birdlife International (2014b) Black-winged Stilt (*Himantopus himantopus*) Species Profile Accessed January 2014 http://www.birdlife.org/datazone/speciesfactsheet.php?id=3101

Birdlife International (2014c) Red-necked Avocet (*Recurvirostra novaeh*) Species Profile Accessed January 2014 http://www.birdlife.org/datazone/speciesfactsheet.php?id=3109

Bolland, M (1998) *Soils of the Swan Coastal Plain* Agriculture Western Australia, Bunbury

Department of Agriculture and Food Western Australia (DAFWA) (2014) NRM Info Mapping http://spatial.agric.wa.gov.au/slip/framesetup.asp Accessed May 2014 Perth Western Australia

Department of Environment and Conservation (DEC) (2002). Fauna Species Profiles http://www.dec.wa.gov.au/content/view/3432/1999/ Government of Western Australia, Perth.

Department of Environment and Conservation (DEC) (2009b) *Acid Sulphate Soils Guideline Series: Identification and Investigation of Acid Sulphate Soils and Acidic Landscapes* Perth Western Australia

Department of Environment and Conservation (DEC) (2011a) *Acid Sulphate Soils Guideline Series: Treatment and Management of Soils and Water in Acid Sulphate Soil Landscapes* Perth Western Australia

Department of Environment and Conservation (DEC) (2011b), *Wildlife Conservation (Specially Protected Fauna) Notice 2008* Perth, Western Australia

Department of Environment and Conservation (DEC) (2012) Fauna Species Profiles Accessed June 2012 http://www.dec.wa.gov.au/content/view/3432/1999/1/1/ Government of Western Australia, Perth.

Department of Parks and Wildlife (DPaW) (2014) Florabase https://florabase.dpaw.wa.gov.au/ Accessed May 2014 Perth Western Australia

Department of the Environment (DoE) (2014). Species Profile and Threats (SPRAT) Database. http://www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl Accessed May 2014 Commonwealth of Australia

Department of Water (DoW) (2014a) Hydrogeological Atlas Accessed May 2014 http://www.water.wa.gov.au/Tools/Maps+and+atlases/Perth+groundwater+atlas/default.aspx Government of Western Australia, Perth.

Department of Water (DoW) (2014b) *Perth Groundwater Atlas* Accessed May 2014 http://www.water.wa.gov.au/idelve/gwa/ Government of Western Australia, Perth.

Environmental Protection Authority (EPA) (2004). Position Statement No. 4 - *Environmental Protection of Wetlands*. Perth, Western Australia

Environmental Protection Authority (EPA) (2008) *Environmental Guidance for Planning and Development – Guidance Statement No. 33.* Perth Western Australia.

Government of Western Australia (2000) Bush Forever - *Keeping the Bush in the City. Volume 2: Directory of Bush Forever Sites*. Perth, WA.

Hill, A.L., Semeniuk, C.A., Semeniuk, V. and Del Marco, A. (1996). *Wetlands of the Swan Coastal Plain Wetland Mapping, Classification and Evaluation, Main Report*. Volume 2a.

Landgate (2014a) WA Atlas Shared Land Information Platform Accessed May 2014 https://www2.landgate.wa.gov.au/bmvf/app/waatlas/ Government of Western Australia, Perth.

Landgate (2014b) Historical Aerial Photography Accessed May 2014 https://www.landgate.wa.gov.au/bmvf/app/mapviewer/ Government of Western Australia, Perth.

Nevill, S (ed) (2005) *Guide to the Wildlife of the Perth Region*. Simon Nevill Publications, Perth, Western Australia

Storr, G.M., Smith, L.A. and Johnstone R.E. (1999) *Lizards of Western Australia I: Skinks*. Revised Edition, WA Museum, Perth, Western Australia.

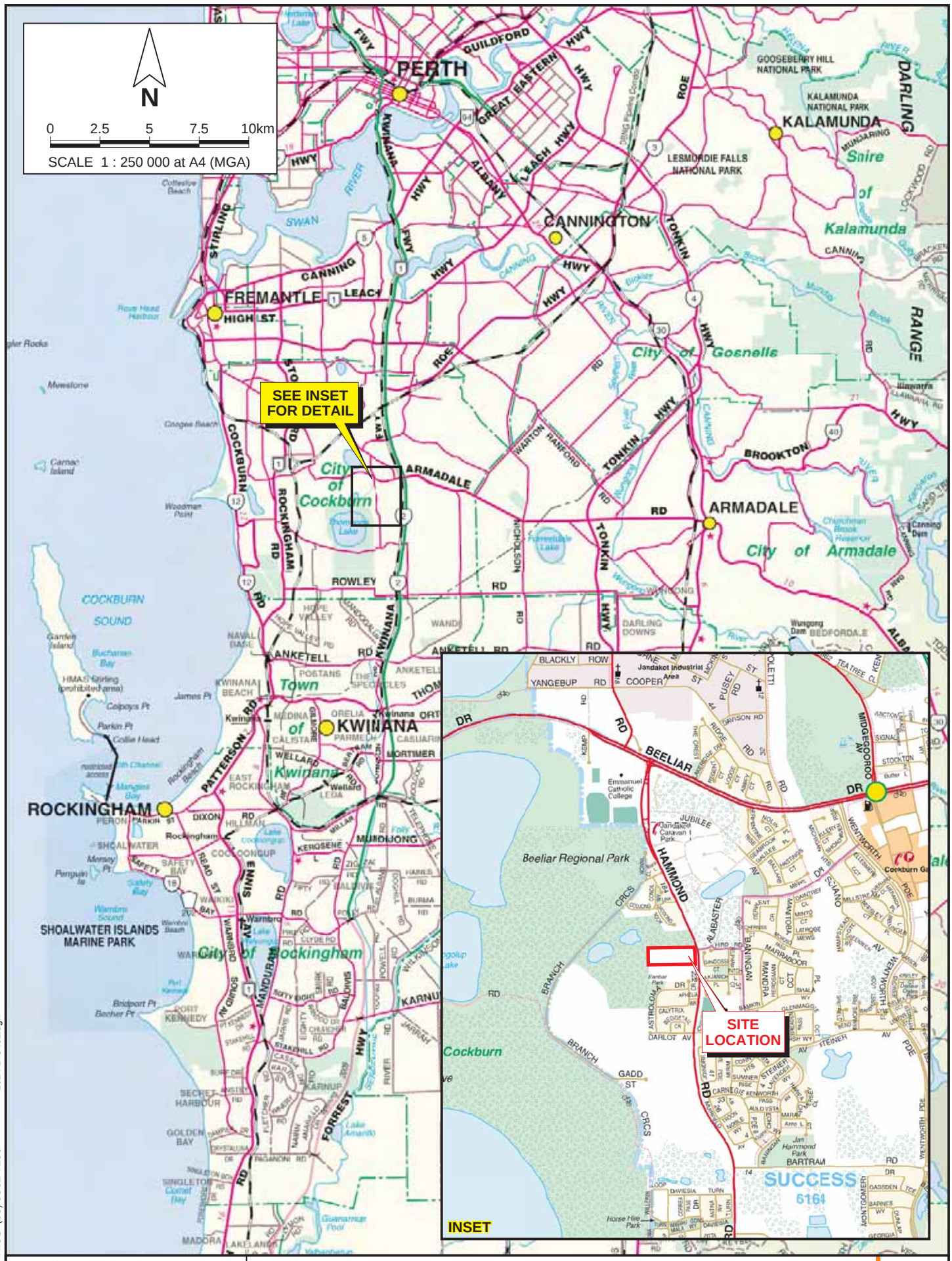
Western Australian Planning Commission (WAPC) (2002) *City of Cockburn Town Planning Scheme No.3* Government of Western Australia, Perth.

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

Western Australian Planning Commission (WAPC) (2009) *Acid Sulphate Soils Planning Guidelines* Western Australian Planning Commission, Perth

Wilson, S and Swan, G (2008) *A complete guide to reptiles of Australia* New Holland Publishers Sydney, New South Wales

FIGURES



pgv ENVIRONMENTAL

Illuminate Property
ENVIRONMENTAL ASSESSMENT
210 HAMMOND ROAD, SUCCESS

Drawn: J. Hams | Date: 18 Jun 2014

Job: 10167 Rpt: 2014-148 | Revision: A

SITE LOCATION

Figure 1

PINPOINT CARTOGRAPHICS (08) 9562 7136 2014-148-f01.dgn

PINPOINT CARTOGRAPHICS (08) 9562 7136 2014-148-f02.dgn

pgv ENVIRONMENTAL

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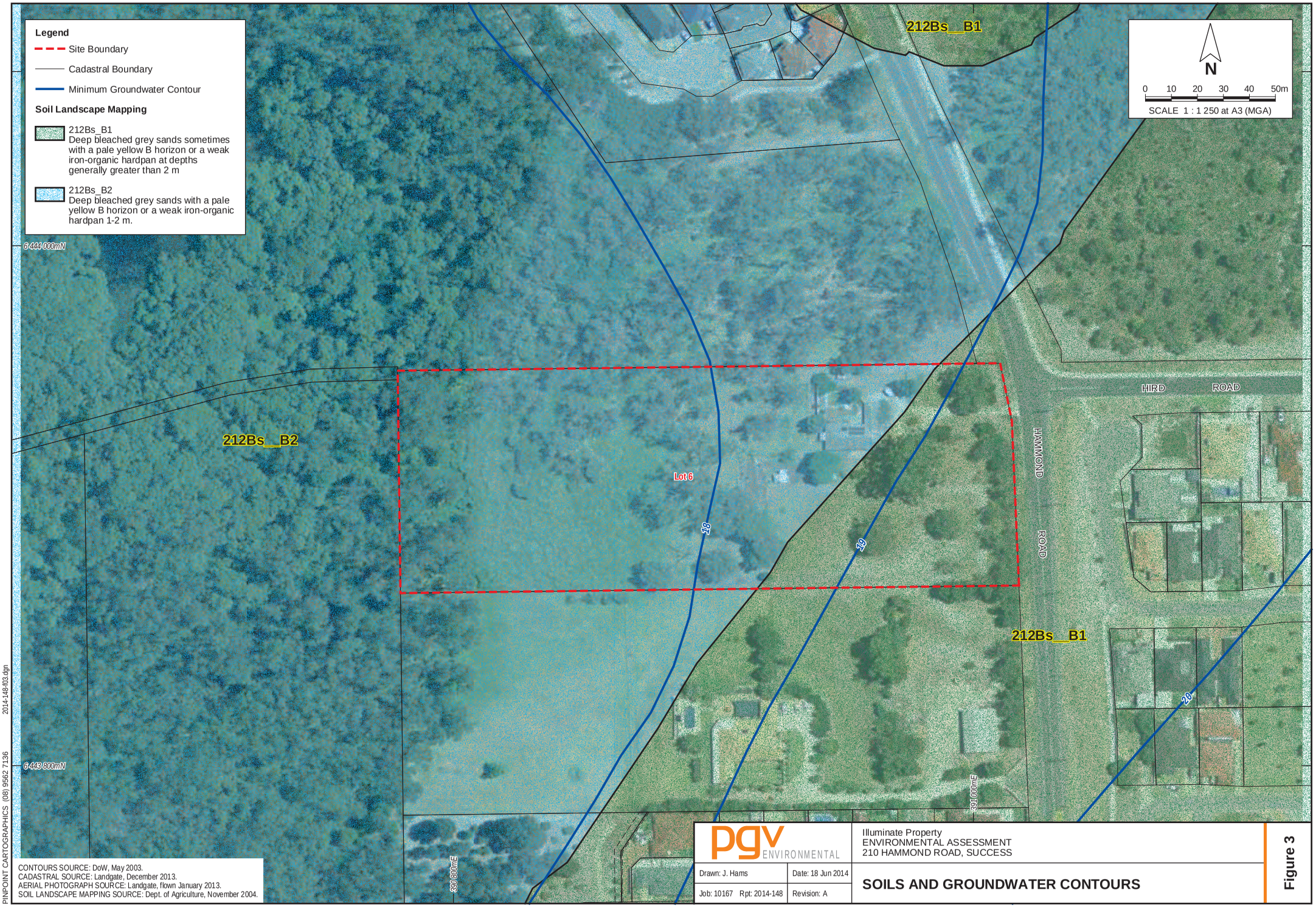
210 HAMMOND ROAD, SUCCESS

Drawn: J. Hams | Date: 18 Jun 2014

Job: 10167 Rpt: 2014-148 | Revision: A

SITE BOUNDARY AND TOPOGRAPHY

Figure 2



CONTOURS SOURCE: DoW, May 2003.
CADASTRAL SOURCE: Landgate, December 2013.
AERIAL PHOTOGRAPH SOURCE: Landgate, flown January 2013.
SOIL LANDSCAPE MAPPING SOURCE: Dept. of Agriculture, November 2004.

PINPOINT CARTOGRAPHICS (08) 9562 7136 2014-148-f03.dgn

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SOILS AND GROUNDWATER CONTOURS

Figure 3

WETLANDS SOURCE: DER, November 2013.
CADASTRAL SOURCE: Landgate, December 2013.
AERIAL PHOTOGRAPH SOURCE: Landgate, flown January 2013.

PINPOINT CARTOGRAPHICS (08) 9562 7136 2014-148-f05.dgn

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GEOMORPHIC WETLANDS

Figure 4

CADASTRAL SOURCE: Landgate, December 2013.
BUSH FOREVER SOURCE: Dept. of Planning, 2007.
AERIAL PHOTOGRAPH SOURCE: Landgate, flown January 2013.

PINPOINT CARTOGRAPHICS (08) 9562 7136 2014-148-f06.dgn

pgv ENVIRONMENTAL

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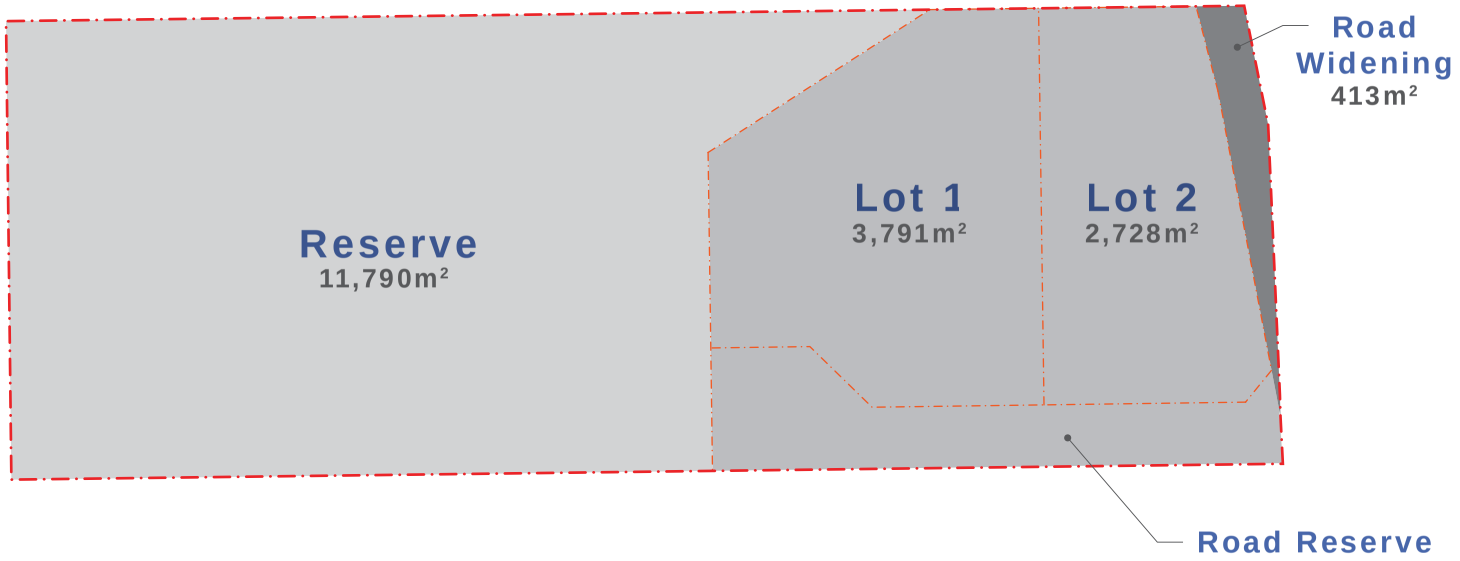
Job: 10167 Rpt: 2014-148	Revision: A

BUSH FOREVER

Figure 5

APPENDIX 1

Subdivision Concept



Subdivision Concept

210 Hammond Road, Success

Project Manager: DR
Drawn: OP
Checked: DR
Date: 12 September 2014
Scale: 1:1,000 @ A3
Drawing No. 714-320 CP-02A

