HATCH

VILLAGE 6 MALVERN SPRINGS DEVELOPMENT PLAN

AUGUST 2024

CITATION

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DOCUMENT CONTROL

Revision	Date	Description
A	March 2016	First Draft
B	August 2024	Final

VILLAGE 6 - ELLENBROOK
DEVELOPMENT PLAN

PREPARED FOR
Ellenbrook Management Pty Ltd

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ENDORSEMENT PAGE

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

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

5 MAY 2006

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

Date of Expiry: **19 OCTOBER 2030**

RECORD OF AMENDMENTS MADE TO THE ENDORSED ELLENBROOK VILLAGE 6 DEVELOPMENT PLAN

Date of Amendment	Description of Amendment	Endorsed by Council	Endorsed by WAPC
Nov 2005	Development Plan submitted as a basis to guide future subdivision, rezoning and development proposals in Village 6, Malvern Springs		
	Modified in accordance with Council Resolution 24 May 2006.	24 May 2006	
	Modified in accordance with WA Planning Commission's instructions, being: - Include a notification on the Development Plan for the central east-west road stating, 'Potential Integrator B/ Neighbourhood Connector A' - A note 5 being added to the Development Plan which states; '5 – The central east-west road is to be integrated with surrounding development and will not form a pedestrian barrier.		12 July 2006
July 2007	Modification to Overall design, Stages 8 and 9; - Inclusion of Stage 9 Active POS; - Improved linkage to the Village Centre; - modification to the Long-run, north-south roads to provide for safe vehicle/ pedestrian movement; - Lot modification and inclusion of a 9m laneway as a result of a level change on the southern boundary fronting The Broadway; and - Inclusion of a greater range of residential lot sizes, including Group housing and the smaller laneway lots consolidated near POS areas		
Oct 2007	- Modification to Residential Density Figure 13 - Modification to Table: Projected Dwelling Yields & Mix - Revised Traffic Report	10 December 2007	
May 2008	Modification to Overall design - Relocation of the road which crosses the retained dampland (UFI 8938 + 8939), in the northern portion of the Village; - Redesign for the northern area to ensure the residential lots have a greater focus on the central retained damplands, incorporating additional rear laneway cottage allotments. - The introduction of four laneways in Stage 9 for lots fronting the POS; - The central east west road reserve being increased to 22 metres to accommodate a median and pedestrian paths; and - The introduction of two laneways in Stage 9 for lots fronting The Broadway.		
May 2009	- Modification to Overall design - Redesign of Stage 8 – 13, 17-18 being the minor modification of residential cells in the northern and eastern areas to ensure greater diversity in residential lot size and project mix; - The introduction of 5.0m product, and - modification to plan series and relevant tables ensuring accuracy with proposed modifications.		
November 2009	- Modification to overall design - Resign of Stages 14- 17, being the minor modification of residential cells in the north east to ensure a greater diversity in residential lot size and project mix - Introduction of additional 5.0m product - Modification to the plan serries and relevant tables ensuring accuracy with proposed modifications.		
April 2011	- Minor modification to lot layout - Modification to densities for grouped housing sites - Normalisation of density for created undersized lots		
September 2011	- Modification to overall design - Redesign of Stages 17 and 18 to consolidate POS and improve connectivity - Redesign of Hillside Precinct to increase POS, introduce linear POS to east, modify road layout and lot sizes to increase responsiveness to topography		
January 2013	- Minor modification to lot layout Stage 17 and 18 - Inclusion of Appendix D: Bushfire Management Plan - Inclusion of Bushfire figures and text		
March 2016	- Modification to design, Hillside precinct - Inclusion of residential design over new portion of land, known as Northlink (Stage 19) - Modification to tables + figures within section 3.6 - Modification to plan series within Appendix A, B and C - Addendum to Appendix G - Addition of Appendix I		
-	- Modification to Village Centre from a Commercial designation to a Commercial and Residential designation	13 March 2024	22 October 2024

EXECUTIVE SUMMARY

This Development Plan been prepared to guide the staged development of Ellenbrook's next village - Village 6, in accordance with the requirements of the City of Swan Local Planning Scheme No. 17.

Village 6, comprising approximately 182 hectares, is located immediately north of the Coolamon and Charlotte's Vineyard Villages. The Perth – Darwin Highway and Transit Corridors define the western boundary, beyond which lies a conservation reserve. Conservation reserves are also located to the north and north east of the village. The Vines Stage 5 development is located to the east and the planned Large Neighbourhood Centre to the south east.

The Development Plan for Village 6 has capacity to accommodate approximately 2003 dwellings for a community of around 5809 residents, a village centre, town square, education and community and recreation facilities.

The design has been guided by a 'healthy living' theme, which will allow residents the ability to live within a sustainable village environment that is complemented by an extensive natural parkway setting comprising wetlands, remnant vegetation and associated fauna. This theme will be further reinforced through the selection of landscaping, the built form and treatments applied to public spaces.

The Development Plan design accommodates a variety of residential lot sizes, ranging from 155m^2 through to 1000m^2. This is to encourage a diversity of households to live in Village 6. This diversity will be further encouraged through design guidelines that will be tailored to achieve specific character within nominated residential precincts.

All future residents will have ready access to the Village Centre and the parkway system via the interconnected street network and extensive network of footpaths and cycleways. Community facilities will be consolidated within the Village Centre for convenient access. Facilities will include a community building that incorporates a flexible design for a range of uses and a public primary school.

CONTENTS

1.0 INTRODUCTION

FIGURE 1 - LOCATION

FIGURE 2 - LOCAL CONTEXT

1.1 LOCATION/LOCAL CONTEXT

The Ellenbrook project is located within the City of Swan, approximately 20km north-east of the Perth CBD and within 10km of the Midland Town Centre.

Village 6 is located immediately north of Coolamon Village and Charlotte's Vineyard which are currently being developed. The Perth – Darwin Highway and Transit Corridor reservations form the western boundary of the village. A regional wetland/conservation area is located to the west of the village beyond the highway reservation.

In a local context, Village 6 is centrally located incorporating road connections and linkages with; Coolamon, Charlotte's Vineyard, Ellenbrook Large Neighbourhood Centre, Village 7, Stage 5 The Vines and the adjoining Vale development.

1.2 LAND DESCRIPTION

1558 lots (January 2013) have already been created in accordance with the original Development Plan approved by the City of Swan in May 2006 and subsequent modified Development Plan approved by the City of Swan in October 2007.

The balance title lots for the remainder of the Development Plan area are:

Lot 9175 on Deposited Plan 43403 (Volume 2711 Folio 647); and

Lot 9507 on Deposited Plan 57881 (Volume 2680 Folio 195).

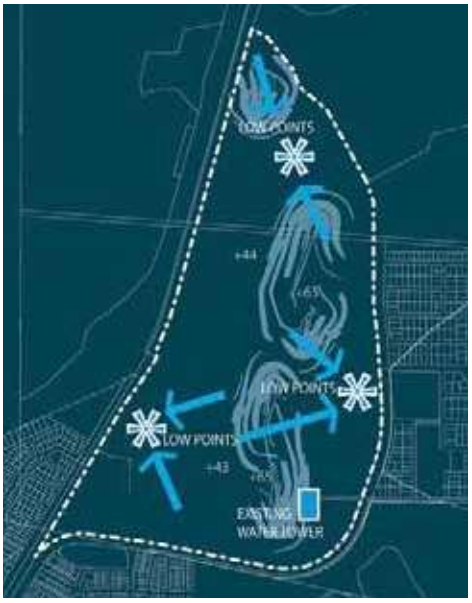


FIGURE 3 - LANDFORM

FIGURE 4 - VIEWS

1.3 LAND USE/LANDFORM

Village 6 extends over approximately 182 hectares that is predominantly covered in vegetation. The site contains a central north-south ridge (highpoint RL66m), which falls to the west (RL43m) and east (RL34m). A small highpoint exists in the top northern corner of the village. A visual analysis of the major landform features and opportunities for views is shown adjacent.

In order to achieve developable land for residential housing (max level 60m AHD) and a cut to fill balance, the central ridge will be earth worked, but a relative highpoint will be retained to become a defining landmark for the village.

1.4 VIEWS

Views are available from within the Village 6 area to the adjacent conservation reserves and Darling Escarpment. The retention of the elevated terrain and careful orientation of streets will enable future residents the ability to enjoy the benefit of these views and assist with orientation.

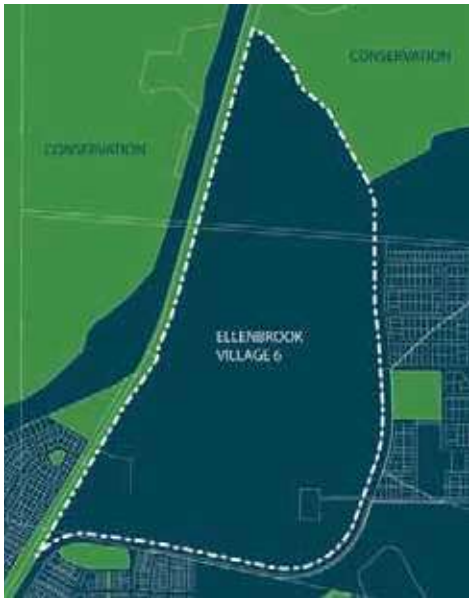


FIGURE 5 - CONSERVATION AREAS

FIGURE 6 - WETLANDS

1.5 CONSERVATION RESERVES

Extensive conservation areas, which are protected through Metropolitan Region Scheme Parks and Recreation Reservations, surround the northern portion of the VIllage 6 area. The northern portion of Village 6 protrudes into this area forming a peninsula of urban development amidst a natural setting. It will be necessary for a hard edge treatment in the form of a road interface to be provided adjacent to the reservation for fire management and public access.

1.6 CONSERVATION CATEGORY WETLANDS

Three Conservation Category Wetlands are situated within the Village 6 development area. The Village 6 development will have the following impact on these wetland areas:

- The northern elongated wetland (DC105), covering an area of approximately 10.4ha, will be retained within public open space (POS). A management plan will be prepared for DC105 which will address controlled pedestrian access, water quality management and drainage. This management plan is curretnly being prepared.
- 3.8ha of the south-western dampland (DC95), which represents approximately 95% of the wetland (this being all of the wetland within Ellenbrook's ownership), will be retained in POS. A management plan for DC95 has been approved by the Department of Environment in June 2005.
- The southern (DC101) wetland will be filled to facilitate development.