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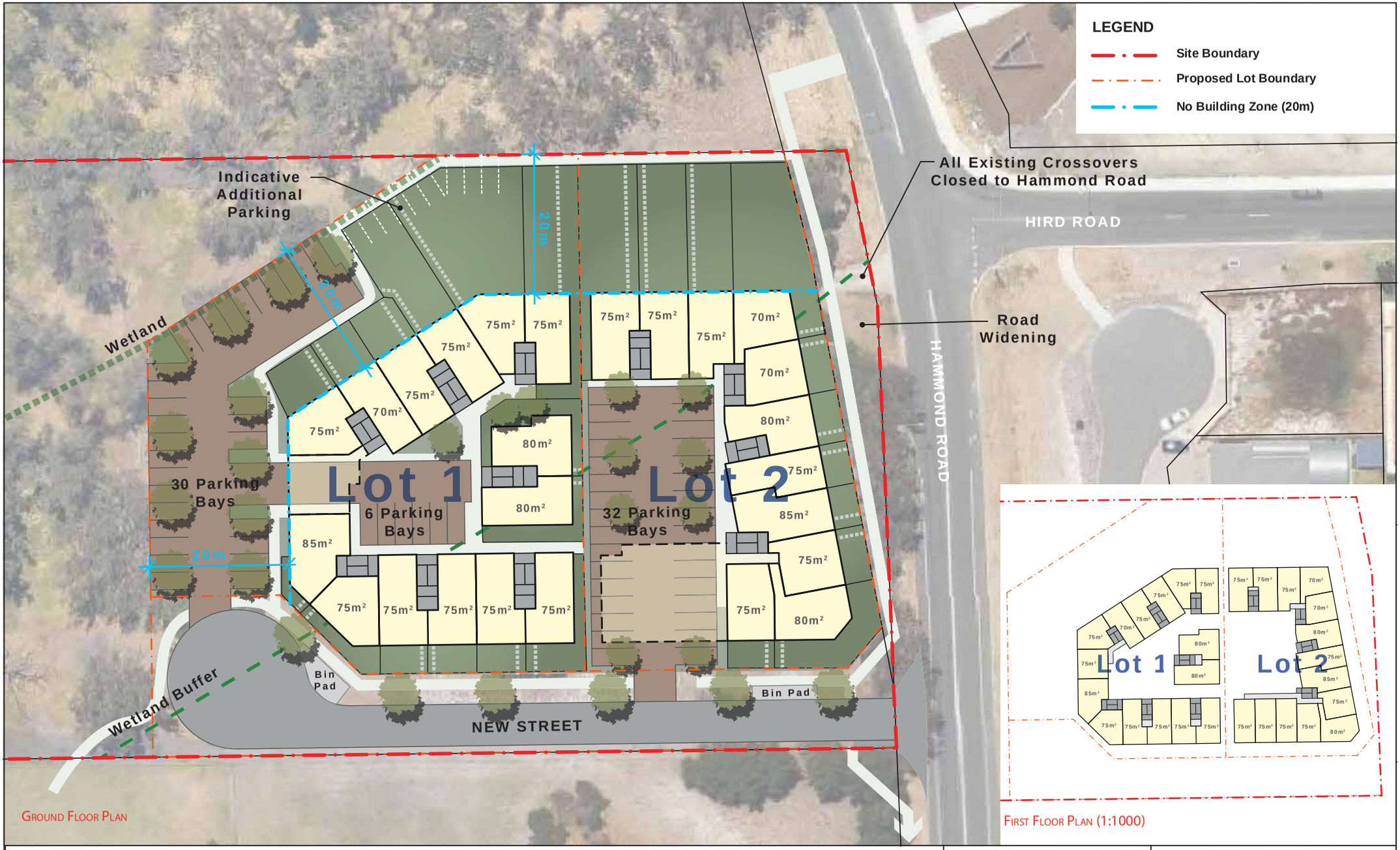
APPENDIX 2

Indicative Concept Plan



Development Concept

210 Hammond Road, Success

Project Manager: DR Date: 22 April 2015
Drawn: OP Scale: 1:500 @ A3
Checked: DR Drawing No. 714-320 CP-01A

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APPENDIX 3

Naturemap Report

NatureMap Species Report

Created By Jackalyn Hams on 28/05/2014

Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	115°50' 35" E,32°08' 08" S
Buffer	2km
Group By	Conservation Status

Conservation Status	Species	Records
Rare or likely to become extinct	4	28
Protected under international agreement	13	218
Other specially protected fauna	1	2
Priority 3	2	128
Priority 4	1	4
Priority 5	1	4
Non-conservation taxon	217	4739
TOTAL	**239**	**5123**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Rare or likely to become extinct					
1.	1596	*Caladenia huegelii (Grand Spider Orchid)*		T	
2.	24784	*Calidris ferruginea (Curlew Sandpiper)*		T	
3.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo (short-billed black-cockatoo), Carnaby's Cockatoo)*		T	
4.	24146	*Myrmecobius fasciatus (Numbat, Walpurti)*		T	
Protected under international agreement					
5.	41323	*Actitis hypoleucos (Common Sandpiper)*		IA	
6.	41324	*Ardea modesta (Eastern Great Egret)*		IA	
7.	24779	*Calidris acuminata (Sharp-tailed Sandpiper)*		IA	
8.	24786	*Calidris melanotos (Pectoral Sandpiper)*		IA	
9.	24788	*Calidris ruficollis (Red-necked Stint)*		IA	
10.	24789	*Calidris subminuta (Long-toed Stint)*		IA	
11.	25574	*Charadrius dubius (Little Ringed Plover)*		IA	
12.	24293	*Haliaeetus leucogaster (White-bellied Sea-Eagle)*		IA	
13.	24598	*Merops ornatus (Rainbow Bee-eater)*		IA	
14.	24843	*Plegadis falcinellus (Glossy Ibis)*		IA	
15.	24806	*Tringa glareola (Wood Sandpiper)*		IA	
16.	24808	*Tringa nebularia (Common Greenshank)*		IA	
17.	24809	*Tringa stagnatilis (Marsh Sandpiper)*		IA	
Other specially protected fauna					
18.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
Priority 3					
19.	25147	*Lerista lineata (Perth Slider, Lined Skink)*		P3	
20.	25249	*Neelaps calonotos (Black-striped Snake)*		P3	
Priority 4					
21.	4763	*Dodonaea hackettiana (Hackett's Hopbush)*		P4	
Priority 5					
22.	24153	*Isoodon obesulus subsp. fusciventer (Quenda, Southern Brown Bandicoot)*		P5	
Non-conservation taxon					
23.	3374	*Acacia huegelii*			
24.	24260	*Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)*			
25.	24261	*Acanthiza chrysorrhoa (Yellow-rumped Thornbill)*			
26.	24262	*Acanthiza inornata (Western Thornbill)*			
27.	24560	*Acanthorhynchus superciliosus (Western Spinebill)*			
28.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			
29.	25536	*Accipiter fasciatus (Brown Goshawk)*			
30.	42368	*Acritoscincus trilineatus (Western Three-lined Skink)*			
31.	25755	*Acrocephalus australis (Australian Reed Warbler)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
32.	11837	*Adenanthos cygnorum subsp. cygnorum (Common Woollybush)*			
33.	1732	*Allocasuarina humilis (Dwarf Sheoak)*			
34.	24310	*Anas castanea (Chestnut Teal)*			
35.	24312	*Anas gracilis (Grey Teal)*			
36.	24313	*Anas platyrhynchos (Mallard)*			
37.	24315	*Anas rhynchotis (Australasian Shoveler)*			
38.	24316	*Anas superciliosa (Pacific Black Duck)*			
39.	24561	*Anthochaera carunculata (Red Wattlebird)*			
40.	24562	*Anthochaera lunulata (Western Little Wattlebird)*			
41.	3692	*Aotus procumbens*			
42.	24285	*Aquila audax (Wedge-tailed Eagle)*			
43.	38968	*Arcyria insignis*			
44.	24341	*Ardea pacifica (White-necked Heron)*			
45.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
46.	20283	*Astartea scoparia*			
47.	7851	*Asteridea pulverulenta (Common Bristle Daisy)*			
48.	6334	*Astroloma pallidum (Kick Bush)*			
49.	24318	*Aythya australis (Hardhead)*			
50.	17737	*Azolla pinnata*			
51.	1800	*Banksia attenuata (Slender Banksia, Piara)*			
52.	1834	*Banksia menziesii (Firewood Banksia)*			
53.	741	*Baumea articulata (Jointed Rush)*			
54.	743	*Baumea juncea (Bare Twigrush)*			
55.	744	*Baumea laxa*			
56.	24319	*Biziura lobata (Musk Duck)*			
57.	16636	*Boronia crenulata subsp. viminea*			
58.	3710	*Bossiaea eriocarpa (Common Brown Pea)*			
59.	244	*Briza maxima (Blowfly Grass)*	Y		
60.	245	*Briza minor (Shivery Grass)*	Y		
61.	249	*Bromus diandrus (Great Brome)*	Y		
62.	25716	*Cacatua sanguinea (Little Corella)*			
63.	25598	*Cacomantis flabelliformis (Fan-tailed Cuckoo)*			
64.	2848	*Calandrinia corrigioloides (Strap Purslane)*			
65.	2856	*Calandrinia liniflora (Parakeelya)*			
66.	25717	*Calyptorhynchus banksii (Red-tailed Black-Cockatoo)*			
67.	5439	*Calytrix angulata (Yellow Starflower)*			
68.	5460	*Calytrix fraseri (Pink Summer Calytrix)*			
69.	2794	*Carpobrotus aequilaterus (Angular Pigface)*	Y		
70.	2795	*Carpobrotus edulis (Hottentot Fig)*	Y		
71.	6214	*Centella asiatica*			
72.	1125	*Centrolepis drummondiana*			
73.	2889	*Cerastium glomeratum (Mouse Ear Chickweed)*	Y		
74.	24377	*Charadrius ruficapillus (Red-capped Plover)*			
75.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
76.	24288	*Circus approximans (Swamp Harrier)*			
77.	24289	*Circus assimilis (Spotted Harrier)*			
78.	24774	*Cladorhynchus leucocephalus (Banded Stilt)*			
79.	38983	*Clastoderma debaryanum*			
80.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
81.	24399	*Columba livia (Domestic Pigeon)*	Y		
82.	38990	*Comatricha nigra*			
83.	6348	*Conostephium pendulum (Pearl Flower)*			
84.	1418	*Conostylis aculeata (Prickly Conostylis)*			
85.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
86.	25592	*Corvus coronoides (Australian Raven)*			
87.	7945	*Cotula coronopifolia (Waterbuttons)*	Y		
88.	24420	*Cracticus nigrogularis (Pied Butcherbird)*			
89.	25595	*Cracticus tibicen (Australian Magpie)*			
90.	25596	*Cracticus torquatus (Grey Butcherbird)*			
91.	3137	*Crassula colorata (Dense Stonecrop)*			
92.	3139	*Crassula exserta*			
93.	3140	*Crassula glomerata*	Y		
94.	25399	*Crinia glauerti (Clicking Frog)*			
95.	25400	*Crinia insignifera (Squelching Froglet)*			
96.	30893	*Cryptoblepharus buchananii*			
97.	30899	*Ctenophorus adelaidensis (Southern Heath Dragon, Western Heath Dragon)*			
98.	25027	*Ctenotus australis*			
99.	6663	*Cuscuta epithymum (Lesser Dodder, Greater Dodder)*	Y		
100.	40660	*Cycnogeton huegelii*			
101.	24322	*Cygnus atratus (Black Swan)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
102.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*	Y		
103.	25673	*Daphoenositta chrysoptera (Varied Sittella)*			
104.	1218	*Dasypogon bromeliifolius (Pineapple Bush)*			
105.	3832	*Daviesia physodes*			
106.	25766	*Delma fraseri (Fraser's Legless Lizard)*			
107.	25296	*Demansia psammophis subsp. reticulata (Yellow-faced Whipsnake)*			
108.	16595	*Desmocladus flexuosus*			
109.	1259	*Dianella revoluta (Blueberry Lily)*			
110.	25607	*Dicaeum hirundinaceum (Mistletoebird)*			
111.	1287	*Dichopogon capillipes*			
112.	347	*Ehrharta calycina (Perennial Veldt Grass)*	Y		
113.	349	*Ehrharta longiflora (Annual Veldt Grass)*	Y		
114.	24567	*Epthianura albifrons (White-fronted Chat)*			
115.	24379	*Erythrogonys cinctus (Red-kneed Dotterel)*			
116.	5763	*Eucalyptus rudis (Flooded Gum, Kulurda)*			
117.	5790	*Eucalyptus todtiana (Coastal Blackbutt)*			
118.	25622	*Falco cenchroides (Australian Kestrel)*			
119.	25623	*Falco longipennis (Australian Hobby)*			
120.	25727	*Fulica atra (Eurasian Coot)*			
121.	25729	*Gallinula tenebrosa (Dusky Moorhen)*			
122.	25730	*Gallirallus philippensis (Buff-banded Rail)*			
123.	20483	*Gastrolobium linearifolium*			
124.	25530	*Gerygone fusca (Western Gerygone)*			
125.	1520	*Gladiolus caryophyllaceus (Wild Gladiolus)*	Y		
126.	24735	*Glossopsitta porphyrocephala (Purple-crowned Lorikeet)*			
127.	3957	*Gompholobium tomentosum (Hairy Yellow Pea)*			
128.	6161	*Gonocarpus pithyoides*			
129.	24443	*Grallina cyanoleuca (Magpie-lark)*			
130.	24295	*Haliastur sphenurus (Whistling Kite)*			
131.	3961	*Hardenbergia comptoniana (Native Wisteria)*			
132.	25410	*Heleioporus eyrei (Moaning Frog)*			
133.	6839	*Hemiandra pungens (Snakebush)*			
134.	25119	*Hemiergis quadrilineata*			
135.	5135	*Hibbertia hypericoides (Yellow Buttercups)*			
136.	5162	*Hibbertia racemosa (Stalked Guinea Flower)*			
137.	25734	*Himantopus himantopus (Black-winged Stilt)*			
138.	24491	*Hirundo neoxena (Welcome Swallow)*			
139.	444	*Holcus lanatus (Yorkshire Fog)*	Y		
140.	6222	*Homalosciadium homalocarpum*			
141.	5825	*Hypocalymma robustum (Swan River Myrtle)*			
142.	8086	*Hypochaeris glabra (Smooth Catsear)*	Y		
143.	917	*Isolepis marginata (Coarse Club-rush)*	Y		
144.	1188	*Juncus pallidus (Pale Rush)*			
145.	15498	*Kunzea glabrescens (Spearwood)*			
146.	925	*Lepidosperma angustatum*			
147.	25133	*Lerista elegans*			
148.	6374	*Leucopogon conostephioides*			
149.	6436	*Leucopogon propinquus*			
150.	25661	*Lichmera indistincta (Brown Honeyeater)*			
151.	25415	*Limnodynastes dorsalis (Western Banjo Frog)*			
152.	25378	*Litoria adelaidensis (Slender Tree Frog)*			
153.	25388	*Litoria moorei (Motorbike Frog)*			
154.	1228	*Lomandra hermaphrodita*			
155.	1097	*Lyginia barbata*			
156.	34736	*Lysinema pentapetalum*			
157.	85	*Macrozamia riedlei (Zamia, Djiridji)*			
158.	24326	*Malacorhynchus membranaceus (Pink-eared Duck)*			
159.	25651	*Malurus lamberti (Variegated Fairy-wren)*			
160.	25654	*Malurus splendens (Splendid Fairy-wren)*			
161.	25758	*Megalurus gramineus (Little Grassbird)*			
162.	34676	*Meionectes brownii (Swamp Raspwort)*			
163.	5952	*Melaleuca preissiana (Moonah)*			
164.	25663	*Melithreptus brevirostris (Brown-headed Honeyeater)*			
165.	24736	*Melopsittacus undulatus (Budgerigar)*			
166.	25184	*Menetia greyii*			
167.	15419	*Microtis media subsp. media*			
168.	25191	*Morethia lineoocellata*			
169.	25420	*Myobatrachus gouldii (Turtle Frog)*			
170.	25748	*Ninox novaeseelandiae (Boobook Owl)*			
171.	25252	*Notechis scutatus (Tiger Snake)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
172.	25564	*Nycticorax caledonicus (Rufous Night Heron)*			
173.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
174.	24328	*Oxyura australis (Blue-billed Duck)*			
175.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
176.	25253	*Parasuta gouldii*			
177.	25681	*Pardalotus punctatus (Spotted Pardalote)*			
178.	25682	*Pardalotus striatus (Striated Pardalote)*			
179.	1550	*Patersonia occidentalis (Purple Flag, Koma)*			
180.	4343	*Pelargonium capitatum (Rose Pelargonium)*	Y		
181.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
182.	2299	*Petrophile linearis (Pixie Mops)*			
183.	25697	*Phalacrocorax carbo (Great Cormorant)*			
184.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
185.	25699	*Phalacrocorax varius (Pied Cormorant)*			
186.	24409	*Phaps chalcoptera (Common Bronzewing)*			
187.	1478	*Phlebocarya ciliata*			
188.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			
189.		*Phytophthora cinnamomi*			
190.	24841	*Platalea flavipes (Yellow-billed Spoonbill)*			
191.	25007	*Pletholax gracilis subsp. gracilis (Keeled Legless Lizard)*			
192.	578	*Poa porphyroclados*			
193.	25704	*Podiceps cristatus (Great Crested Grebe)*			
194.	24907	*Pogona minor subsp. minor (Dwarf Bearded Dragon)*			
195.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
196.	25722	*Polytelis anthopeplus (Regent Parrot)*			
197.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
198.	24769	*Porzana fluminea (Australian Spotted Crake)*			
199.	25732	*Porzana pusilla (Baillon's Crake)*			
200.	24771	*Porzana tabuensis (Spotless Crake)*			
201.	4181	*Pultenaea reticulata*			
202.	25008	*Pygopus lepidopodus (Common Scaly Foot)*			
203.	25271	*Ramphotyphlops australis*			
204.	24243	*Rattus fuscipes (Western Bush Rat)*			
205.	24245	*Rattus rattus (Black Rat)*	Y		
206.	24776	*Recurvirostra novaehollandiae (Red-necked Avocet)*			
207.	4822	*Rhamnus alaternus (Buckthorn)*	Y		
208.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
209.	978	*Schoenus brevisetis*			
210.	984	*Schoenus curvifolius*			
211.	6033	*Scholtzia involucrata (Spiked Scholtzia)*			
212.	25534	*Sericornis frontalis (White-browed Scrubwren)*			
213.	25266	*Simoselaps bertholdi (Jan's Banded Snake)*			
214.	30948	*Smicrornis brevirostris (Weebill)*			
215.	8231	*Sonchus oleraceus (Common Sowthistle)*	Y		
216.	4211	*Sphaerolobium vimineum (Leafless Globe Pea)*			
217.	2918	*Stellaria media (Chickweed)*	Y		
218.	24329	*Stictonetta naevosa (Freckled Duck)*			
219.	25597	*Strepera versicolor (Grey Currawong)*			
220.	25589	*Streptopelia chinensis (Spotted Turtle-Dove)*	Y		
221.	25590	*Streptopelia senegalensis (Laughing Turtle-Dove)*	Y		
222.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
223.	24331	*Tadorna tadornoides (Australian Shelduck, Mountain Duck)*			
224.	24167	*Tarsipes rostratus (Honey Possum, Noolbenger)*			
225.	24844	*Threskiornis molucca (Australian White Ibis)*			
226.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
227.	1351	*Thysanotus sparteus*			
228.	25207	*Tiliqua rugosa subsp. rugosa*			
229.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
230.	25723	*Trichoglossus haematodus (Rainbow Lorikeet)*			
231.	-12897	*Urodacus novaehollandiae*			
232.	25577	*Vanellus miles (Masked Lapwing)*			
233.	24386	*Vanellus tricolor (Banded Lapwing)*			
234.	-11839	*Venator immansueta*			
235.	11474	*Vicia sativa subsp. nigra*	Y		
236.	4325	*Viminaria juncea (Swishbush, Koweda)*			
237.	7384	*Wahlenbergia capensis (Cape Bluebell)*	Y		
238.	1256	*Xanthorrhoea preissii (Grass tree, Palga)*			
239.	25765	*Zosterops lateralis (Grey-breasted White-eye, Silvereye)*			

Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area

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

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

APPENDIX 4

Protected Matters Search Tool Report

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	18
Listed Migratory Species:	14

Other Matters Protected by the EPBC Act

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

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate.