The incorporation of the wetlands within the Village 6 development, and their proposed use for drainage, passive recreation and vegetation retention, is consistent with the Minister for Environment's approval of the Ellenbrook project in Statement 288, subsequent clearance (via Statement 345) of Condition 4.1 and as advised in a letter from the EPA dated 27 October 2004.

2.0 DESIGN CONCEPT

2.1 THEME

'Health' is the theme for Village 6.

A primary objective in the planning of Ellenbrook is to create villages with a distinctive character and identity with 'central places' which foster a sense of community belonging.

Village 6 will bring residents the benefits of a sustainable village within a parkway setting that will embrace the site's natural features. Residential areas will be framed around a north-south linear open space parkway. This parkway setting will offer a natural sanctuary for future residents and provide varied opportunities for leisure and relaxation. The juxtaposition of residential housing on the retained ridge overlooking the conserved wetlands and linear parkway will introduce a diversity of landscape and built form.

The ability to live a healthy lifestyle will be the key attribute of Village 6 – a place "where you can take a year round holiday at home". The theme will appeal to a wide cross section of buyers and clearly identify the village with one of the increasingly important facets of community life. The concept of "creating a healthy community" translates the notion of sustainability into more meaningful terminology for purchasers.

This theme has strongly influenced the major urban design elements for the Village including structure of open spaces, landscaping, housing form and village centre:

2.1.1 Open Space Structure / Landscape

Conservation Reserves set aside in both the Northern and Southern Sectors and adjacent the Lexia Wetlands will be linked through a linear green 'belt' running along the central spine. This will offer residents and visitors an extensive and interesting car-free network system with wider links to Ellenbrook as a whole. This greenway network will serve at least six major functions:

- protect and/or enhance conserved natural wetlands;
- provide linear open space for compatible human use;
- maintain connectivity between conservation lands, communities, parks, schools, other recreational facilities and the greater hike and bike network throughout Ellenbrook ;
- add value to the surrounding properties;
- provide a wildlife corridor between wetlands; and
- improve groundwater infiltration by reducing the run-off into drainage basins.

These characteristics will add to the health, well-being, and aesthetic values of the community and are vital to the maintenance of functional native ecosystems.

2.1.2 Housing Form

A 'retreat' atmosphere and resort style of architecture will be encouraged through the detailed design guidelines. These guidelines will work in conjunction with sustainable living standards promoted throughout the village. Emphasis on comfort and healthy living through use of natural light, shading in summer and breezeways for climate control as opposed to mechanical ventilation will be promoted.

2.1.3 5.0 Metre Product

In order to build on Ellenbrook's previous built form and lot design innovations, including pioneering the provision of 8 metre wide lots, it now proposes the creation of 5 metre wide terrace lots within Village 6 – Malvern Springs.

2.1.4 Village Centre

This area will become the focal point and meeting area for residents. Co-location of the school, shops, community facility and interpretive centre will create a destination point easily accessible by foot or automobile. The Centre's location at approximately the 'halfway point' on the greenway link, will encourage greater use of the hike and bike system. Aromatherapy gardens, an outdoor 'church', pavilions or other forms of contemplation zones for relaxation and focus on human health benefits may be integrated into the design.

2.1.5 Self Sufficiency

The maturing of the Town Centre and ultimately the adjacent Large Neighbourhood Centre will enable the residents of Village 6 to enjoy a relatively sustainable existence within the boundaries of Ellenbrook. Village 6 is the first of Ellenbrook's villages to be able to offer ready access to the majority of daily needs and employment opportunities during its development phase.

Inspirational design elements will include:

- Retaining the natural elevated landscape
- Enhancing the natural landscape in key 'public domain' locations through formal plantings
- Town squares
- Density housing adjacent to town/village squares
- Linear POS
- Simple yet dramatic architecture for public buildings
- Colour palette (white limestone, red ochre, green, purple lavender, terracotta stone, blue) that complements the natural setting
- Interconnected street pattern

The village design and built form will promote:

- energy efficiency by promoting walking/ cycling and solar oriented housing;
- water conservation through selective landscaping and wetland management.

Village 6 will be developed and designed to cater for a return to a simple lifestyle, where neighbours know each other, facilities are within walking distance and centrally located and the landscape is respected. The design will seek to create a pattern of streets, lots and open spaces of varying size to compliment the physical attributes of the site in a sustainable manner.

Theming elements that will define Village 6 include:

- Linear parkways and walking trails
- A genuine sense of community promoted through a central Village focus and deliberate emphasis on the public realm
- Generous verandahs and laneway housing that promote surveillance and community interaction on frontage streets
- Retained remnant vegetation and landform that contribute to local character
- Activity in the public realm, including children at play, walking/cycling and bird life

2.2 DESIGN PRINCIPLES/OBJECTIVES

In keeping with the Ellenbrook Joint Venture's overall vision statement, the design approach adopted for Village 6 was defined by and framed around a number of key principles and objectives.

2.2.1 Principles

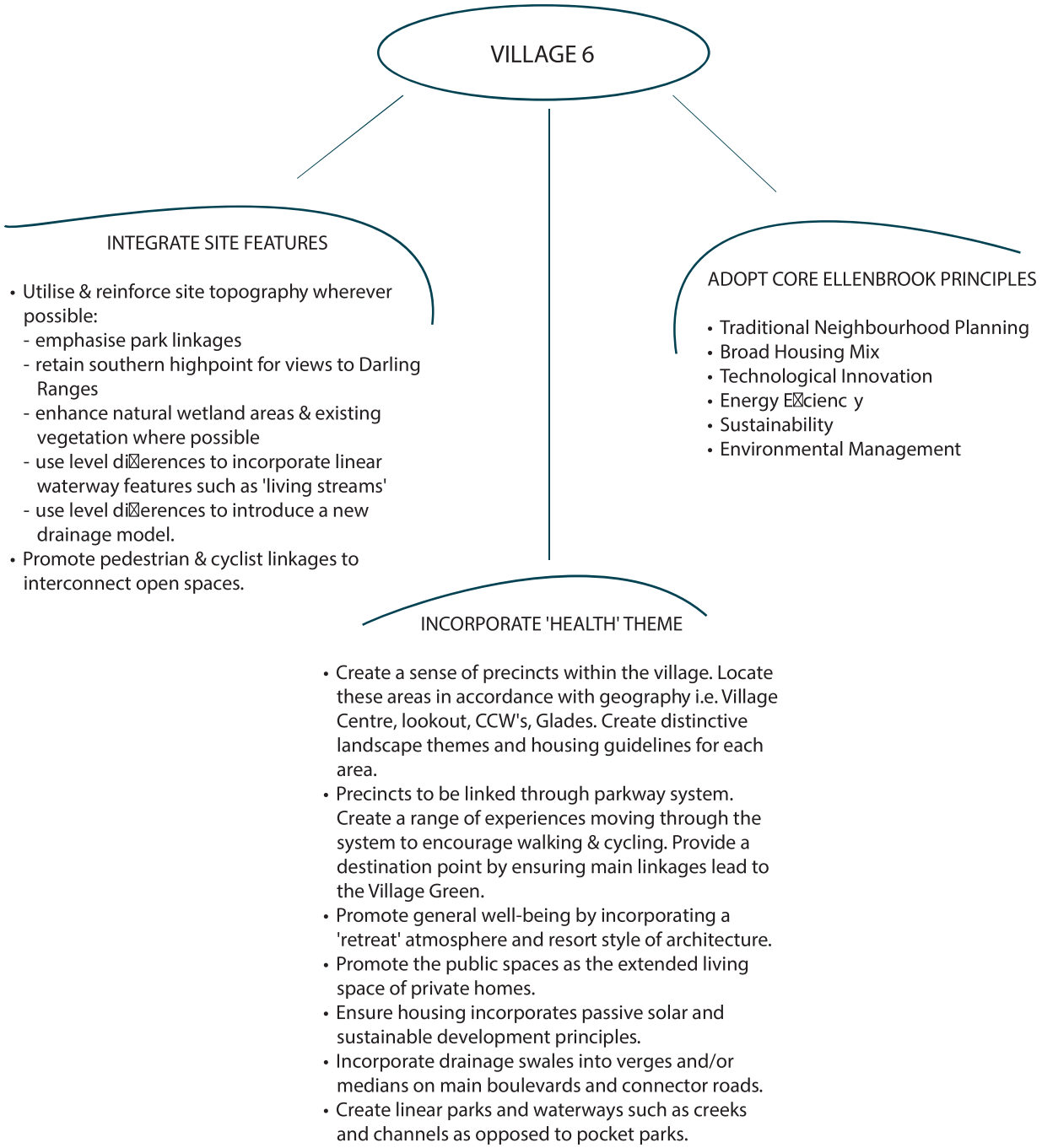
Village 6 will be a modern community designed to provide housing and associated education, recreation, local retail and commercial facilities for approximately 5,809 residents. It will offer a wide choice of housing that caters for varied household types and lifestyles in an attractive environment designed to enhance the natural features of the site.

While signifying a return to the more traditional values of community living, Village 6 will also pursue a leadership role in the more efficient delivery of infrastructure and in the implementation of advanced sustainable environment built form initiatives.

2.2.2 Objectives

- To build a community based upon traditional design principles adapted to the changing demands of our contemporary lifestyles
- To provide varied housing and services for a range of income groups and household types
- To achieve integrated community planning and compliance with the City of Swan Community Plan requirements
- To create an interconnected movement network that minimises total vehicle kilometres travelled and gives priority to pedestrian and cyclist access
- To employ water sensitive design principles and retain and manage damplands for passive recreation, local conservation and stormwater management
- To reinforce the Village's identity through a unifying landscape, retained natural landforms and unique design elements applied to core buildings (i.e. verandahs, intimate courtyards, awnings etc)
- To promote energy efficiency, water conservation and waste management through sustainable village and building design
- To emphasise linear parkway trails and linkages to nature that incorporate the retained and enhanced damplands/water elements and remnant vegetation
- To create a landscaping theme based upon the concept of 'enhanced natural'

FIGURE 7 - VILLAGE 6 DESIGN PRINCIPLES/OBJECTIVES



2.3 PROJECT OVERVIEW

Comprising approximately 182 hectares, Village 6 will accommodate approximately 1810 dwellings, a village centre, town square/ village green, education and community and recreation facilities. It is envisaged the village will be developed over a four year period from 2006 – 2010.