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

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

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	23
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine	None

Extra Information

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

Place on the RNE:	2
State and Territory Reserves:	2
Regional Forest Agreements:	None
Invasive Species:	39
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (RAMSAR) [Resource Information]

Name	Proximity
Forrestdale & thomsons lakes	Within Ramsar site

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo [67034]	Vulnerable	Species or species habitat may occur within area
Calyptorhynchus latirostris Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat may occur within area
Mammals		
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir [25911]	Vulnerable	Species or species habitat may occur within area
Setonix brachyurus Quokka [229]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat may occur within area
Plants		
Andersonia gracilis Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat likely to occur within area
Centrolepis caespitosa [6393]	Endangered	Species or species habitat likely to occur within area
Darwinia foetida Muchea Bell [83190]	Critically Endangered	Species or species habitat likely to occur within area
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area
Diuris purdiei Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat likely to occur within area
Drakaea elastica Glossy-leafed Hammer-orchid, Praying Virgin [16753]	Endangered	Species or species habitat likely to occur within area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat likely to occur within area
Lepidosperma rostratum Beaked Lepidosperma [14152]	Endangered	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat likely to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]		Species or species habitat known to occur

Name	Threatened	Type of Presence within area
Calidris ferruginea Curlew Sandpiper [856]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat likely to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]		Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area
Charadrius dubius Little Ringed Plover [896]		Species or species habitat known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Himantopus himantopus Black-winged Stilt [870]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Philomachus pugnax Ruff (Reeve) [850]		Species or species habitat known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat known to occur within area
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area

Extra Information

Places on the RNE [Resource Information]

Note that not all Indigenous sites may be listed.

Name	State	Status
Natural		
Beeliar Regional Park and Adjacent Areas	WA	Interim List
Thomson Lake Reserve	WA	Registered

State and Territory Reserves [Resource Information]

Name	State
Thomsons Lake	WA
Unnamed WA49561	WA

Invasive Species [Resource Information]

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

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Lycium ferocissimum		
African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Olea europaea		
Olive, Common Olive [9160]		Species or species habitat may occur within area
Pinus radiata		
Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Protasparagus plumosus		
Climbing Asparagus-fern, Ferny Asparagus [11747]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate		
Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla		
Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii		
Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta		
Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Tamarix aphylla		
Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus		
Asian House Gecko [1708]		Species or species habitat likely to occur within area

Coordinates

-32.13598 115.84332

Caveat

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Acknowledgements

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

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Geoscience Australia
-CSIRO
-Other groups and individuals

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

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

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APPENDIX 5

Conservation Codes

Western Australian and Commonwealth of Australia Conservation Codes

Flora

Definitions of the Conservation Codes for the Status of Flora under the Wildlife Conservation Act 1950 follow:

T: Threatened Flora (Declared Rare Flora — Extant)

Taxa1 which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such (Schedule 1 under the Wildlife Conservation Act 1950).

Threatened Flora (Schedule 1) are further ranked by the Department according to their level of threat using IUCN Red List criteria:

CR: Critically Endangered

Considered to be facing an extremely high risk of extinction in the wild

EN: Endangered

Considered to be facing a very high risk of extinction in the wild

VU: Vulnerable

Considered to be facing a high risk of extinction in the wild.

X: Presumed Extinct Flora (Declared Rare Flora — Extinct)

Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such (Schedule 2 under the Wildlife Conservation Act 1950).

Taxa that have not yet been adequately surveyed to be listed under Schedule 1 or 2 are added to the Priority Flora List under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna. Taxa that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Conservation Dependent species are placed in Priority 5.

Priority One: Poorly-known taxa

Taxa that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Taxa may be included if they are comparatively well known from one or

more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.

Priority Two: Poorly-known taxa

Taxa that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.

Priority Three: Poorly-known taxa

Taxa that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.

Priority Four: Rare, Near Threatened and other taxa in need of monitoring

Rare. Taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands.

Near Threatened. Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.

Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Priority Five: Conservation Dependent taxa

Taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxon becoming threatened within five years.

Vegetation

Definitions and criteria for presumed totally destroyed, critically endangered, endangered and vulnerable ecological communities are outlined below.

Presumed Totally Destroyed (PD)

An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence

of it is likely to recover its species composition and/or structure in the foreseeable future.

Critically Endangered (CR)

An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.

Endangered (EN)

An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.

Vulnerable (VU)

An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.

Possible threatened ecological communities that do not meet survey criteria are added to DEC's Priority Ecological Community Lists under Priorities 1, 2 and 3. Ecological Communities that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

Priority One: Poorly-known ecological communities

Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤ 100ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.

Priority Two: Poorly-known ecological communities

Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200ha). At least some occurrences are

not believed to be under immediate threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.

Priority Three: Poorly known ecological communities

(i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or:

(ii) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or;

(iii) communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes.

Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.

Priority Four: Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.

(i) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands.

(ii) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.

(iii) Ecological communities that have been removed from the list of threatened communities during the past five years.

Priority Five: Conservation Dependent ecological communities

Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Fauna

In Western Australia, all native fauna species are protected under the *Wildlife Conservation Act 1950-1979*. Fauna species that are considered rare, threatened with extinction or have a high conservation value are specially protected under the Act. In addition, some species of fauna are covered under the 1991 ANZECC convention, while certain birds are listed under the Japan and Australian Migratory Bird Agreement (JAMBA) and the China and Australian Migratory Bird Agreement (CAMBA). In addition to the above classification, DEC also classify fauna under five different Priority codes and rare and endangered fauna are classified under the Wildlife Conservation (Specially Protected Fauna) Notice 2006 into four schedules of taxa.

Schedule 1

Fauna which are rare or likely to become extinct and are declared to be fauna in need of special protection.

Schedule 2

Fauna which are presumed to be extinct and are declared to be fauna in need of special protection.

Schedule 3

Birds which are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction which are declared to be fauna in need of special protection.

Schedule 4

Fauna that are in need of special protection, otherwise than for the reasons mentioned in Schedule 1, 2 or 3.

In addition to the above classification, the DEC also classifies fauna under five different priority codes:

Priority One: Taxa with few, poorly known populations on threatened lands

Taxa which are known from few specimens or sight records from one or a few localities on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, active mineral leases. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

Priority Two: Taxa with few, poorly known populations on conservation lands

Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

Priority Three: Taxa with several, poorly known populations, some on conservation lands

Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

Priority Four: Taxa in need of monitoring

Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands.

Priority Five: Taxa in need of monitoring (conservation dependent)

Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

Commonwealth of Australia Conservation Codes

The Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* has the following nine conservation codes for Flora and Fauna.

Extinct

Taxa not definitely located in the wild during the past 50 years

Extinct in the Wild

Taxa known to survive only in captivity

Critically Endangered

Taxa facing an extremely high risk of extinction in the wild in the immediate future

Endangered

Taxa facing a very high risk of extinction in the wild in the near future

Vulnerable

Taxa facing a high risk of extinction in the wild in the medium-term

Near Threatened

Taxa that risk becoming Vulnerable in the wild

Conservation Dependent

Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classified as Vulnerable or more severely threatened.

Data Deficient (Insufficiently Known)

Taxa suspected of being Rare, Vulnerable or Endangered, but whose true status cannot be determined without more information.

Least Concern

Taxa that are not considered Threatened

Appendix 3

Transport Impact Statement

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TRANSPORT IMPACT ASSESSMENT

Lot 6 (No 210) Hammond Road,

Success

September 2014, Rev D

kctt

HISTORY AND STATUS OF THE DOCUMENT

Revision	Date issued	Reviewed by	Approved by	Date approved	Revision type
Rev A	10.07.2014	C Kleyweg	C Kleyweg	10.07.2014	Issued for Review
Rev B	14.07.2014	C Kleyweg	C Kleyweg	14.07.2014	Revised in accordance with the comments received from the client on 11.07.2014.
Rev C	15.07.2014	C Kleyweg	C Kleyweg	15.07.2014	Revised in accordance with the comments received from the client on 14.07.2014.
Rev D	15.09.2014	C Kleyweg	C Kleyweg	15.09.2014	Yields amended – traffic impact re-calculated.

DISTRIBUTION OF COPIES

Revision	Date of issue	Quantity	Issued to
Rev A	10.07.2014	1 (PDF)	Mr David Read, Mr Oliver Penman Ms Alison Healey (TPG Town Planning, Urban Design and Heritage), Natalie Jardim
Rev B	14.07.2014	1 (PDF)	Mr David Read, Mr Oliver Penman Ms Alison Healey (TPG Town Planning, Urban Design and Heritage), Natalie Jardim
Rev C	15.07.2014	1 (PDF)	Mr David Read, Mr Oliver Penman Ms Alison Healey (TPG Town Planning, Urban Design and Heritage), Natalie Jardim
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Appendices

Appendix 1 - The Layout of the Proposed Development

Appendix 2 - Hammond Road Duplication - from Beeliar Drive to Bertram Road (Concept Plan)

Appendix 3 - Vehicle Turning Circle Plan

1. Introduction

1.1 Transport Impact Assessment Layout

KCTT have been requested to provide a Transport Impact Assessment for the proposed development of Lot 6 (No 210) Hammond Road in Success. This Transport Impact Assessment has been completed in accordance with the guidelines as shown in the WAPC Transport Impact Assessment Guidelines – Part 4 (Developments).

The purpose of this document is to provide commentary and analysis on the parking requirements and potential traffic and transport impact that the proposed development of this site may have on the surrounding road and transportation networks.

The following is the scope of work in this report: -

Phase 1 – Transport Impact Assessment

- Collate all available traffic volumes from the City of Cockburn and Main Roads WA within 400 metres of the subject site.
- Download all available public transportation information, bicycle routes and pedestrian pathways within a 400 metre radius of the subject site.
- Undertake a site visit and review any existing sight distance / road geometry issues which should be considered in the reporting.
- Collate all crash data for roadways and intersections within a 400 metre radius of the subject site.
- Collate the road hierarchy information, roadway and carriageway widths for all roads directly fronting the subject site.
- Estimate the subject sites' trip generation on the basis of the proposed land-use quantities and areas.
- Confirm parking requirements.
- Compare the "before development" and "post development" scenarios, and therefore determine the impact of the development on the surrounding road network.
- Complete the transport impact assessment checklist for developments.
- We will provide colour graphics showing the following details overlaid on aerial imagery: -
    - Traffic Flow Diagram – up to 400m radius (preferred option only)
    - Existing and future Daily Traffic Flows (combined diagram)
    - AM / PM peak hour Traffic Flows (combined diagram)
    - Vehicle Turning Templates Diagram (preferred option only)

Phase 2 – Geometry Assessments

- Show design options for the intersections and cul-de-sac using vehicle turning circle templates for a standard 8.8 metre long service vehicle.

As part of this assessment, we will also provide general commentary on whether any infrastructure is likely to need to be relocated as part of this project.

This Transport Impact Assessment is presented in the following sequence: -

- Section 1 – Introduction

This section provides a brief description on the role of this report in the Development Application process, the general layout of the report and a list of the guideline and reference documents used in its composition.

- Section 2 – Transport Impact Assessment

This section provides research and analysis of the key items required for submission of a Transport Impact Assessment for Developments in accordance with the Transport Assessment Guidelines nominated above. In this section, KCTT have examined the following subject areas: -

- Section 2.1 – Outline of the Development Proposal

This section provides a brief description of the proposed land uses, as will be submitted to the City of Cockburn for this Development Application.

- Section 2.2 – Vehicle Access and Parking

This section provides a detailed description of the parking requirements using the local authority planning scheme provisions and providing a detailed assessment of whether reciprocity of parking requirements are appropriate in this proposal.

- Section 2.3 – Provision for Delivery and Service Vehicles

This section provides a detailed assessment of the requirements for delivery and service vehicles, both within the subject site and at intersections with the surrounding road networks.

- Section 2.4 – Hours of Operation

This section will describe the general operating times for the proposed land usage as proposed under this Development Application. This information will assist in determining the likely timing of the AM and PM peaks, and therefore the peak impact on the existing and surrounding transportation network. The peak vehicle generation is the key for determining intersection capacities within a road network.

- Section 2.5 – Daily Vehicular Volumes and Vehicular Types

This section will provide details on traffic generation rates used to determine daily traffic generation from the proposed development. It will also discuss the estimated peak hour traffic as well as the expected predominant type of vehicle which will be accessing the proposed development.

- Section 2.6 – Management of Traffic Generated by the Subject Site

This section summarises the expected traffic generated by the land uses as proposed in the Development Application for the subject site and provides an assessment of the cumulative impact of the existing traffic volumes and the proposed traffic volumes as generated by the development.

- Section 2.7 – Public Transport Access

This section provides a summary of the existing public transportation services available within an 800 metre radius of the subject site and whether any improvements to the network should be considered.

- Section 2.8 – Pedestrian and Cyclist Access

This section provides a summary of the existing pedestrian and cyclist infrastructure available within an 800 metre radius of the subject sites boundaries and whether any improvements to the networks should be considered.

- Section 3 – Transport Impact Assessment Checklist

This section provides a concise, tabulated Executive Summary of the detailed information presented in Section 2 of this report. The intention of this checklist is to document the findings of this report, and / or any of the likely transportation / safety issues which should be considered as part of the Development Application submission. This checklist has been developed in accordance with the requirements of the Transport Assessment Guidelines for Developments.

1.2 Notes Pertaining To This Report

This report has been provided as one of the inputs into the overall Development Application submission to the City of Cockburn for the nominated landholding of Lot 6 (No 210) Hammond Road, Success on behalf of the proponent.

1.3 Available Information and Technical Literature

This section provides a brief description of the inputs used in the compilation of this report: -

- WAPC Transport Impact Assessment Guidelines – Volume 4 Developments
- WAPC Transport Impact Assessment Guidelines – Volume 5 (referenced for PM peak hour and traffic splits)
- NSW RTA Guide to Traffic Generating Developments Version 2.2 October 2002 (referenced to determine trip generation / attraction rates for various land uses)
- Guide to Traffic Management – Part 3: Traffic Studies and Analysis, Austroads, 2008
- Guide to Traffic Management – Part 11: Parking, Austroads, 2008
- Guide to Traffic Management – Part 12: Traffic Impacts of Developments, Austroads, 2008
- City of Cockburn Town Planning Scheme No 3.

2. Transport Impact Assessment

2.1 Outline of the Development Proposal

This Development Application considers the proposed development of Lot 6 (No 210) Hammond Road in Success (under the jurisdiction of the City of Cockburn).

The proposed development is a residential land use comprising of: -

Table 1 - Proposed Land Uses within the Development

Lot No	Land Use	No of Units
Stage 1 (Lot 2)	Residential	16 units (75m^2); 5 units (80m^2); 2 units (85m^2);1 unit (100m^2)
Stage 2 (Lot 1)	Residential	28 units (75m^2); 2 units (80m^2)
Total		**54**

The development is to be situated on a 2.0209ha site. Plans for the proposed development have been provided in Appendix 1 of this report.

2.2 Vehicular Access and Parking

2.2.1 Vehicular Access

The subject site fronts and has vehicular access to Hammond Road via the proposed road along the southern boundary. Hammond Road is classified as a Significant Urban Local Road / Distributor B by Main Roads WA. In the vicinity of the subject site, Hammond Road is a two-way two-lane undivided road with a speed limit of 70kph (1.6m wide sealed shoulder on both sides of the road reservation, 3.5m wide lanes). Bus service (Route No 533) operates along this street in the vicinity of the subject site. Pedestrian paths are provided on the eastern side of the road reservation. Immediately to the south of the subject site is a reduction in speed zone to 40kph for the Jandakot Primary School.