2.4 DEVELOPMENT PLAN

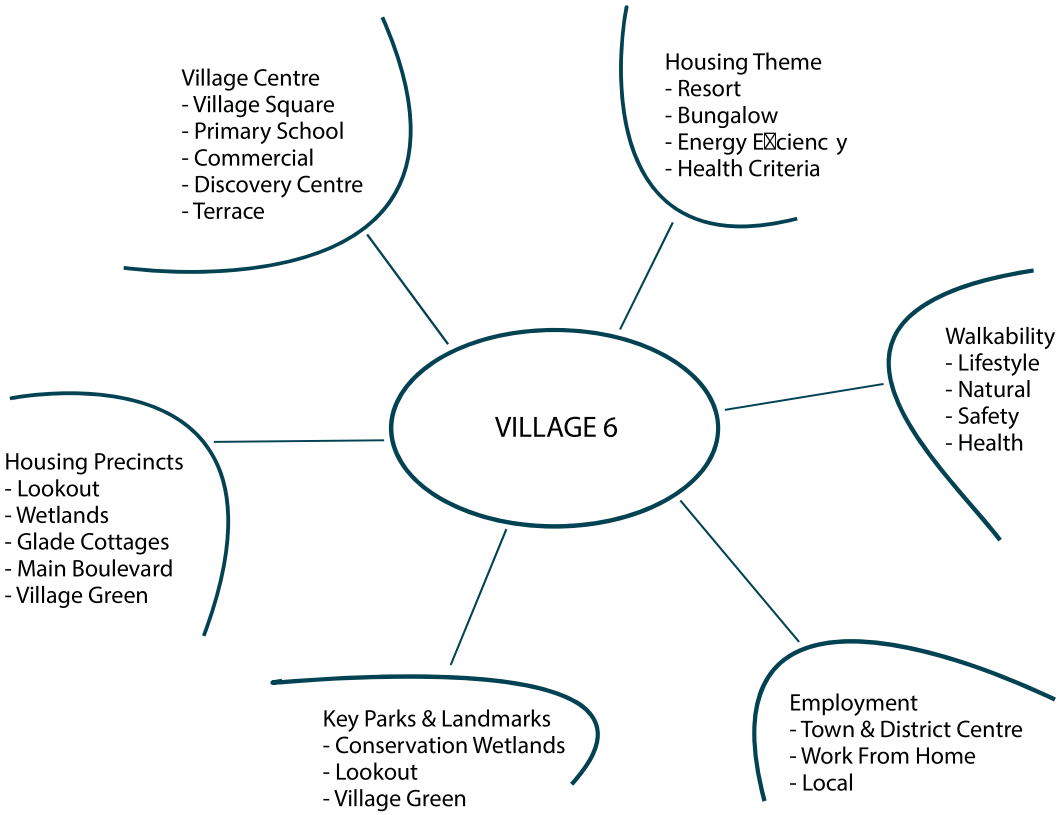
The Village 6 Development Plan is the product of the convergence of the locational, landform and landscape features of the site with the design objectives of sustainability, walkability and an identifiable built form.

The various components that comprise the Development Plan are set out below.

The existing landform and other natural features of the site have influenced the village design. The central north-south ridgeline will be retained in the southern portion of the village which allows the former landscape to be expressed through the design, creating a defining landmark for this new community and focus for 'dress circle' housing. Natural vegetation and wetland areas will be retained in the linear parkway network.

The village centre and associated community facilities will be centrally located and adjacent to the major east-west distributor road. The surrounding residential areas and retained ridgeline will overlook the village centre thereby ensuring passive surveillance opportunities.

The movement network is configured to allow convenient and safe pedestrian/cyclist access to the future facilities and services consolidated within this centre.



Bushfire attack level 19
(House must comply with section 6.2.1 of the Bushfire Management Plan)

Bushfire attack level 12.5
(House must comply with section 6.2.2 of the Bushfire Management Plan)

"Notwithstanding any statement to the contrary within AS3959-2009, (or relevant equivalent) any Class 1, 2 or 3 buildings or a Class 10a building or deck associated with a Class 1, 2 or 3 building to be erected on residential lots within Lexia stages 6, 8 and 9, that are either partly or wholly within 100 metres of the 'extreme' or 'moderate' Bushfire Risk areas as identified in "Figure 3 – Fire Management Risk" of Appendix D, shall comply with the requirements of AS3959-2009, or equivalent Australian Standard."

FIGURE 8 - VILLAGE 6 DEVELOPMENT PLAN

3.0 DEVELOPMENT PLAN STRUCTURE

3.1 MOVEMENT NETWORK, ACCESS & CIRCULATION

The internal movement network is based upon interconnected streets which provide direct and shared vehicular, pedestrian and cycle access to the village centre and linear parkway. The village will be accessed from external areas via numerous entries, evenly spaced along the adjoining distributor road, The Broadway.

There are two main entries from The Broadway, which provide direct access to the village centre and future connection to the Perth-Darwin Highway. The Development Plan makes provision for the future Perth to Darwin Highway connection shown on the Metropolitan Region Scheme. This connection will require earth-worked batters to achieve appropriate construction levels. The Development Plan holds back development from the north side of this road connection to accommodate the required batters.

The Stage 1 main entry is located in the south-west corner of the village adjacent the retained wetland. The retained wetland and associated vegetation defining this entry will signal a sense of arrival to Village 6. The entry road which leads to the village centre contains areas of widening to accommodate linear 'swale drains', in keeping with the sustainability objectives for the village.

In accordance with the parkway theme for the village, the interconnected streets will be tree lined to enhance the streetscape and provide shade for pedestrians.

Rear laneways will be used in proximity to the Centre and adjacent to the linear parkway and other POS areas to provide vehicular access to garages at the rear of lots, thereby reducing traffic movements on frontage streets. Coupled with reduced front house setbacks, the incorporation of laneways will encourage greater community interaction on frontage streets and in the linear parkway.

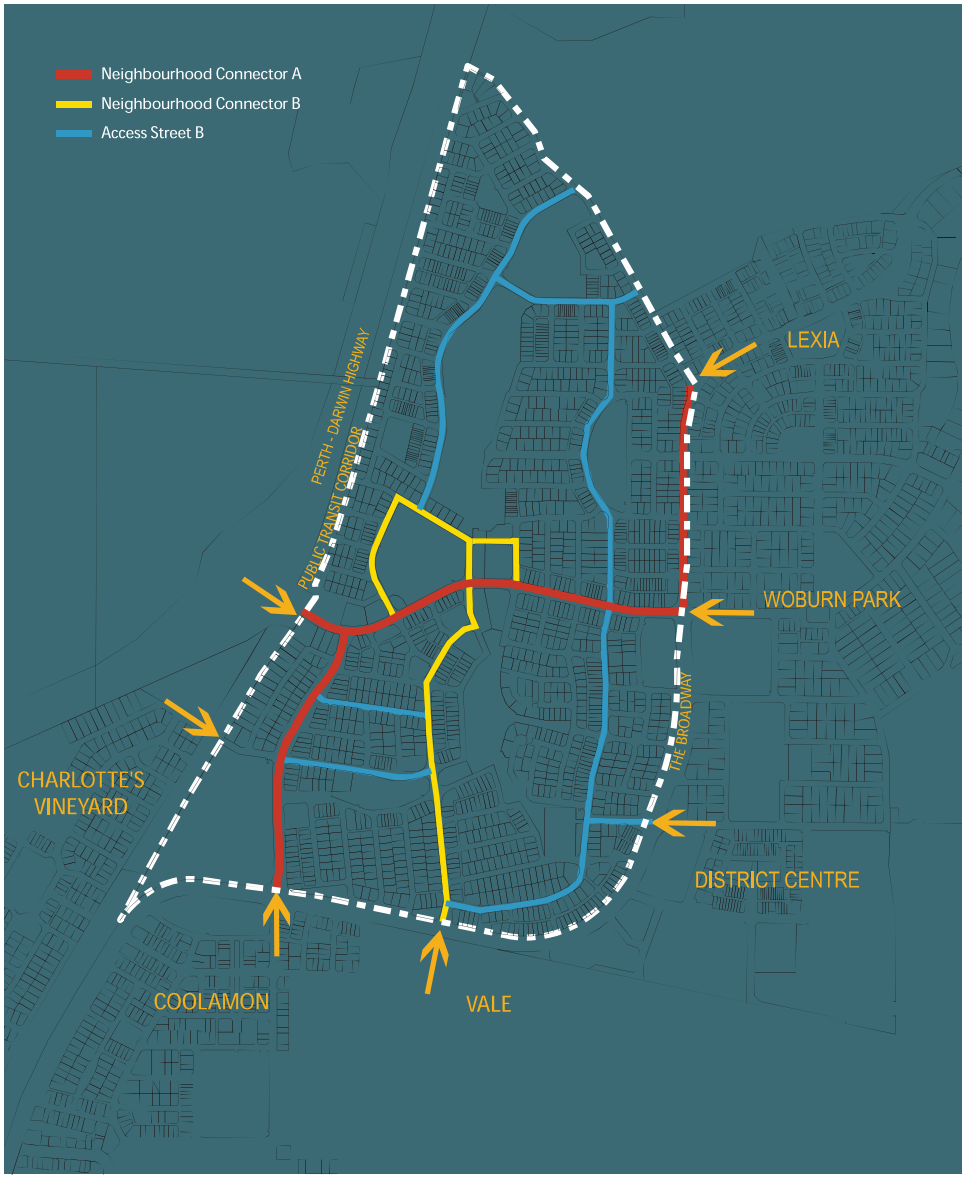


FIGURE 9 - ACCESS/LINKAGES & MOVEMENT NETWORK

3.2 VILLAGE CENTRE

The Village Centre will provide the primary focus for community activities and interaction and bring to the village a sense of permanency that is lacking in conventional suburban areas.

It will comprise, inter alia:

- Primary school (public)
- Local retail
- Village square
- Community building
- Residential housing

The local retail component of the Village Centre will comprise a small local centre (500m^2 floorspace) in accordance with the City of Swan endorsed 'Commercial Centre's Strategy'. This level of floorspace will comprise a range of local shops e.g. hairdresser, cafe, florist etc. Given the development of the Town Centre and Large Neighbourhood Centre adjacent The Broadway a likely outcome may be less than 500m^2 of retail. The balance of the retail land/Village Centre has been allocated for residential housing:

The central location of the Village Centre will bring most of the daily needs of the less mobile residents, including the aged and parents with children, within walking distance (400m–800m / 5 to 10 minute walk), giving them independence of access.

The concentration of civic, educational and commercial facilities will also obviate the need to drive from one use to another, as is commonplace in conventionally designed estates.

1 Wetlands
2 Community Building
3 Primary School
4 Village Square
5 Local Retail
6 Linear Parkway Connection
7 Childcare
8 Residential

The Development Plan proposes an interconnected street pattern and linear parkways that will provide direct access connections and an alternative route choice for accessing the Centre for vehicles and pedestrians/cyclists. The streets surrounding the village square will be 'pedestrian friendly' through the application of design techniques that promote a slow vehicular speed environment and through the appropriate application of paving treatments.

The Village Centre will be of a human scale, incorporating proportioned buildings that are sited close to the street, wide pedestrian pavements, shade protection, public art and tree planting. The re-design of the village centre will provide for a commercially viable local retail centre while retaining the existing parking area. The proposed local road adjacent the POS area will also provide the opportunity for additional public parking to serve the village centre and primary school.

The village square has been developed as a simple space that has the ability to accommodate a range of community activities such as weekend markets and fairs. These activities will be complemented by the adjoining community building. The grouping of uses near the village square will attract residents and visitors to this area and enable this space to become the centrepiece of the community and a major node for informal interaction.

3.3 PUBLIC OPEN SPACE NETWORK

The natural topography of the site has influenced the design of the open space system.

The village is structured around the retained wetlands and north-south ridgeline. These elements will be conserved within a central linear parkway that extends between wetland DC95 in the south-west corner, past the Village Centre and to the regional 'Parks and Recreation' reservation adjoining the northern village boundary. This parkway connection will bind the various elements of Village 6 and be designed to accommodate a range of activities, including both passive and active recreation.

A number of complementary, smaller POS areas/pocket parks will also be strategically sited for ease of access and to provide local amenity for nearby residential lots. A primary design objective is to ensure all residents are within a 5 to 10 minute walk of an open space area. The table adjacent provides an analysis of the public open space to be developed in Village 6 in terms of; recreation use (passive/active), whether the space performs a drainage function.

FIGURE 10 - PUBLIC OPEN SPACE

Public Open Space Schedule

Public Open Space Required (10%)	15.4ha
Public Open Space Provision	
1 – Passive/Active	0.5126ha
2 – Passive	1.4845ha
3 – Passive	2.5129ha
4 – Passive/Active	0.6492ha
5 – Active	2.2502ha
6 – Passive	0.2762ha
7 – Active	1.5668ha
8 – Active/Passive	0.2546ha
9 – Active/Passive	5.0999ha
10 – Active/Passive	1.5377ha
11 - Active/Passive	4.5677ha
12 - Active/Passive	0.3261ha
13 - Active/Passive	0.1806ha
POS Subtotal	21.219ha
Retained Wetlands	12.5784ha
Total Open Space Provided	33.7974ha

The intent and function for each of the proposed POS areas in Village 6 is detailed below.

1. A pocket park providing shade for passive recreation, and a small swale area providing opportunities for informal active recreation, particularly for children.

2. Intended to be a physical linkage from the retained wetlands to the adjacent conservation areas. This area will be a 'parkland cleared' setting suitable for both passive recreation and informal active recreation (i.e. young children).

3. A passive recreation area that will be a buffer between the retained wetlands and the adjacent residential development. This area will comprise harvested native vegetation and new plantings combined with drainage swales and a strategic firebreak/dual use path.

4/5. The central area of POS will contain trees and seating for passive uses, with grassed areas being available for informal active recreation (ie. younger children).

6. A soft and hard landscaped park which is the central focus for the Village Centre and will be utilised as an important meeting place.

In accordance with the Swan City Council approval of the Village 6 Development Plan; the owner/developer of the Ellenbrook Village 6 development shall maintain all landscape areas identified on the Development Plan for a period of two years.

7. A grassed swale area that will accommodate a range of informal active recreation needs while also performing a drainage infiltration function. A small portion of this POS area will be designated as a permanent drainage infiltration area. The landscaping (i.e. reeds) will be suited to a predominately inundated environment which will always be wet when a rain event occurs. Once the stormwater levels exceed the designated infiltration area, water will overflow into the adjoining grassed area for natural infiltration. During fine weather the grassed area will be available for active recreation use (i.e. as per Stage 5 park in Charlotte's Vineyard).

8,12,13. A pocket park which will service the surrounding cottage/group housing sites.

9/10. These two areas will accommodate some retained vegetation. Where the existing levels need to be modified to achieve acceptable servicing the 'harvested' native vegetation being; advanced trees, collected seeds and propagated plants will be re-introduced into the POS areas. The benefits of utilising the harvested native vegetation being a low water regime and the ability to attract native fauna. Area 6 will comprise a highpoint in the southern portion of the village, while providing important pedestrian linkages to the village centre and District Centre. Both these POS areas will perform an important pedestrian linkage function in terms of the north-south movement through the village. These areas will comprise a mix of passive/active areas as you move through them. These two POS areas will be characterised by predominately local native vegetation with pockets of enhanced open space areas for informal active recreation and picnics/bbq's.

11. A 'parkland cleared' landscape with trees and grass infiltration area that will accommodate both a passive/active function, while also acting as a buffer between the retained wetland and adjoining residential development.

3.4 PEDESTRIAN/CYCLE NETWORK

The pedestrian/cycle network for Village 6 is shown on the adjacent plan. The network is designed to provide direct and safe access as one moves through the village to the following attractions:

- Village centre
- Primary school
- Public open space
- Retained ridgeline
- Ellenbrook Town Centre
- Ellenbrook Large Neighbourhood Centre

As a minimum, a pedestrian footpath will be provided on one side of most streets to provide safe pedestrian movement and encourage community interaction.

The provision of dual use paths coincides with roads that would contain traffic volumes high enough to warrant separation of cyclist movement from vehicular traffic and in accordance with WA Planning Commission policy requirements. The remaining component of the cycle network constitutes local subdivisional roads carrying low traffic volumes that are appropriate for shared use by motorists and cyclists.

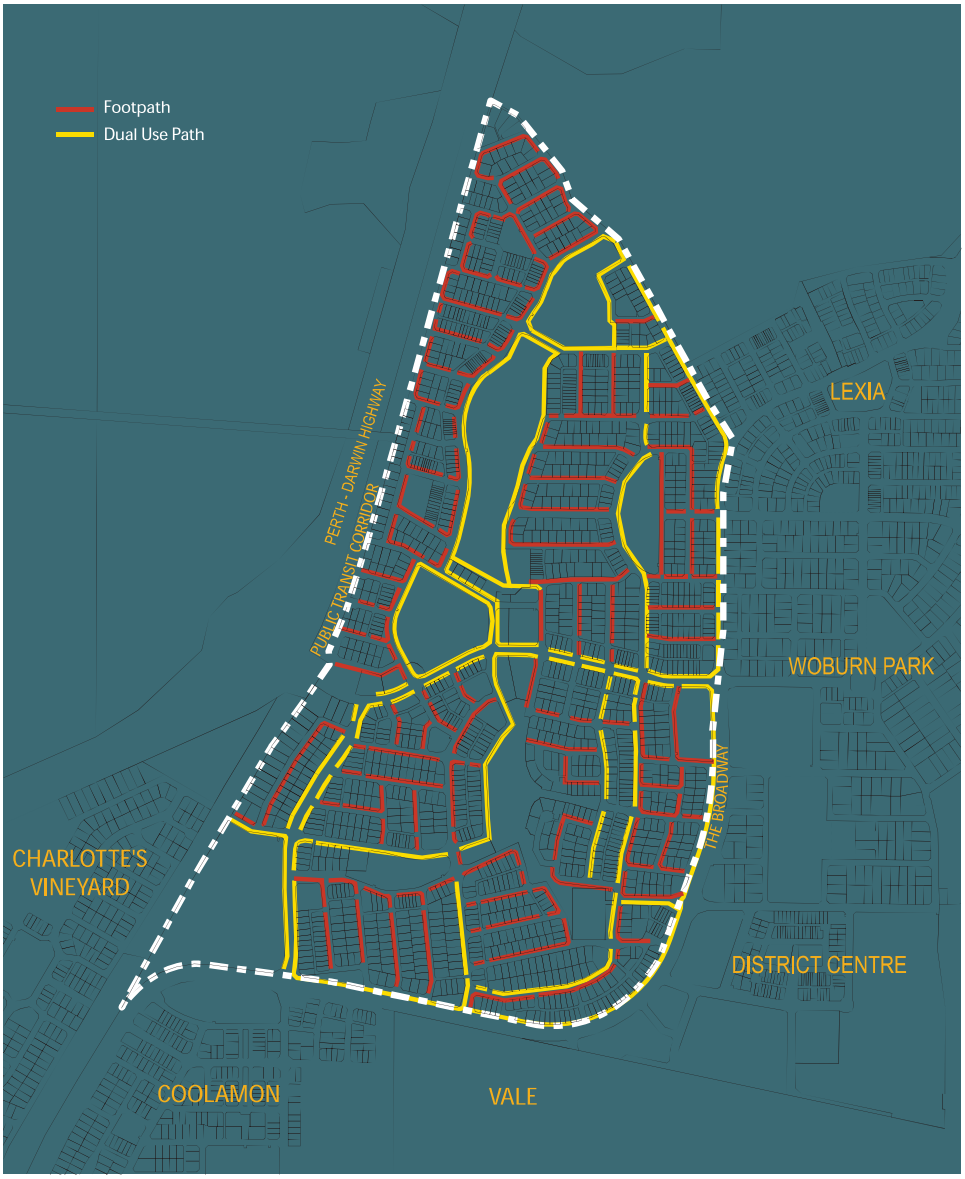


FIGURE 11 - PEDESTRIAN/CYCLE NETWORK

3.5 HOUSING THEME

The theme for Malvern Springs is "An environmentally sensitive home with simple, timeless styling".