In the vicinity of the subject site, Hird Road is a two-way two-lane undivided road with a sign-posted speed limit of 50kph. There is no bus service running along this street. Pedestrian paths are provided on the northern side of the road reservation.

The table below shows the most recent available traffic data for the surrounding network. The following information has been obtained from Main Roads WA and the City of Cockburn.

Table 2 - Traffic Volumes for Roads Adjacent to the Subject Site

Road Name	Functional Classification / Road Hierarchy	Location of Traffic Count	Vehicles Per Day (VPD)	Vehicles per Peak Hour (VPH)	Heavy Vehicle %	Year	Legal Speed Limit
Hammond Road	Significant Urban Local Road / Distributor B	South of Beeliar Drive	8,039	AM 0745 - 825 PM 1500 - 852	4.4	July 2013	60kph
Hammond Road	Significant Urban Local Road / Distributor B	North of Branch Circus	8,428	n.a.	n.a.	August 2013	70 kph
Hammond Road	Significant Urban Local Road /	206 metres north of	5,550	AM – 532 PM – 585	n.a.	June 2011	60 kph

	Distributor B	Bartram Road					
Hird Road	Significant Urban Local Road / Local Distributor	90 metres east of Hammond Road	1,389	AM – 176 PM – 193	n.a.	May 2006	50kph
Baningan Avenue	Significant Urban Local Road / Local Distributor	80 metres north of Hird Road	2,107	AM – 302 PM – 276	n.a.	May 2006	50kph
Carmel Way	Urban Local Road / Access Road	70 metres west of Baningan Avenue	706	AM – 152 PM – 107	n.a.	Mar 2004	50kph
Alabaster Drive	Significant Urban Local Road / Local Distributor	50 metres west of Jubilee Avenue	2,797	AM – 317 PM – 291	n.a.	Sep 2002	50kph
Steiner Avenue	Urban Local Road / Access Road	180 metres west of Wentworth Parade	1,932	AM – 204 PM – 188	n.a.	Apr 2011	50kph
Bartram Road	Urban Local Road / Access Road	515 metres east of Hammond Road	1,161	AM – 88 PM - 123	n.a.	Jun 2011	60kph

Formal peak hour data has been recorded and shown in Table 2 for a location on Hammond Road in the vicinity of the intersection with Beeliar Drive. An analysis of the available data within 900 metres of the proposed residential development suggests the following peak periods: -

- Hammond Road (South of Beeliar Drive):
  - AM peak occurs in the period between 06:45 and 07:45. Traffic volumes in the AM peak are approximately 10.26% of total daily volumes;
  - PM peak occurs in the period between 14:00 and 15:00. Traffic volumes in the PM peak are approximately 10.6% of total daily volumes.

2.2.2 Crash Data

The following table shows the crash data from the Main Roads WA database for crashes and incidents for roads adjacent to the subject site between the 1st January 2009 and 31st December 2013.

Table 3 - Crash Data

Road Name	Road Hierarchy	Functional Classification	Speed Limit	Crash Statistics
Hammond Road & Aphelia Brace	Significant Urban Local Road / Urban Local Road	Distributor B / Access Road	70kph / 50kph	Total of 3 incidents: • 2 PDO Major • 1 PDO Minor MR Type: • 1 Involving Animal • 2 Other / Unknown
Hammond Road & Bartram Road	Significant Urban Local Road / Significant Urban Local Road	Distributor B / Local Distributor	70kph / 60kph	Total of 4 incidents: • 4 PDO Major MR Type: • 4 Other / Unknown
Hird Road &	Significant Urban	Local Distributor /	50kph /	Total of 3 incidents:

Baningan Avenue & Marraboor Place	Local Road / Significant Urban Local Road / Urban Local Road	Local Distributor / Access Road	50kph / 50kph	• 1 Hospital • 2 PDO Major MR Type: • 3 Other / Unknown
Hammond Road (1.61 to 3.19)	Significant Urban Local Road	Distributor B	70 kph	Total of 5 incidents: • 1 Hospital • 2 PDO Major • 2 PDO Minor MR Type: • 1 Involving Overtaking • 1 Entering / Leaving Driveway • 3 Other / Unknown
Baningan Avenue (0.00 to 0.68)	Significant Urban Local Road	Local Distributor	50kph	Total of 3 incidents: • 1 Medical • 1 PDO Major • 1 PDO Minor MR Type: • 2 Involving Parking • 1 Other / Unknown

2.2.3 Vehicle Parking Requirements

KCTT have undertaken an analysis based on the minimum requirements for parking in accordance with the City of Cockburn Town Planning Scheme No 3 (Table 2 - Residential Use Classes - Vehicle Parking).

The City of Cockburn Town Planning Scheme No 3 stipulates that parking provisions for residential developments should be made in accordance with the Residential Design Codes of Western Australia.

Clause 7.3.3 On-site Parking Provision (section A3.1) of the Residential Design Codes provides guidance on the minimum requirements for parking provisions for developments of multiple dwellings with a coding of R30 or higher. When dwellings are not within the following distances: 800m of a train station on a high frequency rail route, measured in a straight line from the pedestrian entry to the train station platform to any part of a lot; or 250m of a high frequency bus route, measured in a straight line from along any part of the route to any part of a lot, the following parking requirements should be considered applicable:-

- Parking for residents (dwelling area <75m^2) - 1 parking space per dwelling,
- Parking for residents (dwelling area 75m^2 < GFA < 110m^2) - 1.25 parking spaces per dwelling,
- Parking for visitors - 0.25 parking spaces per dwelling.

The table below shows the minimum car parking requirements for the proposed development which have been calculated in accordance with Residential Design Codes.

Table 4 - Minimum Car Parking Requirements (R Codes requirement)

Criteria / Units	Requirement	Yield	Total
STAGE 1 (Lot 2)			
Residential Land Use - Resident's Parking			
Residential Units with 75m^2 < GFA < 100m^2	1.25 parking bays per dwelling	24	30
Residential Land Use - Visitor's Parking			
Residential Units	0.25 parking bays per dwelling	24	6
Total - STAGE 1 (Lot 2)			**36**
STAGE 2 (Lot 1)			
Residential Land Use - Resident's Parking			
Residential Units with 75m^2 < GFA < 110m^2	1.25 parking bay dwelling	30	38
Residential Land Use - Visitor's Parking			
Residential Units	0.25 parking bays per dwelling	30	8
Total - STAGE 2 (Lot 1)			**46**
Total - The proposed development			**82**

With reference to the Residential Design Codes, the proposed development will require a total of 36 parking spaces when Stage 1 (Lot 2) of the proposed development is completed and a total of 82 parking spaces when Stage 2 (Lot 1) is completed.

The preliminary plans for the development show a total of 73 car parking bays provided after Stage 2 is finished, however space for an additional 9 bays is available on Lot 1, therefore the subject site is deemed to have sufficient car parking.

2.2.4 Bicycle Parking

Bicycle parking provisions for residential developments should be made in accordance with the Residential Design Codes of Western Australia. However, the City of Cockburn Town Planning Scheme No 3 stipulates that bicycle parking provisions for grouped and multiple dwellings should be made in accordance with different ratios as shown in the following table.

The following table provides a preliminary calculation for the bicycle parking for the proposed development on the basis of the development yields.

Table 5 - Bicycle Parking Requirements (City of Cockburn Town Planning Scheme No 3 Requirements)

Land Use	Yield	Employee / Resident Parking Spaces	No of Parking Spaces
STAGE 1 (Lot 2)			
Residential Component - Resident's Parking			
Residential Unit	24	1 parking bay per 4 dwellings	6
Residential Component - Visitor's Parking			
Residential Unit	24	1 parking bay per 16 dwellings	2
Total - STAGE 1 (Lot 2)			**8**
STAGE 2 (Lot 1)			
Residential Component - Resident's Parking			
Residential Unit	30	1 parking bay per 4 dwellings	8
Residential Component - Visitor's Parking			
Residential Unit	30	1 parking bay per 16 dwellings	2
Total - STAGE 2 (Lot 1)			**10**

Total - The Proposed Development	**18**

A total of 18 bicycle parking spaces is therefore considered appropriate if the City of Cockburn standards are utilised on this site after the completion of Stage 2.

2.2.5 ACROD Parking

According to the Building Code of Australia the proposed development can be classified as Class 2. Given that there are no accessible units planned there is no specific requirement for provision of ACROD bays within the development.

2.3 Provision for Delivery and Service Vehicles

Delivery and service vehicles would approach the site via Hammond Road and the proposed Road 1, approximately 80 metres south of the intersection of Hird Road.

The minimum parking requirements for provision of delivery and service vehicles according to the NSW RTA Guide to Traffic Generating Developments are as follows: -

- Residential flat buildings (50% of spaces adequate for trucks):
  - < 200 flats or home units - 1 space per 50 flats or home units, plus
  - 1 space per 1,000m^2 of public area set aside for bar, tavern, lounge and restaurant.

Therefore we believe that a total of 1 service vehicle parking space would be sufficient to cater for the requirements of this development.

The waste bins (recycling and standard bins) will be placed in a designated area as shown in Appendix 1 (Development Concept).

2.4 Hours of Operation

This category is not applicable for the residential development. The peak trip generations from a residential development are likely to be between 07:30 - 08:30 for the morning and between 16:00 - 17:00 for the evening peak.

The analysis of traffic volumes data obtained from the MRWA on the 3rd July 2013 for Hammond Road close to the intersection with Beeliar Drive shows that the morning peak is in the period between 06:45 and 07:45 and in the afternoon peak period in the period between 14:00 and 15:00.

The expected peak operating times for the proposed development will not coincide with peak times for traffic on Hammond Road.

2.5 Daily Vehicular Volumes and Vehicular Types

The WAPC Transport Assessment Guidelines for Developments offers the following AM / PM peak vehicle trip generation rates for the proposed land uses in this development: -

- Residential - 0.8 vehicle trips per dwelling for the AM and PM peak hours. A 25% IN / 75% OUT split has been adopted for the AM peak and a 67% IN / 33% OUT split for the PM peak hour.

Given that WAPC Transport Assessment Guidelines does not offer daily vehicle trip generation rates for the land uses proposed within the development. The NSW RTA Guide to Traffic Generating Developments suggests developments of this type in Sydney tend to generate between 4 and 5 vehicular trips per dwelling. In Perth, the Department of Planning and Infrastructure conducted a series of studies in the late 1990's / early 2000's which showed that higher density dwellings tended to average closer to 5.5 vehicle movements per day. For the purposes of this report we will use 5.5 VPD for each proposed unit.

Table 6 - Trip Generation

Land Use Type	WAPC Transport Assessment Guidelines for Developments / NSW RTA Guide To Traffic Generating Developments Requirement	Yield	Daily Traffic Generation	PM Peak Hour Traffic Generation
Residential Units - Stage 1 (Lot 2)	5.5 vehicle trips per unit (Peak 0.8 vehicle trips per unit)	24	132 VPD	20 VPH
Residential Units - Stage 2 (Lot 1)	5.5 vehicle trips per unit (Peak 0.8 vehicle trips per unit)	30	165 VPD	24 VPH
Total - The Proposed Development			**297 VPD**	**44 VPH**

In discussions with the proponent, the following development timeline is expected: -

- Stage 1 (Lot 2) – development completion in 2015
- Stage 2 (Lot 1) – development completion in 2016.

The subject site will therefore have a staggered impact on the existing road network, and in particular on Hammond Road. This will be discussed in further detail below in Section 2.6.

2.6 Management of Traffic Generated by the Subject Site

The development of the site is to be staged as shown above in Section 2.5, with the following impacts on the adjoining road network: -

- 2015 – an additional 132 VPD with 20 VPH in the AM and PM peaks;
- 2016 – an additional 165 VPD with 24 VPH in the AM and PM peaks.

After discussions with the City of Cockburn, we understand that Hammond Road will be converted to a dual carriageway road with a median south of Hird Road in 2017 / 2018. Given there is limited opportunity to design for right turn access into the property due to the proximity of the intersection of Hird Road, it is our belief that access to this road will be closed for right turning vehicles in the future. Given short-term safety concerns with the high volume of traffic on Hammond Road and the 70kph signposted speed environment we believe the most appropriate design at this proposed intersection is a LILO or Left In Left Out configuration only. Section 2.6.2 Road Safety highlights this issue, as the location of the intersection cannot comply with the SISD requirements for right turn movements which are critical for right turning vehicles.

2.6.1 Traffic Flow

Based on the analysis of employment opportunities, location of schools, shopping centres and preferred locations for social and recreational activities and the proposed designated access/egress points to the site, we believe the generated traffic from the development would be distributed onto the adjacent road network as follows:

- 66% of all trips from the proposed development are expected to be to the north (via Hammond Road);
    - 26% to the north via Hammond Road / Beeliar Drive / Kwinana Freeway
    - 8% to the north via Hammond Road / North Lake Road
    - 14% to the east via Hammond Road / Beeliar Drive (Cockburn Central)
    - 6% to the east via Hammond Road / Beeliar Drive / Armadale Road
    - 12% to the west via Hammond Road / Beeliar Drive
- 16% to the east via Hird Road (Cockburn Central)
- 18% of all trips from the proposed development are expected to be to the south (via Hammond Road);
    - 8% to the south via Hammond Road (Success)
    - 6% to the west via Hammond Road / Russell Road
    - 4% to the south via Hammond Road / Russell Road / Kwinana Freeway.

The estimated traffic flow is expected to be equal for in and out direction on the access/egress points. Approximately 99% of all vehicles would be light vehicles.

The PM Peak traffic is expected to be between 16:00 - 17:00, with an in-bound to out-bound flow ratio of 67% to 33% for the residential land use, in accordance with statistics quoted in the Western Australian Planning Commission's Transport Assessment Guidelines for Developments – Volume 5 (Technical Appendix).

Given our proposal that the new intersection is a LILO restriction, vehicles needing to head south from the subject site would be required to use Hammond Road, Hird Road and Baningan Avenue to the south.

2.6.2 Road Safety

We have reviewed the intersection location in accordance with two of the criteria outlined below:

- Approach Sight Distance (ASD)
- Safe Intersection Sight Distance (SISD)

The following table provides volumes for ASD and SISD in accordance with AustRoads Part 4A Table 3.1 Approach Site Distance (ASD) and corresponding minimum crest vertical curve size for sealed roads (S<L) (page 18)) and with AustRoads Part 4A Table 3.2 Safe Intersection Sight Distance (SISD) and corresponding minimum crest vertical curve size for sealed roads (S<L) (page 21)).

Table 7 - Required Approach Site Distance and Safe Intersection Sight Distance Volumes

	Speed Limit (kph)	Design speed (kph)	Reaction Time (s)	Approach Site Distance (m)	Safe Intersection Sight Distance (m)
Hammond Road / Proposed Road Intersection	70	80	2.0	**114.0**	**181.0**

We believe the propose intersection location adheres to the requirements for ASD meaning left turn movements into and out of this road are in accordance with the design requirements.

We do not believe the intersection warrants left turn deceleration lanes as the vehicle volumes in the peak are not high enough to warrant deceleration lanes.

2.7 Public Transport Access

Bus stops for Routes No 533 and 525 are within 400 metres (5 minute walking distance) from the proposed development. These bus routes provide connectivity to Cockburn Central Train Station.

- Bus Route No 525 - Cockburn Central Station - Hammond Park via Baningan Avenue
- Bus Route No 533 - Cockburn Central Station - Fremantle Station via Yangebup Road & Marvell Avenue

Cockburn Central Train Station is in 15 - 20min walking distance from the subject area. Cockburn Central Station belongs to the Mandurah Line (Zone 3) connecting the area with the Perth CBD (Perth Underground Station) - Stop No 99662.

2.8 Pedestrian and Cyclist Access

The following is a list of the major cyclist infrastructure (Perth Bicycle Network) within an 800 metre radius of the subject site:

- Hammond Road (south of Hird Road), Hird Road and Baningan Avenue (north of Hird Road) are part of the SE41 Continuous Signed Route;
- Hammond Road (between Beeliar Drive and Hird Road) and Baningan Avenue (south of Hird Road) are classified as PBN "Good Road Riding Environment" route;
- Shared Path (Shared by Pedestrian & Cyclists) along Baningan Avenue, Alabaster Drive and Carmel Way;
- Hammond Road (south of Hird Road) is classified as PBN "Bicycle Lanes or Sealed Shoulder Either Side" route.

The bus stops in Hammond Road and Baningan Avenue (Baningan Avenue before Cherniss Ct and Baningan Avenue before Carmel Way) are within walking distance (5 minutes) from the proposed development.

3. Transport Impact Assessment Checklist for a Development Site

The following is the summary / checklist for a Transport Impact Assessment as shown in the Department for Planning and Infrastructure's Transport Assessment Guidelines – Part 4.

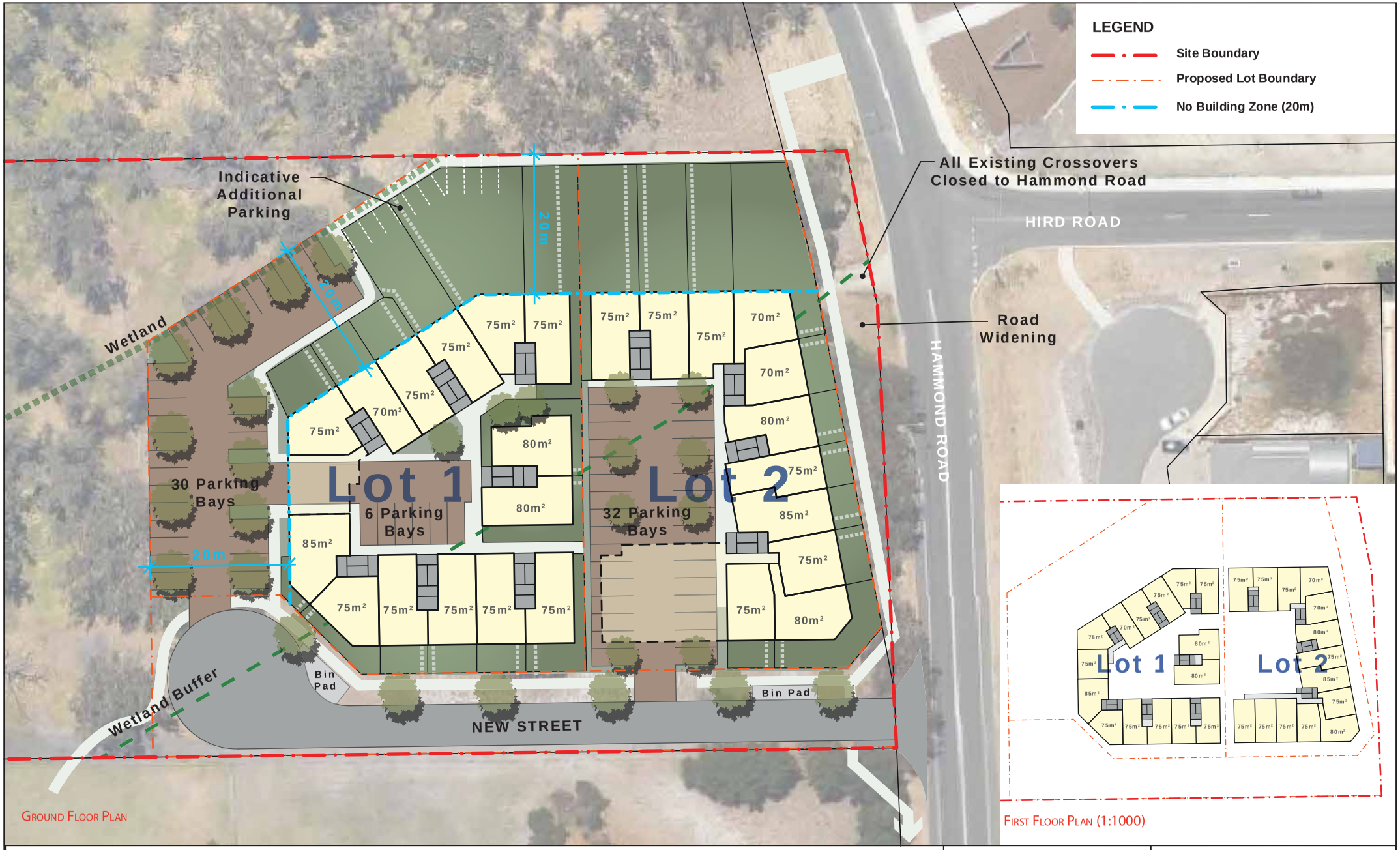
<table>
<tr><th>Item</th><th>Status</th><th>Comments/Proposals</th></tr>
<tr><td colspan="3">Proposed development</td></tr>
<tr><td>Proposed land uses</td><td>Y</td><td>Proposed Residential Land Use</td></tr>
<tr><td>Existing land uses</td><td>Y</td><td>There is an existing residential dwelling on Lot 6 (No 210) Hammond Road, Success.</td></tr>
<tr><td>Context with surrounds</td><td>Y</td><td>Complementary</td></tr>
<tr><td colspan="3">Vehicular access and parking</td></tr>
<tr><td>Access arrangements</td><td>Y</td><td>Vehicular access to Hammond Road via the proposed road along the southern boundary of the development. Refer Section 2.2 and Appendix 1.</td></tr>
<tr><td>Public, private, disabled parking set down / pick up</td><td>Y</td><td>The development application offers 62 parking bays to be provided on-site (after the Stage 2 is completed) which meets the parking requirements for the proposed development and complies with the City of Cockburn Town Planning Scheme No 3 and the Residential Design Codes.</td></tr>
<tr><td colspan="3">Service vehicles (non-residential)</td></tr>
<tr><td>Access arrangements</td><td>Y</td><td>Via the proposed road along the southern boundary of the development i.e. via Hammond Road</td></tr>
<tr><td>On / off-site loading facilities</td><td>Y</td><td>Via the proposed road along the southern boundary of the development i.e. via Hammond Road</td></tr>
<tr><td colspan="3">Service vehicles (residential) – N/A</td></tr>
<tr><td>Rubbish collection and emergency vehicle access</td><td>Y</td><td>Via the proposed road along the southern boundary of the development i.e. via Hammond Road</td></tr>
<tr><td>Hours of operation (non-residential only)</td><td>N</td><td>For residential land use, the hours of operation are not applicable.</td></tr>
<tr><td colspan="3">Traffic volumes</td></tr>
<tr><td>Daily or peak traffic volumes</td><td>Y</td><td>
<table>
<tr><th>Land Use Type</th><th>Daily Traffic Generation</th><th>PM Peak Hour Traffic Generation</th></tr>
<tr><td>Residential Units - Stage 1 (Lot 2)</td><td>132 VPD</td><td>20 VPH</td></tr>
<tr><td>Residential Units - Stage 2 (Lot 1)</td><td>165 VPD</td><td>24 VPH</td></tr>
<tr><td>Total - The Proposed Development</td><td>297 VPD</td><td>44 VPH</td></tr>
</table>
</td></tr>
<tr><td>Type of vehicles (eg cars, trucks)</td><td>Y</td><td>Light vehicles - predominantly passenger vehicles.
Access reviewed for 8.8m service vehicle for loading purposes.</td></tr>
<tr><td colspan="3">Traffic management on frontage streets</td></tr>
</table>

Public transport access	Y	Public transport access enabled in Hammond Road and Baningan Avenue
Nearest bus/train routes	Y	Bus Routes: • 525 - Cockburn Central Station - Hammond Park via Baningan Avenue • 533 - Cockburn Central Station - Fremantle Station via Yangebup Road & Marvell Avenue Refer Section 2.7.
Nearest bus stops/train stations	Y	In Hammond Road, 200m north and 300 south of the subject area (for bus route No 533) and in Baningan Avenue, 300m east of the subject area (for route No 525).
Pedestrian / cycle links to bus stops/train station	Y	Pedestrian paths on Hammond Road and Hird Road provide connectivity to above mentioned bus stops.
Pedestrian access/facilities		
Existing pedestrian facilities within the development (if any)	N / A	N / A
Proposed pedestrian facilities within development	Y	The development proposes pedestrian site linkages, as shown in Appendix 1. The goal of this development is to provide good quality pedestrian access from, to and within the subject area. A pedestrian path connection is proposed to the east and south of the subject site.
Existing pedestrian facilities on surrounding roads	Y	There are pedestrian facilities on the eastern side of Hammond Road and the southern side of Hird Road. These are interlinked with pedestrian paths on surrounding / connecting streets.
Proposals to improve pedestrian access	N	The development does not propose any further modifications to the existing pedestrian network.
Cycle access/facilities		
Existing cycle facilities within the development (if any)	N / A	N / A
Proposed cycle facilities within development	Y	The units on this site will offer bicycle parking opportunities. This is to be agreed with the City of Cockburn.
Existing cycle facilities on surrounding roads	Y	• Hammond Road (south of Hird Road), Hird Road and Baningan Avenue (north of Hird Road) are part of the SE41 Continuous Signed Route; • Hammond Road (between Beeliar Drive and Hird Road) and Baningan Avenue (south of Hird Road) are classified as PBN "Good Road Riding Environment" route; • Shared Path (Shared by Pedestrian & Cyclists) along Baningan Avenue, Alabaster Drive and Carmel Way; • Hammond Road (south of Hird Road) is classified as PBN "Bicycle Lanes or Sealed Shoulder Either Side" route.
Proposals to improve cycle access	N	The development does not propose any further modifications to the existing cycling network.
Site specific issues		

Identify issues	Y	1. Hammond Road has a significant volume of vehicles on a daily basis. Right turn traffic from the proposed gazetted road on the southern boundary may not meet all Austroads Design Standards. 2. Hammond Road is proposed to have a dual carriageway and median, potentially by 2017 / 2018, thereby excluding right turn movements from the subject site within 3 years of completion of Stage 1. 3. The existing driveway for Lot 1 is located in close proximity of the intersection of Hird Road and Hammond Road. This driveway crossover does not meet current standards.
Remedial measures	Y	1. We propose that the intersection of the new subdivision road and Hammond Road is limited to Left In / Left Out only (LILO). There is adequate opportunity for southbound traffic to exit the site northbound on Hammond Road and to turn right into Hird Road. In addition, we do not believe the dominant movement from this site will be to the south. Our traffic model suggests less than 20% of vehicle trips will be generated toward the south from this site. 2. Given the high vehicle volumes on Hammond Road and the 80kph design speed (signposted at 70kph) the City of Cockburn plans to extend the dual carriageway construction through this section of Hammond Road. Current plans suggest this work may take place in 2017 / 2018. Given the proposed development is likely to be staged over 2 years, the full traffic generation from this site is not likely to occur until around the same time as construction commences on the widening of Hammond Road. Therefore we believe it is pertinent to limit access / egress at this location to LILO from Stage 1, as in the future the opportunity to turn right will be removed. There is insufficient distance between the intersection of the proposed new road and the intersection of Hird Road to generate two right turn deceleration lanes. 3. This proposal shows the removal of the crossover to the existing house for Lot 1 and proposes the crossover is shifted to the cul-de-sac end of the proposed new road. Therefore the hazard is eliminated from this section of Hammond Road.

Appendix 1

The layout of the proposed development



Development Concept

210 Hammond Road, Success

Project Manager: DR Date: 22 April 2015
Drawn: OP Scale: 1:500 @ A3
Checked: DR Drawing No. 714-320 CP-01A

tpg TOWN PLANNING URBAN DESIGN AND HERITAGE
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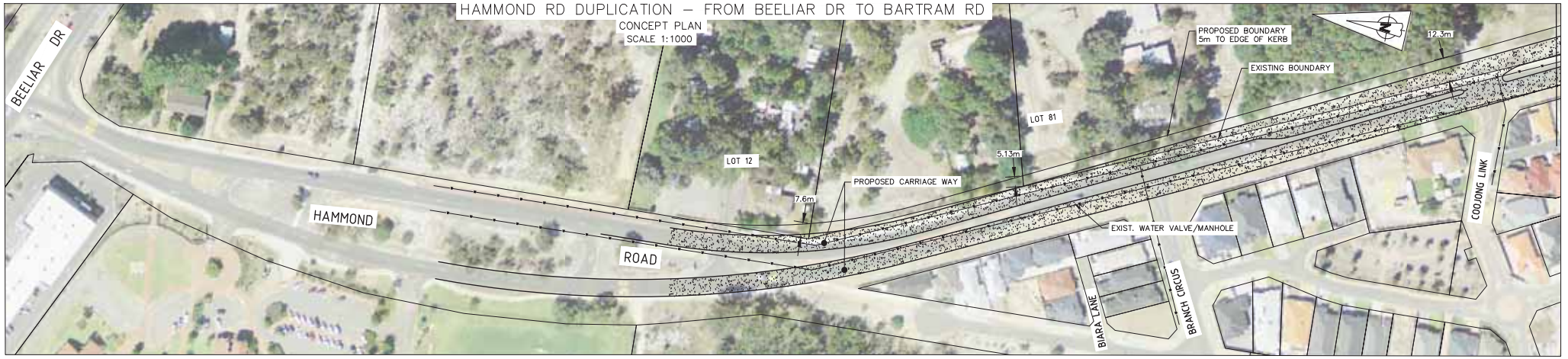
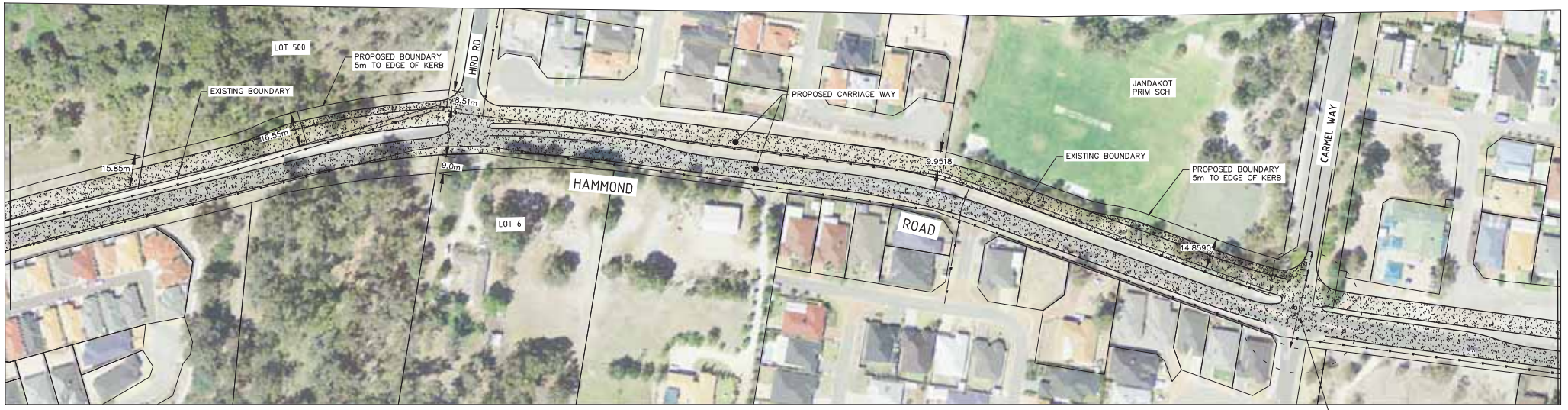
Appendix 2

Hammond Road Duplication - from Beeliar Drive to Bertram Road (Concept Plan)

HAMMOND RD DUPLICATION – FROM BEELIAR DR TO BARTRAM RD

CONCEPT PLAN
SCALE 1:1000



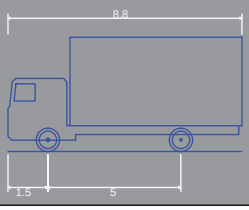


MIN CENTRAL ISLAND RADIUS OF A TWO–LANE ROUNDABOUT IS 18m IN 70km/h SPEED. (FROM AUSTROADS PART 4B: ROUNDABOUT PAGE 20.)

I:\Design & Traffic Service\2011-12\Budget Submissions\Hammond Rd-Beeliar to Bartram\Concept.dwg

Appendix 3

Vehicle Turning Circle Plan



Service Vehicle (8.8 m)	
Overall Length	8.800m
Overall Width	2.500m
Overall Body Height	4.300m
Min Body Ground Clearance	0.427m
Track Width	2.500m
Lock to Lock Time	4.00s
Kerb to Kerb Turning Radius	12.500m

Subject Site Boundary
Wheel Path
Body Path
Reverse Path

LEGEND

NO	DATE	AMENDMENT
E	15-09-2014	PROPOSED LAYOUT AMENDED
D	06-08-2014	PROPOSED LAYOUT AMENDED
C	14-07-2014	REVISED IN ACCORDANCE WITH THE COMMENTS RECEIVED FROM THE CLIENT ON 14.07.2014.
B	11-07-2014	PROPOSED LAYOUT AMENDED

PROJECT:
No 210 Hammond Road Success TIA

TITLE:
Vehicle Turning Circle Plan 01 - Service Vehicle 8.8m

DRAWING NUMBER:
KC00243.000_S20

DRAWN BY:
K.P. / DJ.M.

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Appendix 4

Engineering Servicing Report

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DEVELOPMENT
ENGINEERING
CONSULTANTS

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Suite 3, 123A Colin Street
West Perth W.A. 6005

Our Ref: PRO963
Lot 210 Hammond Rd Servicing report
25 September 2014

LOT 210 HAMMOND ROAD DEVELOPMENT, SUCCESS ENGINEERING SERVICING REPORT

It is proposed to develop lot 210 into two green title R60 group housing sites along the Hammond Rd frontage, with the balance of the land on the western area of the site being designated as Open Space. The existing residence on Lot 1 is to be retained in the short term. A new cul de sac road off Hammond Rd will be constructed to service the development.

This report sets out the existing and proposed servicing facilities for Roads, Power Supply, Water Supply, Sewerage, Site Drainage and Telecommunications as required for current urban development standards, as shown on the development plan.

The Department of Water (DoW) has advised that a formal LWMS is not required for this development, but that water management issues should be addressed in this report.

Site

The site is located on the west side of Hammond Rd, immediately opposite and south of Hird Rd in the City of Cockburn suburb of Success. The site contains a residence and associated sheds, and the eastern portion is half cleared where the buildings are. The residence is accessed by a driveway off Hammond Rd opposite Hird Rd. Hammond Rd along the frontage of the site is a single carriageway sealed road.

The site covers some two hectares, of which 6,519m^2 is to be subdivided into two multiple dwelling sites, 413m^2 is to be a widening of Hammond Rd, and the residual land to the west is to be left as a balance lot. The balance title abuts a conservation area, and apart from a thirty metre wide cleared area adjacent to the proposed group sites, is bush.

The elevation of the land varies from RL 24m AHD at the south east corner, to RL 21m AHD at the western boundary of the proposed group site, to RL 19m AHD at the western boundary of the site.