3.5.1 Building Form

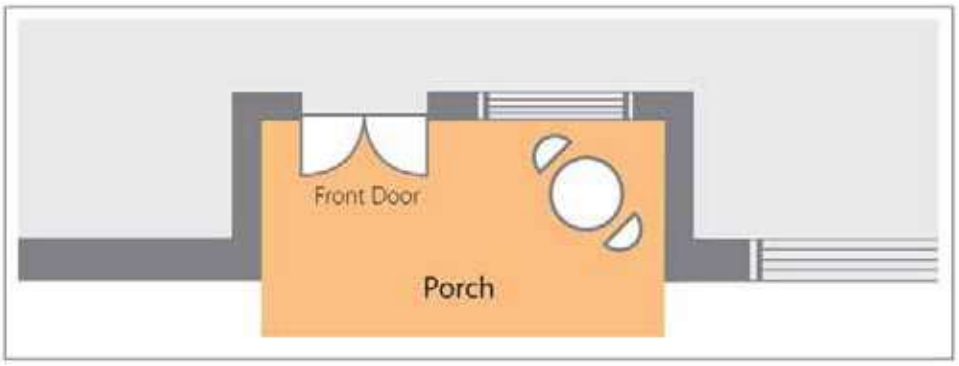
The form of new homes will reflect the theme through the incorporation of elements such as pitched roofs, entry porticos, formal residential entries facing the primary street elevation and verandahs.

3.5.2 Front Entries

A front entry feature, that is clearly visible from the street, will be incorporated into the front facade design. A good effect can be created through the incorporation of entry porticos or design features such as side and highlight glazing panels, the use of accent colours, feature lighting etc.

3.5.3 Front Porches

All homes at Malvern Springs must include a front porch. This will allow you to have a lovely outdoor space at the front of your home where you can relax and chat to your neighbours. The inclusion of front porches and the resulting increased activity can also help to promote safer streets.



This diagram indicates a good front porch, out of the way of access to the front door.

3.5.4 5.0 Metre Product

The 5 metre wide lots allows for the construction of a one or two bedroom single storey terrace homes which offer apartment style living on a green title lot. Due to the size and design of the dwelling it is suitable to meet a variety of demographics including singles, young couples, young families and retirees. The lots are to be located in areas which are close in proximity to services and facilities including schools, public open space, public transport, cycle ways and commercial facilities. The strategic location of these lots will contribute to a vibrant and active neighbourhood whilst promoting walking and cycling rather than travel by car.

3.6 RESIDENTIAL LOT YIELD & MIX

Australians have become more discerning and selective in their preferred choice of urban environment for living, working, learning and recreating. The role and function of the home is now more varied than at any time in Australian history. Accordingly, Village 6 has been designed to offer a range of lots and facilities to satisfy a diversity of lifestyles and associated demands

A diverse range of lot and housing types will be provided within Village 6. Village 6, while catering for first homebuyers with an affordable cottage and traditional lot product, will also be well suited to the second and third homebuyer given its parkway setting and proximity to the Town Centre and future Large Neighbourhood Centre.

Provided adjacent is a summary of land use, projected dwelling yield and population forecasts for Village 6.

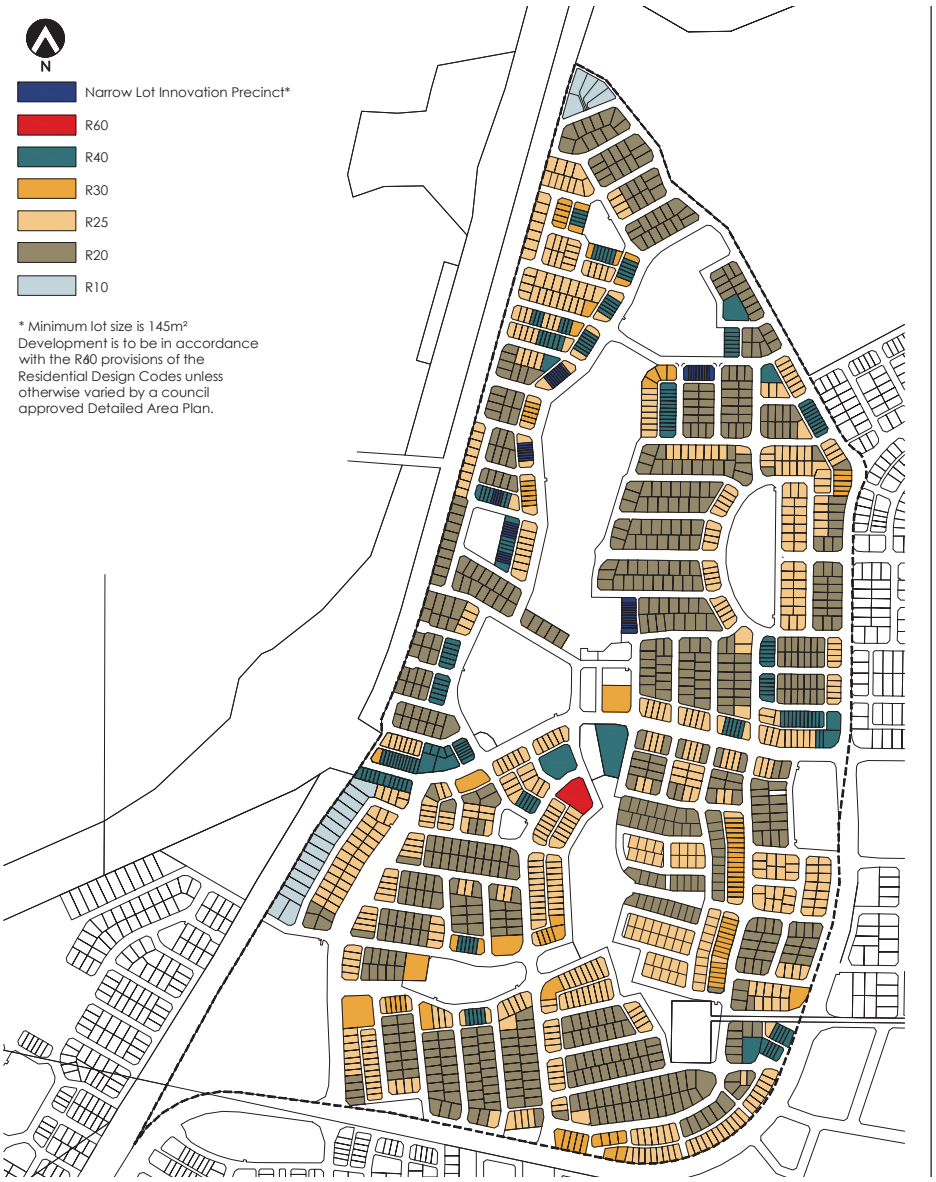


FIGURE 13 - RESIDENTIAL DENSITIES

Land Use Summary

Total Area of Village	182ha
Deductions	
• Primary School (Public)	4.0ha
• Village Centre	0.32ha
• Retained Wetlands	12.58ha
• N/S Distributor Road (The Broadway)	9.1ha
• Perth/Darwin Highway Interface	0.83ha
Total Deductions	26ha
Nett Subdivisible Area	156ha
10% POS	15.6ha
POS (provided on Development Plan)	21.22ha
Nett Residential Area (Roads Included)	134.78ha
Nett Residential Area (Roads Excluded)	84.77ha

Projected Dwelling Yield and Mix

R-CODE	LOTS	DWELLINGS
R10	21	21
R20	752	752
R25	626	628
R30	98	139
R40	193	262
R60	53	73
OVERALL	1743	1875

Nett Dwelling Density/ha - *13.91 dwelling / ha (Roads Included)*
- *22.12 dwelling / ha (Roads Excluded)*

Estimated Population - *5625 (Based on average people per household rate of 3 – ABS, 2011 Census, Ellenbrook Statistical Area 2)*

Population Process Density/ha - *41.73 people / ha (Roads Included)*
- *66.36 people / ha (Roads Excluded)*

4.0 STATUTORY PLANNING

4.1 ZONING/PLANNING APPROVAL PROCESS

The Ellenbrook project and specifically Village 6 are zoned 'Urban' under the Metropolitan Region Scheme (MRS). In this context the Urban zone is a generalised zoning category which may include residential, retail, community services, local open space and related activities. The planning process undertaken to facilitate development of land for urban purposes is described below.

Following the rezoning of the Ellenbrook project to 'Urban' under the MRS, the City of Swan Town TPS No. 17 was amended to rezone the Ellenbrook landholdings, including Village 6, to 'Special Use Zone – Ellenbrook'. This zoning establishes a tiered strategic planning framework for the implementation of urban development. Subdivision and development at Ellenbrook is proceeding in accordance with this staged approval process, which embodies the following:

- Structure Plan
- Development Plan

A Structure Plan has been prepared and approved for Ellenbrook which provides the broad structure for future development at Ellenbrook. This development plan represents the next step in the strategic planning process with the objective to refine proposals in the Structure Plan affecting the subject land and to guide development. Detailed Site Plans are prepared on a per lot basis, where warranted, to enhance and expand upon the planning proposals or the provisions contained within a Structure Plan or Development Plan.

4.2 DEVELOPMENT CONTROL

In accordance with Clause 4 of 'Schedule 4 Special Use Zones (No. 4)' development control and land use permissibility for Village 6 will be based upon the City of Swan TPS No. 17 in conjunction with the Zoning Classification Plan as contained in this Development Plan.

The Zoning Classification Plan depicts the location of the various land use activities within Village 6. As noted on the plan, no further fragmentation of lots for development in excess of the R20 standards will be permitted except where nominated on Detailed Site Plans or the Density Sites Plan as adopted by Council.