According to the DoW's 1997 Perth Groundwater Atlas, the land has a high water table at approximately RL 21m AHD in the area adjacent to Hammond Rd, falling to RL 20m AHD at the western boundary of the proposed group site. Recent work (UWMP) opposite this site on Hird Rd indicates that these levels are correct, as the levels have been correlated with DoW bore JM24. These groundwater contours are therefore designated the AAMGL for the site.

Geology

The Geological Survey plan shows that the development area is generally "S8" deep Bassendean Sand, suitable for urbanisation and well drained.

Site Levels and Fill

A detailed geotechnical site investigation will be carried out prior to any site works to ascertain fill levels for site drainage and house foundations. Fill will be required on the western half of the development area to allow connection to the Water Corporation sewer, at a minimum filled level of RL 21.7m AHD. The site will therefore have the required 1.2m clearance to the AAMGL.

Roads & Traffic

The land is currently accessed from Hammond Rd via the existing driveway opposite Hird Rd.

Hammond Rd is a local distributor road, and is constructed as a single carriageway along the site frontage. It is proposed to be upgraded to a dual carriageway by the City of Cockburn when funds permit. A headworks levy is expected to be imposed on all developments along Hammond Rd to part fund the duplication.

The development will include a new dedicated cul de sac road on the southern boundary. This will be constructed to current WAPC and City of Cockburn standards.

In order for it to be constructed, the road will require a retaining wall of some 1.2m in height along the southern boundary as there is only a one metre clearance to the abutting boundary on the south side..

Power

The site will be supplied by the existing aerial pole line in the eastern verge of Hammond Rd adjacent to the development. It has low voltage and high voltage combined.

Power cables will be extended along the length of the new road.

Water Supply

The site is expected to be adequately supplied with reticulated water by extension off the existing 150mm water main located in the eastern verge of Hammond Rd. The water supply extension will be required to cross over an 800mm trunk water main located in the western verge of Hammond Rd.

A new water main to service the development will be constructed along the new cul de sac road from Hammond Rd.

Sewer

The site can be connected to existing Water Corporation sewers located along the southern boundary of the site within the adjacent property by way of an extension across the new road to the lots. A retaining wall is required along the western boundary of Lot 1 to accommodate fill levels above the sewer.

Drainage

A special Water Corporation Drainage Headworks is applied to the development area, which is designated "Thomsons Lake non-standard infrastructure contribution area".

The site groundwater levels are controlled by the Water Corporation's pumping system located in Lake Kogolup just north of the site; therefore the AAMGL is fixed as set out above.

The site is a minimum of 1 metre above this level, and after fill is placed for sewer purposes, it will be a minimum of 1.2 metres above the AAMGL. This will allow site drainage disposal by infiltration.

Generally each green title lot will contain its own stormwater in underground storage units for infiltration. Each housing unit will have roof stormwater connected to the site storage units.

The site will be drained using on site soak wells to contain storm events up to and including the 1 in 10 year ARI storm. Builders will be required to provide $1m^3$ of onsite storage per $40m^2$ of site area to achieve this.

In rainfall events exceeding the 1 in 10 year ARI storm, lot runoff will surcharge the onsite storage units and be conveyed to small swales located adjacent to the northern boundary of each lot.

An underground storage unit will be used to infiltrate road reserve runoff for storm events up to and including the 1 in 100 year event.

The site unit layout has been designed to allow an overland floodway for storms in excess of the 1 in 100 year event from the landscaped areas and road reserve to exit the development site into the Balance Lot.

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

It is expected that an Urban Water Management Plan will be undertaken as a condition of subdivision.

Drainage Calculations

A soakage rate of 0.016L/s was taken for the soil onsite. This is the same rate used in a previous calculation for nearby underground storage on the opposite side of Hammond Road.

Lots

Stormwater runoff from the two green title lots was calculated using runoff coefficients of 0.9 and 0.3 for paved and unpaved areas, respectively. The flow rate for each storm event, along with the storage volume required to accommodate the runoff, is shown in the following table:

Table 1 – Lot Runoff

Catchment	ARI	Q (L/s)	Storage Volume Required (Less Soakage) (m^3)
Lots 1 and 2	1	46.13	69.19
	5	77.24	138.75
	10	89.08	164.89
	100	150.98	311.63

The installation of $1m^3$ of storage per $40m^2$ of site area will provide a total of some $165m^3$ of onsite storage for lot runoff. As shown in the table above, this amount of storage is adequate for all storms up to and including the 10 year ARI event.

Swales on each lot will accommodate the excess lot runoff for storm events exceeding the 1 in 10 year ARI, and up to and including the 1 in 100 year ARI. Swale details are as follows:

Table 2 – Swale Details

Catchment	Volume Required to Contain 100 Year ARI Storm (m^3)	Swale Dimensions			
		Base Length (m)	*Base Width (m)*	*Depth Required to Contain 100 Year ARI Storm (m)*	*Minimum RL (mAHD)*
Lot 1	94	15	7	0.51	20.60
Lot 2	71	15	5	0.49	20.80

Road Reserve

Stormwater runoff from road reserve will be collected in one single and one double 1,050mm diameter side entry pit before being conveyed to the underground storage unit. Stormwater runoff from the road reserve was calculated using a runoff coefficient of 0.8.

The flow rate for each storm event, along with the storage volume required to accommodate the runoff, is shown in the following table:

Table 3 – Road Reserve Runoff

Catchment	ARI	Q (L/s)	Storage Volume Required (Less Soakage) (m^3)
Road Reserve (New Road)	1	11.20	36.00
	5	18.65	53.00
	10	21.47	59.00
	100	36.14	88.00

The storage volume required (less soakage) to accommodate the 1 in 100 year ARI storm is 88.00m^3. As some 6.35m^3 is provided by the side entry pits and their pipework, the underground storage unit must provide some 81.65m^3 of storage.

This translates to actual constructed dimensions of 7.05m wide × 1.20m high × 12.00m long (according to standard "StormTrap" module dimensions), and actual storage volume of some 90.65m^3. This underground storage unit will accommodate all storm events up to and including the 1 in 100 year ARI.

Telephone & NBN

Telstra services exist in the area, and will most likely to be able to be extended (without any significant upgrading) to adequately service this proposed development.

In line with current requirements for NBN, NBN Pipe & Pit installation is not required as the development has less than 100 lots.

Gas

ATCO Gas services are currently available in the area, and will most likely be able to be extended (without any significant upgrading) to adequately service this proposed development.

This report is dated the 25th September, 2014.

DEVELOPMENT ENGINEERING CONSULTANTS PTY LTD

REV	DATE	BY	DESCRIPTION
A	25/9/14	JEG	ISSUED FOR APPROVAL/TENDER

CLIENT: ILLUMINATE PROPERTY

DEVELOPMENT ENGINEERING CONSULTANTS
SUITE 3, 123A COLIN ST, WEST PERTH, 6005 WESTERN AUSTRALIA
Ph: (08) 9481 1900
Fax: (08) 9481 1700

PROJECT: LOT 210 HAMMOND ROAD SUCCESS

DRAWING: DRAINAGE LAYOUT PLAN

SCALE	DRAWN	DESIGN	REV No.
1:500	JEG	DNW	A
DATE: 25/9/14	CHECKED: JEG	APPROVED: SRA	

PROJECT NUMBER: PRO963 K01

1:500

Appendix 5

Bushfire Management Plan

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BUSHFIRE MANAGEMENT PLAN

LOT 6 (210) HAMMOND ROAD, SUCCESS

Project No: 14110
Report Date: September 2014
REVISED FINAL v3

Document Control Record

Site Details	Lot 6 (210) Hammond Road, Success
Prepared By	**Bushfire Prone Planning (BPP Pty Ltd)** ABN: 39 166 551 784 M: 0438 946 285/ 0459 558 986 Email: enquiries@bushfireprone.com.au
Prepared For	N. Jardim
Reference	14110
Document Status and Date	Revised Final. September 2014 Revised Final v3 May 2015

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 Bushfire Prone Planning 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 Bushfire Prone Planning has no control. Notwithstanding anything contained therein, Bushfire Prone Planning 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 provided by the consultants.

Contents

1 Introduction and Purpose

N. Jardim of Illuminate Property engaged Bushfire Prone Planning to develop a Fire Management Plan for a Structure Plan for Lot 6, number 210 Hammond Street, Success in the City of Cockburn. The Structure Plan is for the subdivision of existing Lot 6 into 3 Lots. This Bushfire Management Plan details the bushfire management requirements that may be implemented at the Development Application stage. The indicative Development Application details identified in figure 8 are subject to change. This Bushfire Management Plan is required to be amended or a separate Bushfire Management Plan is to be formally approved by the City of Cockburn at Development Application stage.

The purpose of this Plan is to provide guidance on how to plan for and manage the potential bushfire threat of the specified area. The Plan identifies the bushfire risk and addresses requirements of local government and the responsibilities for both the developers and property owners. This Bushfire Management Plan details the specific fire management requirements that will be implemented within the development and design.

The objectives of this Plan are to:

- Define areas where values are located
- Define and rank fire hazard areas
- Define management responsibilities
- Define fire management responsibilities
- Provide performance criteria and acceptable solutions (non-construction).

2 Site Details

The site is Lot 6 / 210 Hammond Road, Success located within the City of Cockburn (Figures 1 and 2) and is situated on the eastern side of Hammond Road sitting within a Structure Plan Area but as yet has not been classified with an R code. The Lot is 2.0209 ha in size with the proposed subdivision being Lot 1 – 3,791m², Lot 2 – 2,728m² and Balance Lot 3 – 11,790m² in size.

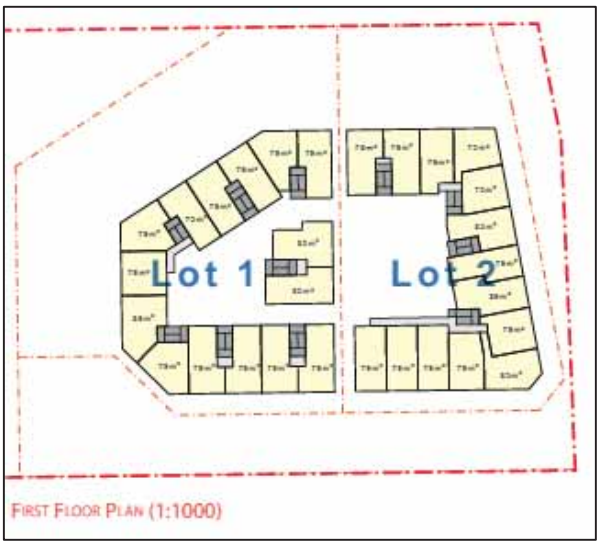

Figure 1: Lot 6 Hammond Road with Proposed Subdivision (Source: Town Planning Urban Design & Heritage).

Figure 2: Lot 6 Hammond Road with Proposed Subdivision structures (Source: Town Planning Urban Design & Heritage).

Figure 3

Proposed Subdivision

Lot 6 Hammond Rd,
Success

LEGEND

- Lot 6 Hammond Rd
- Proposed Subdivision
- Road Alignment
- Blocks

LOCALITY

0 10 20 30

Meters

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BUSHFIRE PRONE PLANNING

Date: 14/09/2014

2.1 Residential Development Proposal;

Lot 6 Hammond Road is proposed for subdivision into three lots being Lot 1, Lot 2 and Balance Lot (3) (Figures 1, 2 and 3).

2.2 Vegetation

The subject site is predominately cleared with wetland fuels to the north and west. The vegetation classification and type is Woodland. To the east and south is low threat vegetation consisting of Managed Gardens and introduced low flammability plants (Figure 4 & 5).

Figure 4: Remnant flooded gums with introduced Weed understorey

Figure 5: Cultivated Gardens

2.3 Climate and Topography

The topography of the subject site is level. The closest weather station to the locality of Success is located at Jandakot. Climate experienced in Jandakot is characteristic of the Mediterranean climate generally experienced in the south west of the State. The area experiences generally warm, dry summers and cool, wet winters with the majority of rain falling in late autumn through to early spring. This rainfall supports substantial vegetation growth, which dries off during the spring and summer period. The climatic data from the Jandakot station is summarized in Table 1.

Table 1. Summary of Average Climate Records from Jandakot, Western Australia
(Bureau of Meteorology 2014).

90% Percentile Maximum Temperature February	Mean Relative Humidity February 3pm	Maximum Mean Wind February 3pm
31.6°C	36 %	23.6 km/h

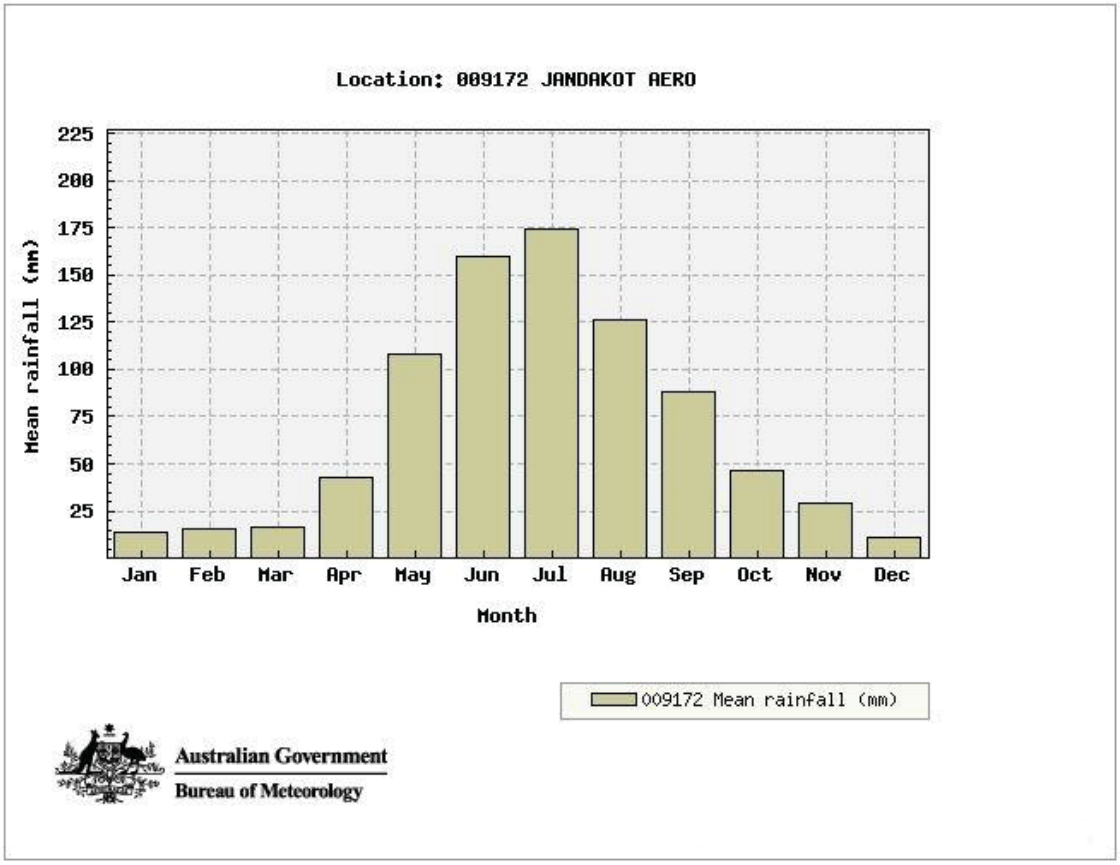

Figure 6. Jandakot Rainfall Data (Bureau of Meteorology 2014).

2.4 Prevalent Fire Weather

The combination of prevailing winds (generally experienced from the southwest) and north-west and easterly winds experienced during the summer months are most conducive to extreme fire weather and subsequent extreme fire danger events. The combination of prevailing winds and dry vegetation pose a fire risk and active bush fire control is considered essential for the protection of life and property. Direct attack of fire suppression activities is likely to fail in unfavorable weather conditions between the months of December through to March.

3 Statutory Conditions

This Fire Management Plan has been prepared to accompany a subdivision application to the WA Planning Commission.

This Fire Management Plan is aligned to the following policies and guidelines:

- Planning for Bushfire Protection Guidelines, Department for Planning and Infrastructure and Department of Fire and Emergency Services
- Australian Standards (AS) 3959-2009 Construction of buildings in bushfire prone- areas, Standards Australia
- City of Cockburn Fire Break Notice
- City of Cockburn Town Planning Scheme No 3
- Bush Fires Act 1954 (as amended).

4 Bushfire Hazard Assessment

4.1 Method of Assessment

There are two processes for determining the bushfire hazard level of an area. The first assessment is a broad assessment intended to be used at strategic level planning to identify the suitability of an area for the intensification of land use and to determine if the area is bushfire prone. Hazard levels are based on the prominent vegetation at the location and are identified as being either Low, Moderate or Extreme bushfire risk. The method for determining the bushfire hazard at the strategic level is aligned to the Western Australian Planning for Bushfire Protection Guidelines, 2010.

The second assessment, the Bushfire Attack Level (BAL) is a more detailed assessment of the site that is applied after the bushfire hazard and land capability assessment has been conducted. The BAL is required at the development stage to determine the potential level of construction standard as specified in *AS 3959-2009 Construction of buildings in bushfire prone areas*. Within this Plan the BAL assessment is an overview for the purpose of the Development Application and a more specific assessment prior to the construction of any buildings may be required.

4.2 Hazard Assessment – Strategic Level

The assessment of bushfire risk takes into consideration existing site conditions, which include:

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

Based on these considerations the strategic Bushfire Hazard Assessment for Lot 6 / 210 Hammond Road, Success is Low, Moderate and Extreme. The hazard ratings for the adjoining properties are also a combination of hazard ratings being Low, Moderate and Extreme (Figure 7).