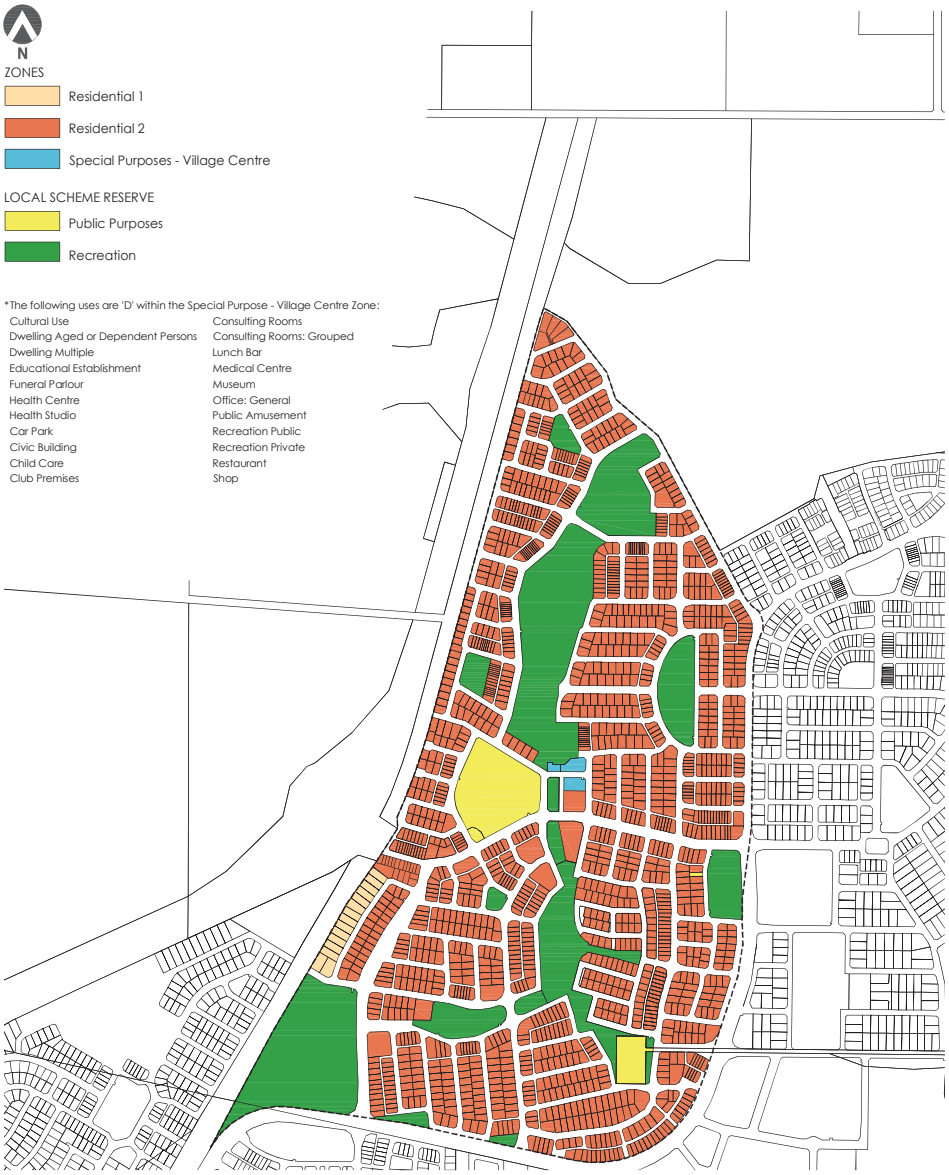


FIGURE 14 - ZONING CLASSIFICATION PLAN

* *The following uses are 'D' within the Special Purpose - Village Centre Zone:*

Cultural Use
Dwelling Aged or Dependent Persons
Dwelling Multiple
Educational Establishment
Funeral Parlour
Health Centre
Health Studio
Car Park
Civic Building
Child Care
Club Premises
Consulting Rooms
Consulting Rooms: Grouped
Medical Centre
Museum
Office: General
Public Amusement
Recreation Public
Recreation Private
Restaurant
Shop

5.0 TRAFFIC/ROAD PLANNING

A revised traffic report for the modified Village 6 design has been prepared by Sinclair Knight Merz – Traffic Engineers and appears at Appendix A. The projected traffic volumes in the village are shown in the report and incorporate both internal and external vehicle movements. The resultant volumes are considered acceptable for the proposed residential development.

The proposed road network will adequately accommodate the projected volumes of traffic and provide good accessibility and permeability throughout the village. The report also provides details on; traffic management, road design, public transport routes and the pedestrian/cycle network.

6.0 COMMUNITY FACILITIES

6.1 EDUCATION

The planning for Village 6 encompasses development of a government primary school. The primary school is located in the village centre and abuts the western boundary of the village square. It is proposed for the school administration/library building to be developed with frontage to the village square.

6.2 ELLENBROOK COMMUNITY PLAN

A Community Plan is an overall strategy for the provision of facilities and services designed to meet the objectives of the community in an interactive and participative manner. The Ellenbrook Community Plan comprises:

- Identification of facilities and services required by the Ellenbrook community;
- A program for the timely development of such facilities and services; and
- Process for development, including community consultation with residents and other interested parties.

Ellenbrook's innovative Community Plan was compiled with assistance from the broader community, both on an individual basis and through various associations and agencies. The plan has been endorsed by the City of Swan and represents an important planning tool for service providers and creates a sense of community ownership.

6.3 COMMUNITY/CULTURAL FACILITIES

The Ellenbrook Community Plan outlines a range of community facilities for Village 6 including the following:

- Primary school
- Child care
- Family day care
- Play group / toy library
- Child health service
- Place of worship

The village centre will accommodate a community building/house that will incorporate a flexible design to accommodate a range of services and facilities as outlined above. The design of this building and the functions it performs will be determined in further detail in collaboration with the City of Swan.

The objective will be to ensure the community building and the programmes and services provided from this facility respond to the needs of the Village 6 community. In some instances the facility may cater to a wider catchment, such as if the facility provides an environmental interpretation function linked with the wetland reserve.

Consultation with the Ellenbrook community regarding the design and function of this facility would be encouraged.

7.0 SUSTAINABILITY

7.1 INTRODUCTION

The Western Australian State Sustainability Strategy (SSS) was released in September 2003. The purpose of the Strategy is to establish a framework for the development and implementation of initiatives that reflect the principles of sustainability. The primary goal of the Strategy for the creation of new communities is to "... plan and provide settlements that reduce the ecological footprint and enhance quality of life at the same time."

The Strategy outlines objectives and strategies to ensure new communities embrace sustainability including:

- the integration of land use and balancing transport;
- the reduction and management of waste;
- sustainable energy, built form and natural resources.

The existing statutory and policy planning framework operating under this overarching strategy, including in particular Liveable Neighbourhoods, gives guidance for Village 6 in regard to appropriate land use, transport and infrastructure, and the protection of natural resources.

The project team in conjunction with Ellenbrook Management are currently researching and preparing reports that will allow for the implementation of the following sustainability initiatives in the Village 6 development;

- Housing Design Guidelines
- Sustainable Housing Report and Recommendations
- Water Conservation Strategy for POS landscaping/front yards of dwellings
- Water Management Strategy - stormwater disposal/swales etc.

The Development Plan has been reviewed in terms of the orientation of the lots to facilitate dwelling designs that enjoy the benefits of passive solar access. The review identified 85% of the lots have their long axes within the range 20^{O} from the N/S and E/W alignments to take advantage of Winter solar access and Summer sun deflection

7.2 SUSTAINABILITY PRINCIPLES

The Development Plan promotes an urban settlement focussed on an enhanced natural landscape with good access to recreation opportunities, community facilities and services, the Village Centre and Town Centre. Described below are the sustainability principles inherent in the Development Plan design.

7.2.1 Urban Structure

The urban structure expressed in the Development Plan embraces many of the principles set out in Western Australia's leading urban planning initiative - the Liveable Neighbourhood Community Design Code, Edition 3 (WAPC 2004). This Code is aimed at fostering sustainable community development through six key elements of community design and development.

Key initiatives proposed for Village 6, that are consistent with the Code, include: mixed use development; a choice of quality density housing; a walkable movement network; accessible parks and community facilities; and a well defined Village Centre.

7.2.2 Transport Alternatives

The range of lot sizes and building form, together with the permeable and legible movement system whereby all elements of the village are within approximately a 10 minute walk, will contribute to an environment that is highly conducive to walking and cycling.

To entrench walking and cycling as an integral part of the culture and lifestyle a dual use path and/or footpath will be provided on every street and all streets will have good surveillance, shady trees and offer stimulating local character.

Furthermore, regular public transport services and a planned future transit connection to the Town Centre will promote access using public transport.

The availability of viable alternatives to private motorised transport, will translate to reduced total kilometres travelled and significant annual reductions in carbon gas emissions and cost savings per household.

Access for all people, including people with disabilities and those without access to a motor vehicle, will foster an inclusive community. Reducing car dependency through urban design and community infrastructure will also enable people to be more physically active and healthier.

7.2.3 Affordable Housing

Housing affordability has declined in Perth in recent years with increasing land and building costs. Village 6, like the other villages at Ellenbrook, will incorporate a proportion of public housing and privately owned affordable housing.

Low income households will be able to live in an environment supported by essential infrastructure, public transport and local employment opportunities in the expanding Town Centre. The cumulative effect will be a socially inclusive and diverse community.

7.2.4 Building Design

Design Guidelines and Detailed Site Plans will be used for defined housing precincts to control the quality of the built form and promote sustainable practices, including buildings oriented and designed for passive solar access, recycled materials, breezeways and surveillance of public areas.

7.2.5 Safety

Open spaces will have surveillance, lighting and appropriate landscaping to enable safe community access and use.

A comprehensive network of pathways will be provided to ensure safe access for pedestrians and cyclists and streets will be designed to incite a slow speed environment.

7.2.6 Landscape & Open Space Systems

The public realm will be a central focus of Village 6 and contribute to its distinctive character and identity. It will feature a linear park system incorporating highly accessible spaces that will comprise enhanced wetlands and a low maintenance landscape with water sensitive design principles.

The opportunity also exists to incorporate alternative stormwater drainage design (i.e. swale drains) into the streetscape with linkages to the open space network.

7.2.7 Local Identity

The Development Plan is configured to allow the defining qualities of the former landscape of the site to permeate the design.

Landscaping treatments, public art and building design will all contribute to identity and place association.

The residents will be provided with a rich assortment of experiences, originating with the open spaces of the hill top park through to intense urban spaces focussed around the Village Centre.

7.2.8 Inclusive Community

The village will be built in accordance with sustainable practices and incorporate a flexible design that is capable of accommodating the needs of all members of the community, including parent groups, young people and the elderly.

The walkability of Village 6 and emphasis on the public realm will be imperative to creating opportunities for planned and unplanned interaction and promoting social cohesion.