Figure 7

Bushfire Hazard Mapping Strategic

Lot 6 Hammond Rd, Success

LEGEND

- Lot 6 Hammond Rd
- Blocks
- Low Bushfire Hazard
- Moderate Bushfire Hazard
- Extreme Bushfire Hazard

LOCALITY

0 100 200

Meters

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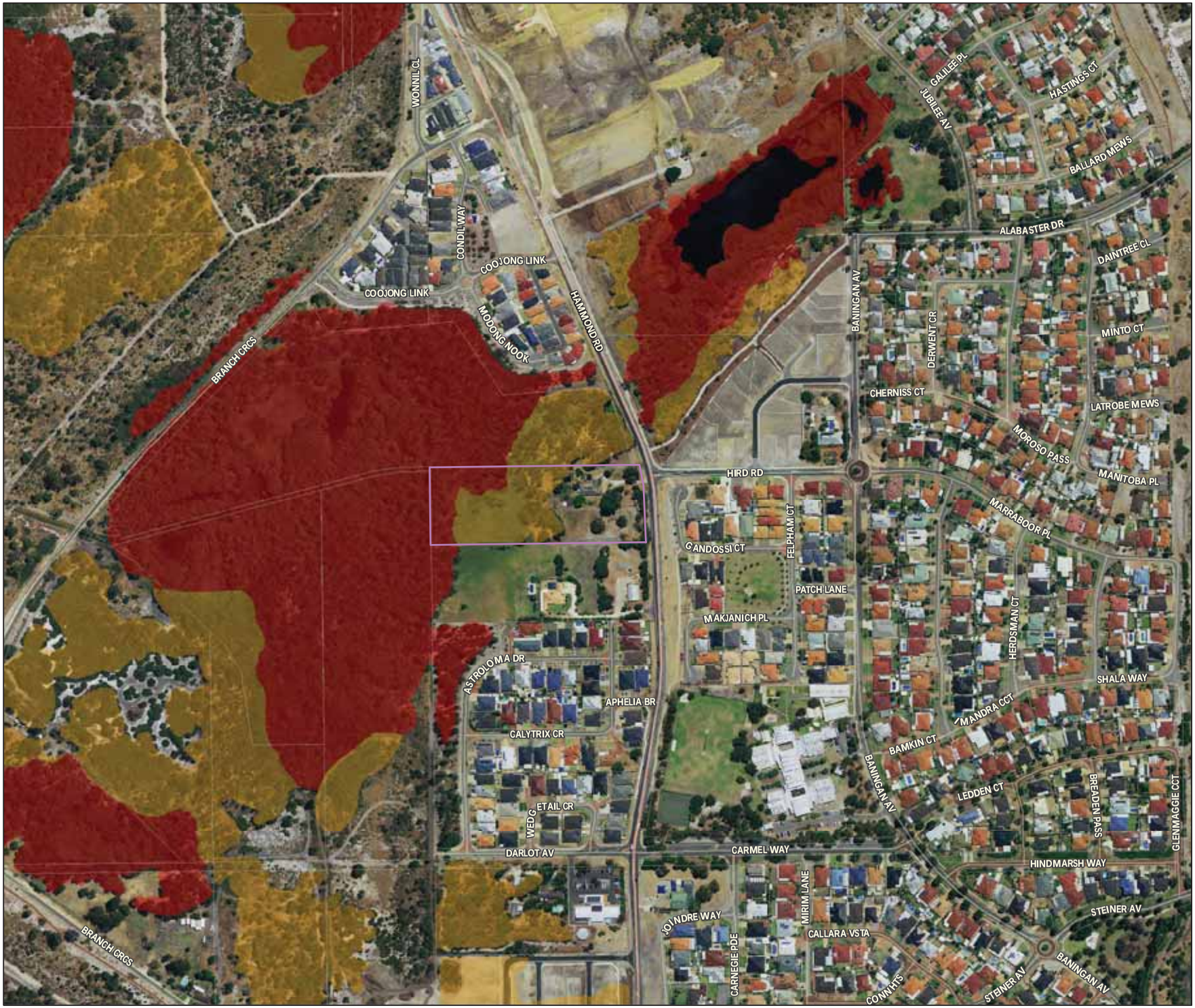
BUSHFIRE PRONE PLANNING

Date: 14/09/2014



4.3 Bushfire Attack Level (BAL)

The methodology rates bushfire attack using a combination of vegetation type, slope and distance from the building or building envelope to the predominant vegetation. In Western Australia it assumes a Forest Fire Danger Index (FFDI) of 80. The BAL assessment involves the following process in accordance with the Australian Standard- *Construction of Buildings in Bush Fire Prone Areas (AS 3959 – 2009)* (Method 1);

- Determination of the area to be assessed
- Identification of vegetation type and class
- Determination of distance of the site from classified vegetation
- Determination of average slope (under the classified vegetation)
- Determination of a BAL
- Determination of construction standards

AS 3959 – 2009 has six categories of BAL. These categories are based on heat flux exposure thresholds and are summarised in Table 2.

Table 2: Bushfire Attack Levels and Corresponding Sections for Specific Construction Requirements (AS 3959-2009).

Bushfire Attack Level (BAL)	Classified vegetation within 100 m of the site and heat flux exposure thresholds	Description of predicted bushfire attack and levels of exposure	Construction Section
BAL- LOW	See Clause 2.2.3.2	There is insufficient risk to warrant specific construction requirements	4
BAL- 12.5	≤ 12.5 kW/m2	Ember attack	3 and 5
BAL- 19	>12.5 kW/m2- / ≤19 kW/m2	Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux	3 and 6
BAL- 29	>19 kW/m2- / ≤29 kW/m2	Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux	3 and 7
BAL- 40	>29 kW/m2- / ≤40 kW/m2	Increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux with the increased likelihood of exposure to flames	3 and 8
BAL- FZ	>40 kW/m2	Direct exposure to flames from fire front in addition to heat flux and ember attack	3 and 9

The BAL assessment using methodology from AS 3959-2009 (Section 2.2.1, 2.2.3.2 and Table 2.4.3 of the Standards) for the proposed development area is provided in Tables 3 and 4 below.

To reduce the heat flux on the proposed subdivided Lots, the following Section (4.4 Bushfire Hazard Management) contains recommendations for the development planning and design.

4.4 Environmentally Sensitive Area (Wetlands)

The wetlands to the north and west of the proposed development are rich in ecological and cultural values and form an integral part of the natural environment of the area. The vegetation that occurs in the wetland is an important component of the ecosystem and the vegetation assists in:

- maintaining natural wetland water regimes
- provides habitat and food for animals
- protects against salinity and erosion
- provides soil stability
- filters pollutants
- provides natural beauty
- helps maintain a healthy wetland system.

The adjoining wetlands will not impacted on achieving the BAL setback requirements. The distances have been calculated from the Lot boundaries. (Refer Figure 2)

Figure 8

BAL Determination

Lot 6 Hammond Rd,
Success

LEGEND

- Lot 6 Hammond Rd
- Proposed Subdivision
- Road Alignment
- Classified Vegetation
- Blocks
- BAL FZ
- BAL 40
- BAL 29
- BAL 19
- BAL 12.5

LOCALITY

0 10 20 30

Meters

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W E
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BUSHFIRE PRONE PLANNING

Date: 14/09/2014

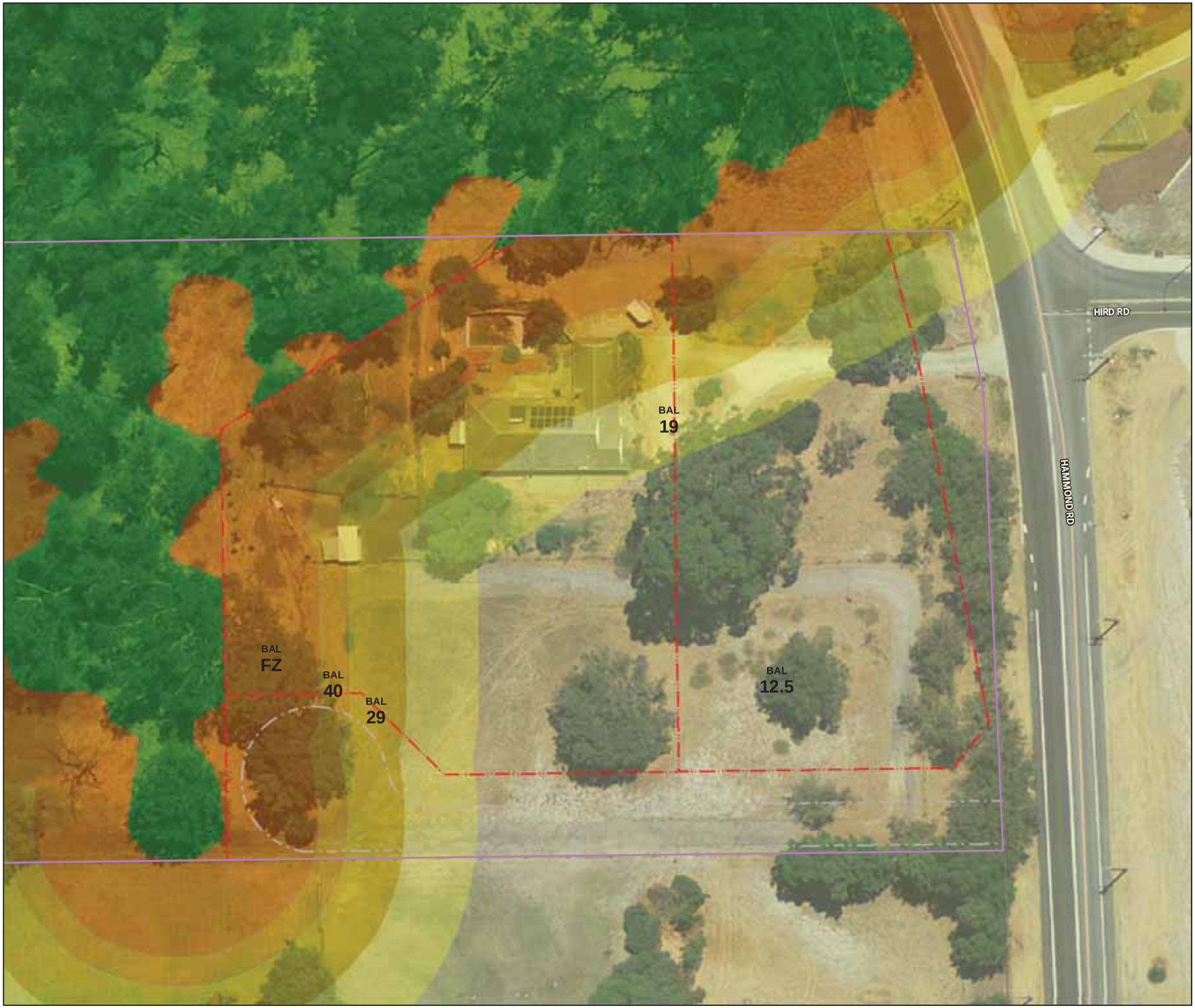


Table 3: Requirements for new dwelling Development, Planning and Design (BAL 29 setback distances in metres). The separation distance has been calculated from the Lot boundary. Minimum distance from Lot boundary will be 20 metres to maintain a Building Protection Zone (BPZ)

Vegetation Type & Direction	Average Slope (Degrees)	Separation Distance from Classified Vegetation (Lot boundary)	Bushfire Attack Level	AS 3959:2009 Construction Level Section
Woodland to the north	0	20m	BAL: 29	3 & 7
Woodland to the north west & west	0.5	20m-<25m	BAL: 29	3 & 7

Table 4: Requirements for new dwelling Development, Planning and Design (BAL 19 setback distances in metres). The separation distance has been calculated from the Lot boundary. Minimum distance from Lot boundary will be 20 metres to maintain a Building Protection Zone (BPZ)

Vegetation Type & Direction	Average Slope (Degrees)	Separation Distance from Classified Vegetation (Lot Boundary)	Bushfire Attack Level	AS 3959:2009 Construction Level Section
Woodland to the north	0	20m-<29m	BAL: 19	3 & 6
Woodland to the north west & west	0.5	25m-<35m	BAL: 19	3 & 6

Table 5: Requirements for new dwelling Development, Planning and Design (BAL 12.5 setback distances in metres). The separation distance has been calculated from the Lot boundary.

Vegetation Type & Direction	Average Slope (Degrees)	Separation Distance from Classified Vegetation (Lot Boundary)	Bushfire Attack Level	AS 3959:2009 Construction Level Section
Woodland to the north	0	29m-<100m	BAL: 12.5	3 & 5
Woodland to the north west & west	0.5	35m-<100m	BAL: 12.5	3 & 5

4.5 Bushfire Hazard Management

Tables 3 and 4 provide recommendations and requirements for proposed future dwellings. The dwellings are to be located in areas with appropriate BAL's and to minimize the impact on the environment. The minimum BAL will be 12.5 and the maximum BAL allowable will be BAL 29. Vegetation may require modification where appropriate. Section 5.4 of this Plan sets out the requirements to achieve this. Note that the minimum BPZ allowable is 20m and future dwelling locations may change. A detailed BAL assessment in accordance with AS 3959-2009 methodology may be required prior to design and construction.

The following Figures 9 and 10 detail the Classified Vegetation to determine the approximate BAL setbacks relating to the site.

Figure 10 details the modified Classified Vegetation and BAL setbacks.

Figure 9

Proposed Subdivision
BAL Determination

Lot 6 Hammond Rd,
Success

LEGEND

- Lot 6
- Proposed Subdivision
- Road Alignment
- Classified Vegetation
- Blocks
- BAL FZ
- BAL 40
- BAL 29
- BAL 19
- Proposed Building

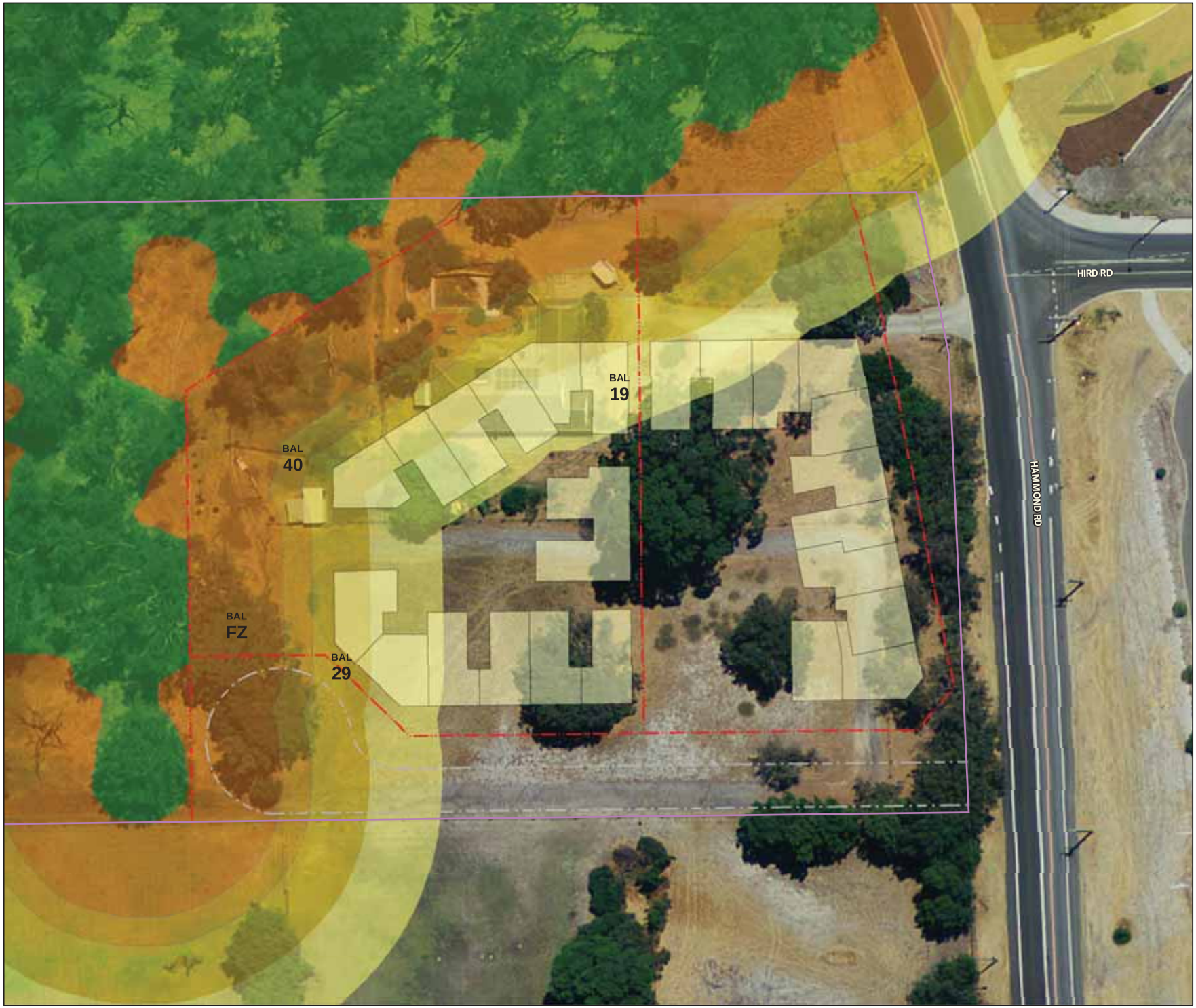
LOCALITY

0 10 20 30

Meters

BUSHFIRE PRONE PLANNING

Date: 15/05/2015



5 Fire Protection Performance Criteria

The site will be required to meet the Performance Criteria for Extreme Hazard, taking into consideration the following as per the Planning for Bushfire Protection Guidelines, 2010;

- Location (P1)
- Vehicular access (P2)
- Water (P3)
- Siting of development (P4)
- Design of development (P5)

5.1 Location (P1)

The subdivision is located in an area where the bush fire hazard level is manageable.