8.0 ENVIRONMENT

8.1 ENVIRONMENTAL STUDIES

A number of detailed environmental studies have been conducted over the Ellenbrook project area including the Public Environmental Review (PER) assessed by the Environmental Authority in 1992. As a result of this assessment a major conservation area of approximately 600ha was established and reserved to the west of Village 6. On the basis of the conservation outcomes achieved within the reserved area, the balance of the land (i.e. Village 6) has been approved for urban development subject to the management of groundwater, drainage and nutrient export. Ongoing environmental studies include protection of the Lexia Wetlands and associated conservation areas, and involve the follwoing:

- Routine monitoring of shallow groundwater levels in the vicinity of the wetlands, and water levels in the wetlands, predominantly during the winter – spring period of groundwater recharge; and

- Evaluation of the monitoring data, including comparative evaluation of data from nearby Water Authority bores, in order to revise and update the interim water level criteria for the Lexia Wetlands (established as condition of environmental approval for the Ellenbrook project).

8.2 DRAINAGE & NUTRIENT MANAGEMENT PROGRAM

Following approval of the PER, a number of conditions were set by the Environmental Protection Authority. One condition required more detailed drainage and nutrient management work to be undertaken. A Drainage and Nutrient Management Program was prepared for the northern catchment of Ellenbrook and is being implemented.

8.3 ENVIRONMENTAL MANAGEMENT

An environmental management report has been prepared by RPS Bowman Bishaw Gorham – Environmental Management Consultants and appears at Appendix B. The report provides details on the physical and biological environment within Village 6 and confirms the implementation of the Development Plan, as proposed, accords with the environmental assessment of the overall Ellenbrook project and approvals issued by the Minister for the Environment.

As part of the proposed environmental management regime, the four damplands within the development area or directly adjacent have been identified and an analysis carried out in terms of achieving a sustainable balance between environmental, social and economic outcomes. The northern (DC105) and south-western (DC95) damplands will be retained within POS. A management plan for DC95 has been approved by DOE in June 2005. A management plan is currently being prepared for DC105. The southern (DC101) and eastern (DC144) wetlands will be filled to facilitate development.

Incorporation of these areas within Village 6, and their proposed use for vegetation retention, passive recreation and drainage is consistent with the Minister for Environment's approval of the project in Statement 288 and subsequent clearance (via Statement 345) of Condition 4.1. The EPA has advised, in a letter dated 27 October 2004, that the project continues to be covered by the Minister's approval and subsequent stages of subdivision within Village 6 do not require any further referral to the EPA.

9.0 LANDSCAPE

9.1 LANDSCAPE APPROACH

Village 6 will be a community living within a rich natural setting. The "enhanced natural" character of the site will have distinctive landscape character sub precincts related to the topography and retained natural features of the area.

The core of all the areas will be a linear park system that incorporates the retained wetlands and links to the high point of the site.

The objectives of the landscape are;

- To create an environmentally appropriate landscape
- To bring a 'Village' atmosphere to urban life
- To retain and enhance the wetlands
- To integrate the landscape within water sensitive design principles

The landscape of Village 6 falls into two broad categories, Open Space and Streetscapes.

The open spaces will form the dominant feature of the community with extensive areas of mature retained vegetation.

The streetscapes will present a different character and will include some drought tolerant exotic tree planting. The streets of the urban cells will be designed to have trees planting selected and located for solar access to the buildings, wind reduction and aesthetics.

9.2 PUBLIC OPEN SPACE

The Public Open Spaces are arranged to ensure all of the community has easy and direct access to a linear park system. The linear park system accommodates a series of walks and cycle routes that link to provide diverse recreational routes and circuit walks throughout the community.

The broad retained conservation areas will be enhanced with supplementary planting of locally native species and made accessible to the community.

The wetlands will be protected by managing public access to specific points with boardwalks and fenced trails that will incorporate interpretation installations.

The wetlands and damplands will form the heart of the linear parkland system providing the structuring landscape framework and dominant character of the lower precincts of the village.

The landscape design for the open spaces will adopt a landscape strategy of "Strings, Beads and Settings".

- Strings being maintained movement routes.
- Beads, the intensively developed parklands that provide a destiantion point and a local facility.
- Setting, the structural bushland and retained vegetation.

This strategy will deliver a maintainable, manageable, quality landscape that focuses maintenance and water requirements to key areas, creating an environmentally responsible landscape.

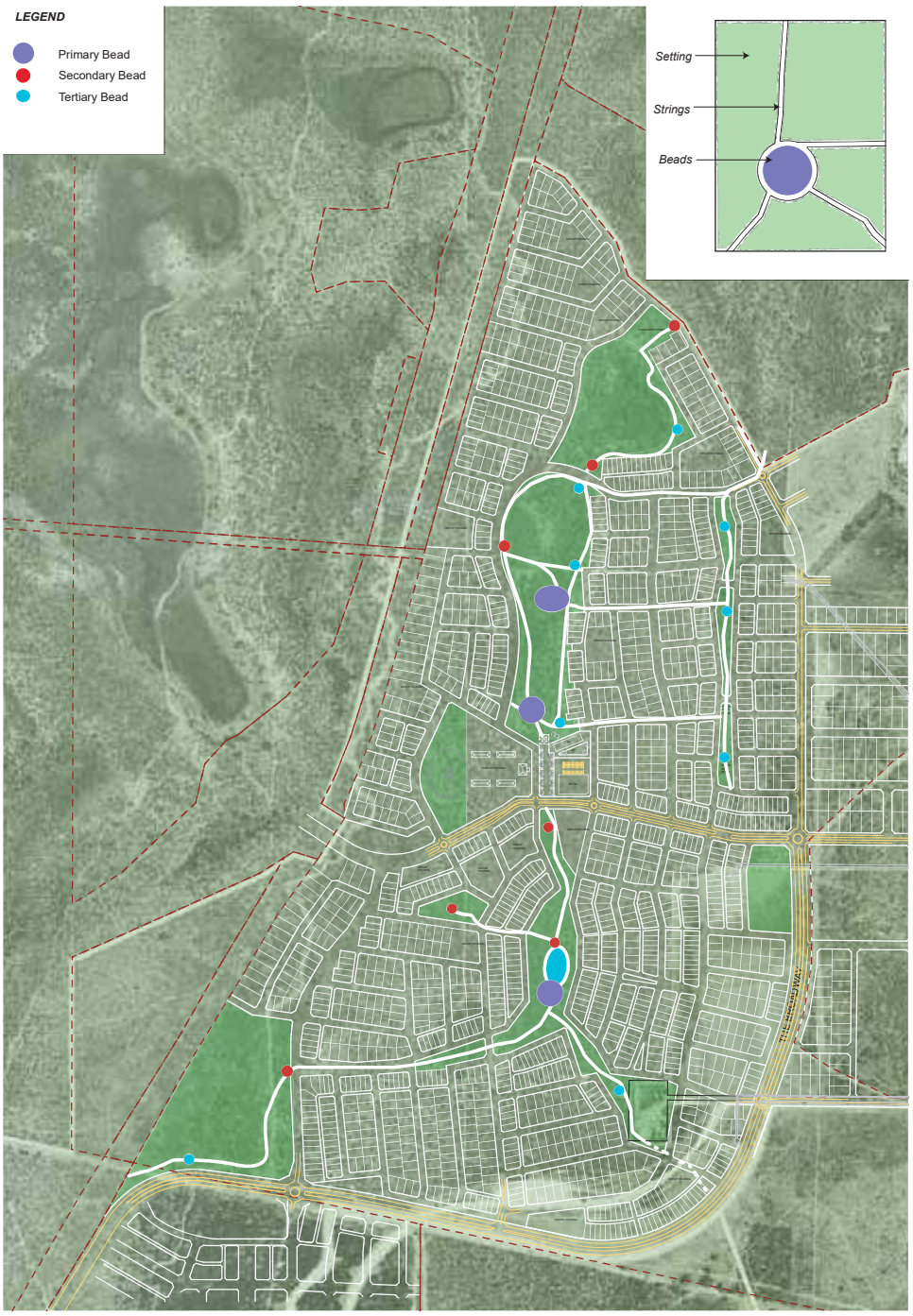


FIGURE 15 - LANDSCAPE DESIGN

Source: EPCAD

9.2.1 Strings

The maintained corridors will be paths and trails that ensure that residents have a safe series of recreational and destination routes. The linking natural parkland will be well observed from adjacent housing that will afford a high level of natural surveillance. The strings will create "cool corridors" – shade walks with glades around the community. The character of these linear spaces will draw on the native bushland but will be presented with contemporary detailing of incidental seating areas and structures and the presentation of native vegetation in bold and dramatic way. Linear features, such as ephemeral streams, will lead linear park users from one area to the next. Such features accepting and celebrating the seasonal landscape changes.

9.2.2 Beads

The beads are nodes of highly maintained and developed parkland, providing destinations and local facilities. They will range from local play areas and picnic spots to more active open kick-a-bout areas and an interpretive centre. The beads associated with the wetlands will be designed to provide interpretive information in regard to the environment while still producing facilities for the community. The bead areas will be located to enable easy community accessibility and to maximise marketing exposure.

9.2.3 Setting

The major component of the open space network will be the setting, which will also create the dominant landscape of the community. The setting will include the retained vegetation but will also comprise new areas of recreated native landscapes that are planned and designed to provide a quality aesthetic.

The setting will be a low maintenance, with the more intensive maintenance and irrigation being focused on the strings and beads. The landscape will create a strong visual and physical indigenous landscape that uses native plants and local materials. This will be counterbalanced with contemporary design and a bold use of colours drawn from the inherent colour palette of the local environment. Wherever practical drainage will be integrated within the broader landscape to provide passive irrigation and created damplands.

The plan provides a series of linking linear spaces that will be developed as extensions of the wetlands and damplands. They will create shady corridors that carry informal walking and cycling routes around the community linking other park activity spaces. As these corridors gain in level the plant species will change reflecting and emphasising the level change. The high point of the linear park system opens to form an activity area; a bead with extensive views. This area will create a contrasting environment to the lower wetlands.

The landscape approach recognises the importance of the native vegetation and the value that a strong "enhanced natural" landscape structure creates as a recreational, aesthetic and functional local environment.

The dominant open space network will create the character of Village 6. The "enhanced natural" approach is characteristic of areas of bushland that have become valued parklands incorporating limited areas of managed lawns and introducing some species that accept the conditions but are not locally native.