5.1.1 Development Location

The site sits within a TPS3 - Development / Structure Plan Zoning. The Lots are located in a bushfire hazard area that has been assessed as a combination of Low, Moderate and Extreme. Any future construction on the site will be required to comply with the construction requirements and vegetation setbacks as detailed in Tables 3 and 4 of this Plan.

5.2 Vehicular Access (P2)

The internal layout, design and construction of public and private vehicular access in the subdivision allows emergency and other vehicles to move through it safely at all times.

5.2.1 Two Access Routes

Two way vehicle access is available by Hammond Road.

5.2.2 Cul-de-sacs

The construction of a cul-de-sac at from joining Hammond Road, must meet as a minimum the requirements set out below and the City of Cockburn minimum public roads standards (Refer Figures 1 and 2).

Table 6: Minimum Standard for Cul-de-sacs

Standard	Public Road
Maximum length	200 meters (if emergency access is provided between cul-de-sac heads maximum length can be increased to 600 meters provided no more than 8 lots are serviced)
Minimum trafficable surface	6 metres
Horizontal clearance	6 metres
Maximum grades	1 in 8
Maximum grade over <50m	1 in 5
Maximum average grade	1 in 7
Minimum weight capacity	15 tonnes
Maximum crossfall	1 in 33
Curves minimum inner radius	12 metres
Turnaround areas	As per turn around area requirements – including 21 metre diameter head. To accommodate 3.4 fire appliance and enable them to turn around safely.

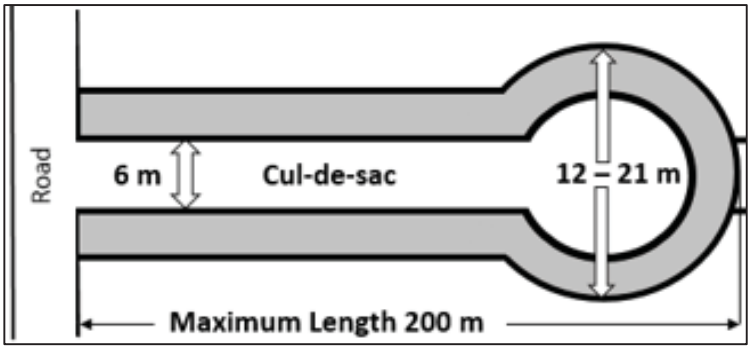


Figure 11: Cul-de-sac construction widths.

5.2.3 Battle Axes

Not applicable.

5.2.4 Private Driveways

Not applicable.

5.2.5 Emergency Access Ways

Not applicable.

5.2.6 Fire Service Access Routes

Not applicable.

5.2.7 Gates

Not applicable.

5.2.8 Firebreak Widths

Proposed Lots 1, 2 and 3 must comply with the City of Cockburn Firebreak Notice as follows;

Firebreak Requirements:
The works outlined in the following (as applicable) must be completed on or before the 1 November of each year and then maintained up to and including 31 May of the following year.

Trim all overhanging branches, trees, limbs, etc. from over the top of the firebreak area to a minimum height of 4 metres.

Remove all flammable matter surrounding all buildings situated on the land except living trees shrubs, green lawns and plants under cultivation to a minimum width of 5 metres and a minimum height of 4 metres.

Remove all flammable matter except living trees, shrubs, green lawns and plants under cultivation to a minimum width of 5 metres and a minimum height of 4 metres immediately surrounding any place where wood, timber, mulch piles, hay stacks, tyres, vehicles, flammable liquids, chemicals and gas products are stored on the land.

Maintained and living lawns and gardens are an acceptable alternative in conjunction with or in lieu of bare earth firebreaks provided that the same minimum width and height requirements for a firebreak are maintained

All flammable materials such as long dry grass, weeds, etc. slashed, mown or trimmed down by other means to a maximum height of 50mm across the entire property. Where living and maintained gardens or lawns are established these areas are to remain green and maintained.

Additional Requirements

In addition to the requirements noted above, regardless of land size and location, Council or its duly authorised officer may require you to undertake additional works on your property to improve access and or undertake further hazard removal and/or reduction works, where in the opinion of that authorised officer, it is to be conducive to the outbreak and/or the spread of a bush fire.

Fire Management Plans and Building Protection Zones

All subdivisions and / or developments within the City of Cockburn must comply with the Fire Management Plans for their subdivision/ estates in entirety to the satisfaction of Council or its duly authorised officer.

5.2.9 Signs

Not applicable.

5.3 Water (P3)

To ensure that water is available to the development to enable life and property to be defended form bushfire.

5.3.1 Reticulated Areas

The proposed Lots are located 20m from the nearest hydrant on the corner of Hammond and Hird Roads, Success.

5.3.2 Non-Reticulated Areas

Not applicable.

5.3.3 Non-Reticulated Areas- Dams

Not applicable.

5.4 Siting of Development (P4)

The siting (including paths and landscaping) of the development minimises the bushfire risk to life and property.

5.4.1 Hazard Separation-Moderate to Extreme Bushfire Hazard Level

Refer to Section 4.4 for acceptable solution.

5.4.2 Hazard Separation-Low Bushfire Hazard Level

Not applicable.

5.4.3 Building Protection Zone (BPZ)

A Building Protection Zone (BPZ) will be incorporated into the design to reduce bushfire intensity close to dwellings, therefore minimising the likelihood of flame contact and radiant heat onto buildings. The BPZ standards that are recommended to be incorporated into the overall design are provided below (and shown in Figure 9). Barriers such as driveways, lawns, ovals, orchards and pathways surrounding dwellings can form part of a BPZ.

As a minimum, the BPZ must comply with the *Planning for Bushfire Protection Guidelines*, however it is recommended that any future development comply with a BPZ as detailed below and set out in Section 4.4. In accordance with *AS 3959-2009,* as the distance from the vegetation is reduced, the construction standard must be increased. Table 2.4.3 of *AS 3959-2009* sets out this relationship between separation distances and construction standards (refer to Section 4.4 of this Plan for explanation):

- Width: The BPZ's for Lots 1 and 2 are measured from the external wall of the building or proposed buildings (see Section 4.4).
- Fuel Load: reduced to and maintained at 2 tonnes per hectare.
- The crowns of trees are to be separated where possible to create a clear separation distance between adjoining or nearby tree crowns. The separation distance between tree crowns is not required to exceed 10 metres
- No tall shrub or tree is located within 2 metres of a building (including windows).
- There are no tree crowns overhanging the building.

- Fences and sheds within the Building Protection Zone are constructed using non-combustible materials (eg: Colorbond, iron, brick, limestone) or within 6 metres of the main structure comply with AS 3959: 2009.
- Shrubs in the Building Protection Zone are cleared of dead material within the plant.
- Tall shrubs in the Building Protection Zone are not arranged in clumps, close to buildings (ie: within 3 metres).
- Trees in the Building Protection Zone have no dead material within the plant's crown or bole, and;
- Maintain debris accumulation in areas against, under or within the buildings structure.

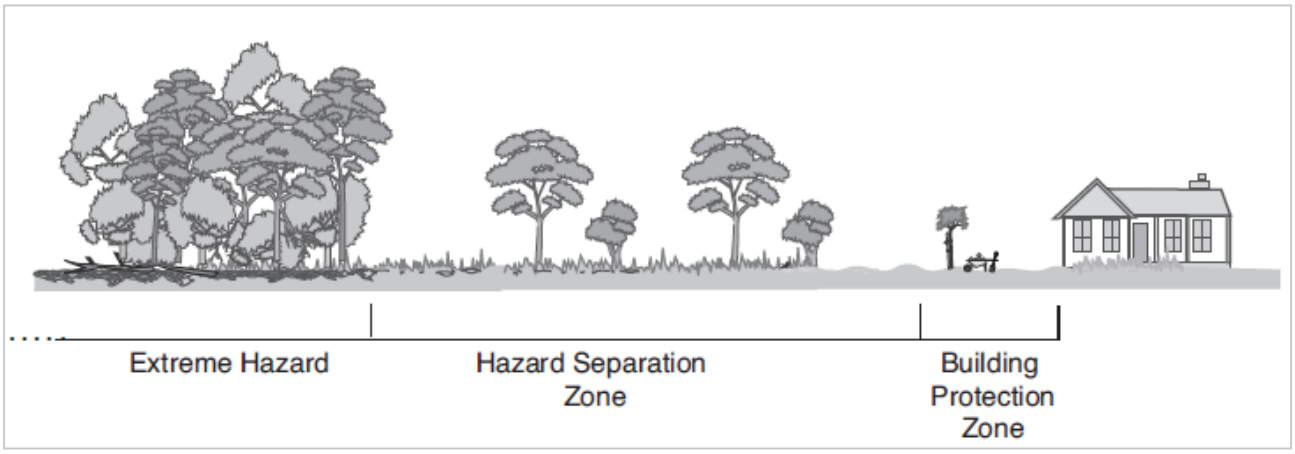


Figure 12. Diagram showing Hazard Separation Zones and Building Protection Zone Requirements.

5.4.4 Hazard Separation Zone (HSZ)

Hazard Separation Zones are unachievable within the Lot boundaries. The areas of Classified vegetation (woodland) to the north and west of the proposed development falls in the HSZ, and is predominately wetlands. Due to ground moisture, green understory and low flammability introduced plant species that are dispersed throughout the wetlands, bushfire behaviour is likely to be moderate, thus reduced radiant heat and ember attack impacting on the development structures.

5.4.5 Reduction in Bushfire Attack Level Due to Shielding

On final approval and development design, a number of buildings will be shielded from the classified vegetation, thus reducing the BAL rating to a maximum of one level in accordance with Section 3.5 of AS3959-2009. A detailed BAL assessment will be required at the planning and design stage to calculate the determination.

5.5 Design of Development (P5)

The design of the development is appropriate to the level of bush fire hazard that applies to the development site.

5.5.1 Compliant Development

It is recommended the development comply with the requirements set out in Section 5.4 to include appropriate Building Protection Zones and are maintained to the requirements set out in this Section. This will ensure the bushfire hazard level is kept as low as feasible on existing and future dwellings on the site. Hazard Separation Zones are unachievable within the Lot boundaries.

5.5.2 Non-Compliant Development

Not applicable.

6 Fire Fighting Service and Predicted Head Fire Rates of Spread

The City of Cockburn Fire Service supports 2 Volunteer Bushfire Brigades. This development site is within 7.5 Kilometres / 15 minute average turn out response zone from the Jandakot Volunteer Bush Fire Brigade's fire station.

Table 6 shows the predicted head fire behaviour in the vegetation assemblages found in the Locality of Success as relevant to this location. Fire fighter safety during fire suppression activities is taken into consideration and the BPZ and HSZ is to be maintained around surrounding buildings in respect of this. The fire behaviour rate of spread and fireline intensity is set out below and is calculated for the 95% percentile weather conditions relating to the area.

Table 7. Head Fire Behaviour Classes for the Site (Source: Muller, 2008).

HEAD FIRE BEHAVIOUR CLASSES
5 Indirect attack likely to fail Intensity > 4000 kW/m and/or ROS > 800 m/hr in forest/woodland Intensity > 8000 kW/m and/or ROS> 2000 m/hr in shrubland ROS > 10000 m/hr in grassland
4 Direct attack not possible/unlikely to succeed. Intensity > 2000 kW/m and/or ROS > 400 m/hr in forest/woodland Intensity > 2000* kW/m and/or ROS > 1000 m/hr in shrubland Intensity > 5000 kW/m and/or ROS > 6500 m/hr in grassland
3 Direct machine and tanker attack possible Intensity < 2000 kW/m and/or ROS < 400 m/hr in forest/woodland Intensity < 2000* kW/m and/or ROS < 1000 m/hr in shrubland Intensity < 5000 kW/m and/or ROS < 6500 m/hr in grassland
2 Hand tool attack possible Intensity < 800 kW/m and/or ROS < 140 m/hr in forest/woodland and shrubland Intensity < 800 kW/m and/or ROS < 300 m/hr in grassland
1 Readily suppressed. Intensity < 800 kW/m and/or ROS < 60 m/hr in all fuels

7 Implementation and Responsibilities

The proposed development for Lot 6 Hammond Road, Success will be required to meet the minimum criteria as per the Western Australian Planning for Bushfire Protection guidelines, AS 3959-2009, City of Cockburn Town Planning Scheme, City of Cockburn Firebreak Notice and other requirements as stipulated in this Plan. A summary of these requirements and recommendations are as follows:

The design of structures and the modification to vegetation are such that with implementation of this Plan, the fire threat to persons and property within the development is reduced. This is subject to the owners and occupiers of the proposed development complying with their responsibilities as described in this section.

7.1 Property Owner's Responsibilities

To maintain the reduced level of risk and threat of fire, the owners/occupiers of the site will be responsible for undertaking, complying with and implementing measures protecting their own assets from the threat and risk of bush fire:

- Ensure all new buildings are designed and constructed in full compliance with the requirements of the City of Cockburn
- Implement and maintain a Building Protection Zone
- Implement hazard reduction and or fuel modification to the requirements of the City of Cockburn and *AS 3959-2009* to reduce/maintain BAL's
- Maintain Fire Break Notice compliance.

7.2 Developer's Responsibilities

Prior to Development Approval by the City of Cockburn, the developer shall be required to carry out works as described below:

- Lodging a Section 70A Notification on each Certificate of Title proposed by this subdivision. The Notification shall alert the purchasers of land and successors in title of the responsibilities of this Bushfire Management Plan
- Ensure all grass and dead flammable matter on the land is to a height no greater than 5cm as as required by the City of Cockburn's Firebreak Notice as set out in Section 4.4
- If building, the structure must comply with Construction Standards as set out in Section 4.4

- Battle axe must comply with section 5.2.3
- Ensure the wetlands will not be impacted by the development and construction.

7.3 Builders Responsibility

Future structures must comply with Construction Standards as set out in Section 4.4.

7.4 City of Cockburn Responsibilities

The responsibility for compliance with the law rests with individual property owners. The City of Cockburn shall be responsible for:

- Developing and maintaining district fire fighting facilities.

Appendix 1. Compliance Checklist for Performance Criteria and Acceptable Solutions

Element 1: Location	Compliance
Does the proposal comply with the performance criteria by applying acceptable solution A1.1?	Yes

Element 2: Vehicular Access	Compliance
Does the proposal comply with the performance criteria by applying acceptable solution A2.1?	Yes
Does the proposal comply with the performance criteria by applying acceptable solution A2.2?	Yes
Does the proposal comply with the performance criteria by applying acceptable solution A2.3?	Yes – meets the requirement of cul-de-sacs. Refer Section 5.2.2
Does the proposal comply with the performance criteria by applying acceptable solution A2.4?	Yes – Meets the requirement in Section 5.2.3
Does the proposal comply with the performance criteria by applying acceptable solution A2.5?	N/a
Does the proposal comply with the performance criteria by applying acceptable solution A2.6?	Yes
Does the proposal comply with the performance criteria by applying acceptable solution A2.7?	N/a
Does the proposal comply with the performance criteria by applying acceptable solution A2.8?	N/a
Does the proposal comply with the performance criteria by applying acceptable solution A2.9?	Yes - complies with City of Cockburn Fire Break Notice
Does the proposal comply with the performance criteria by applying acceptable solution A2.10?	N/a

Element 3: Water	Compliance
Does the proposal comply with the performance criteria by applying acceptable solution A3.1?	Yes, nearest hydrant opposite side of subject site, Hammond Road
Does the proposal comply with the performance criteria by applying acceptable solution A3.2?	N/a
Does the proposal comply with the performance criteria by applying acceptable solution A3.3?	N/a

Element 4: Siting of Development	Compliance
Does the proposal comply with the performance criteria by applying acceptable solution A4.1?	Yes - Refer Section 5.4.2
Does the proposal comply with the performance criteria by applying acceptable solution A4.2?	Yes
Does the proposal comply with the performance criteria by applying acceptable solution A4.3?	Yes - Future buildings must comply to specified setback from vegetation (BPZ) - refer to Section 5.4.3
Does the proposal comply with the performance criteria by applying acceptable solution A4.4?	N/a
Does the proposal comply with the performance criteria by applying acceptable solution A4.5?	N/a - Existing and future developments may be assessed if requested.

Element 5: Design of Development	Compliance
Does the proposal comply with the performance criteria by applying acceptable solution A5.1?	Yes–the proposal does comply with the performance criterion P5 because building construction standards will be increased to comply with AS 3959-2009, and appropriate setbacks provide where possible.
Does the proposal comply with the performance criteria by applying acceptable solution A5.2?	Yes - The proposal complies as the development will meet the performance criteria with compliance to AS 3959-2009.

8 References

- Muller, C 2008*. Report on a Bushfire Threat Analysis for Western Australia.*
- Western Australian Planning Commission & Fire and Emergency Services Authority 2010, *Planning for bush fire protection guidelines,* edition 2, State of Western Australia.
- City of Cockburn Town Planning Scheme No 3
- City of Cockburn - *Firebreak Notice 2013/14*
- Standards Australia 2009, *Australian Standard, Construction of buildings in bushfire prone areas, AS 3959-2009 (incorporating Amendment No 1, 2 and 3),* NSW Australia.