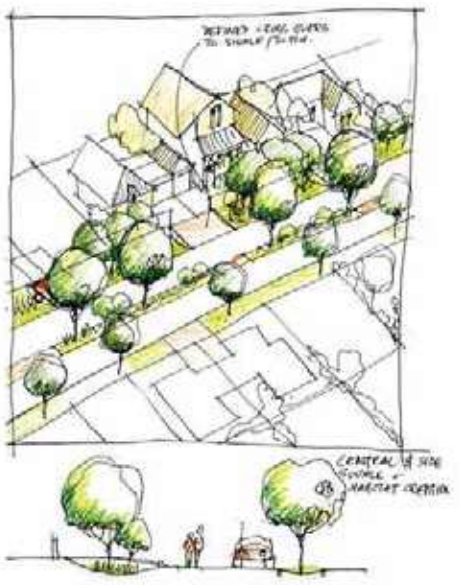
9.3 STREETSCAPE

In addition to the structuring open space landscape, the streetscape of the development areas will play a critical role in defining the village identity. The streetscape will also utilise indigenous species augmented with Australian natives and selected exotics as highlights and where solar access to development is appropriate.

The exotic range will be drawn from species that are tolerant of the local site conditions, low water users and have references to the species traditionally established by early settlers in the area (species established at the nearby heritage dam, mill and church).

A diverse streetscape hierarchy is proposed that creates distinctive places ranging from informal street planting to formal avenues of large trees with monocultures of native ground covers. The need to facilitate solar access to selected streets and spaces will dictate species selection. It is intended that each sub neighbourhood within Village 6 has a distinctive character that is created from the topography, relationship to open space and street tree planting.

The landscape treatment of the streets will reinforce the hierarchy of roads. Species, planting types and verge treatments will create a diverse range of experiences and integrate drainage within the landscape. Verge and median swales will manage surface drainage while providing opportunities for passive irrigation to the landscape.



10.0 ENGINEERING SERVICES & INFRASTRUCTURE

A comprehensive Engineering Services Report has been prepared by Cossill & Webley – Consulting Engineers and appears at Appendix C. This report provides details on the following engineering components relating to the Development Plan and provision of services:

- The provision of a reticulated water supply and sewerage disposal.
- The provision of public utility services i.e. underground reticulated electricity supply, telephone and natural gas supplies.
- Drainage strategy, based upon the approved Drainage and Nutrient Management Programme.
- The required road network to service the development.

10.1 TELECOMMUNICATIONS

The current development at Ellenbrook incorporates a BES underground cable which provides for high speed internet access, community intranet and television reception. This cable network is one of the most advanced in Australia being implemented in a new town project. Ellenbrook Management is currently liaising with key telecommunications groups to identify the appropriate technology to implement for business development in the Estate. Preliminary feedback has identified the need to increase the capacity of the network to accommodate future technology/information requirements. This is best achieved via a fibre optic system which is currently being considered.

11.0 BUSHFIRE MANAGEMENT

A Bushfire Management Plan has been prepared for lots within what is recognised as Stage 17 and Stage 18. These lots are currently unconstructed and a Bushfire Management Plan has been prepared to address the requirements for bushfire preparedness and bushfire damage mitigation.

Notwithstanding any statement to the contrary with AS3959-2009, (or relevant equivalent) any Class 1, 2 or 3 buildings or a class 10a building or deck associated with a Class 1, 2 or 3 building to be erected on residential lots within Malvern Springs, that are either partly or wholly within 100 metres of the 'extreme' Bushfire Risk areas as identified in 'Figure 4 – AS3959 Design Requirements Plan' of Appendix D, shall comply with the requirements of AS3959-2009, or equivalent Australian Standard. These areas are declared as 'Bushfire Prone Areas' (areas subject to a moderate or extreme bushfire hazard risk, in addition to those areas that are within 100 metres of a moderate or extreme bushfire hazard risk) for the purpose of Local Planning Scheme No.17 and the Building Codes of Australia, and development within these areas are subject to additional planning and built form controls, including a requirement for Detailed Area Plans as a condition of subdivision and/or the imposition of Australian Standard 3959 as a component of any relevant Building Licence issued.

To ensure compliance with the 'Planning for Bushfire Protection Guidelines' (WAPC, 2010) as AS3959-2009, the risk and threat of retained vegetation has been assessed and a Bushfire Attack Level of 19 or 12.5 has been assigned through the Bushfire Management Plan (Please refer to Figure 16 and Figure 4 –AS3959 Design Requirements Plan of Appendix D). BAL 19 and BAL 12.5 require particular construction standards, which are provided in detail within the Bushfire Management Plan and AS3959-2009.

The Bushfire Management Plan also outlines mitigation strategies, namely:

- Hazard management;
- Bushfire risk management (advise to homeowners, etc);
- Appropriate road layout and service provision;
- Public education and community awareness;
- Fire safer areas; and
- Ongoing assessment of fire management strategies.

For a more detailed assessment please refer to the Bushfire Management Plan contained in Appendix D.

FIGURE 16 - BUSHFIRE MANAGEMENT PLAN

APPENDIX A DEVELOPMENT PLAN

BUSHFIRE MANAGEMENT

* Bushfire attack level 19
(House must comply with section 6.2.1 of the Bushfire Management Plan)

\+ Bushfire attack level 12.5
(House must comply with section 6.2.2 of the Bushfire Management Plan)

"Notwithstanding any statement to the contrary within AS3959-2009, (or relevant equivalent) any Class 1, 2 or 3 buildings or a Class 10a building or deck associated with a Class 1, 2 or 3 building to be erected on residential lots within Lexia stages 6, 8 and 9, that are either partly or wholly within 100 metres of the 'extreme' or 'moderate' Bushfire Risk areas as identified in "Figure 3 – Fire Management Risk" of Appendix D, shall comply with the requirements of AS3959-2009, or equivalent Australian Standard."

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DEVELOPMENT PLAN
Malvern Springs (Village 6), Ellenbrook
City of Swan

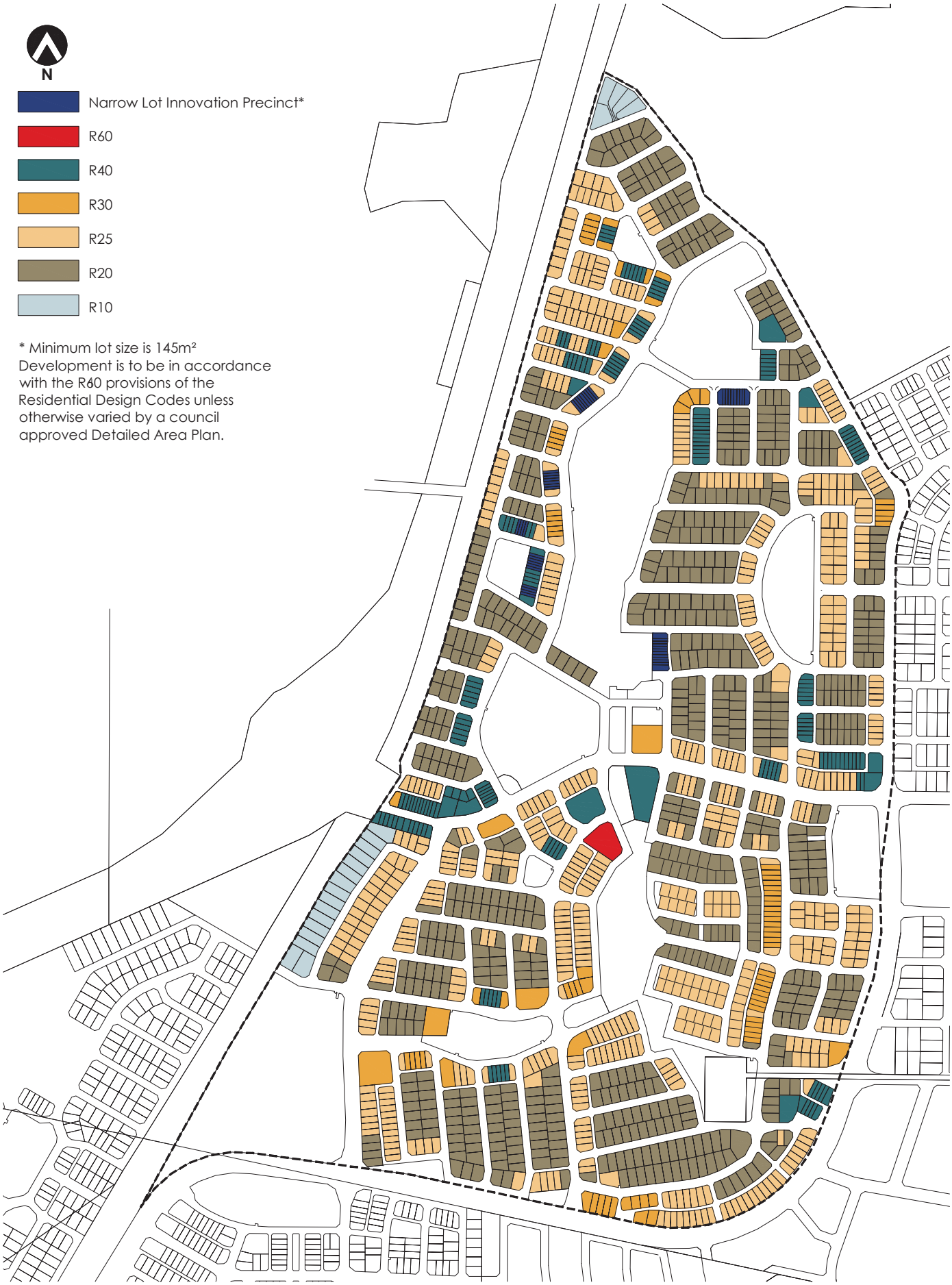
SIZE A2
1:5000 0 metres 50 100 150 200 300

REV	DESCRIPTION	YYMMDD	DRAWN	APPR'D
C	REVISE DESIGN - NTH LINK & HILLSIDE	150327	SB	EJ
B	UPDATE DESIGN	130307	SB	DD
A	BASE PLAN EJV VL6 &L 18E	120229	SJ	TT

REF NO. EJV VL6 | DRAW NO. RD3 002 | REV. C

DISCLAIMER: ISSUED FOR DESIGN INTENT ONLY. ALL AREAS AND DIMENSIONS ARE SUBJECT TO DETAIL DESIGN AND SURVEY

APPENDIX B DENSITY PLAN



great places

SIZE A4_1:10000

0 metres 100 200 300 400 500

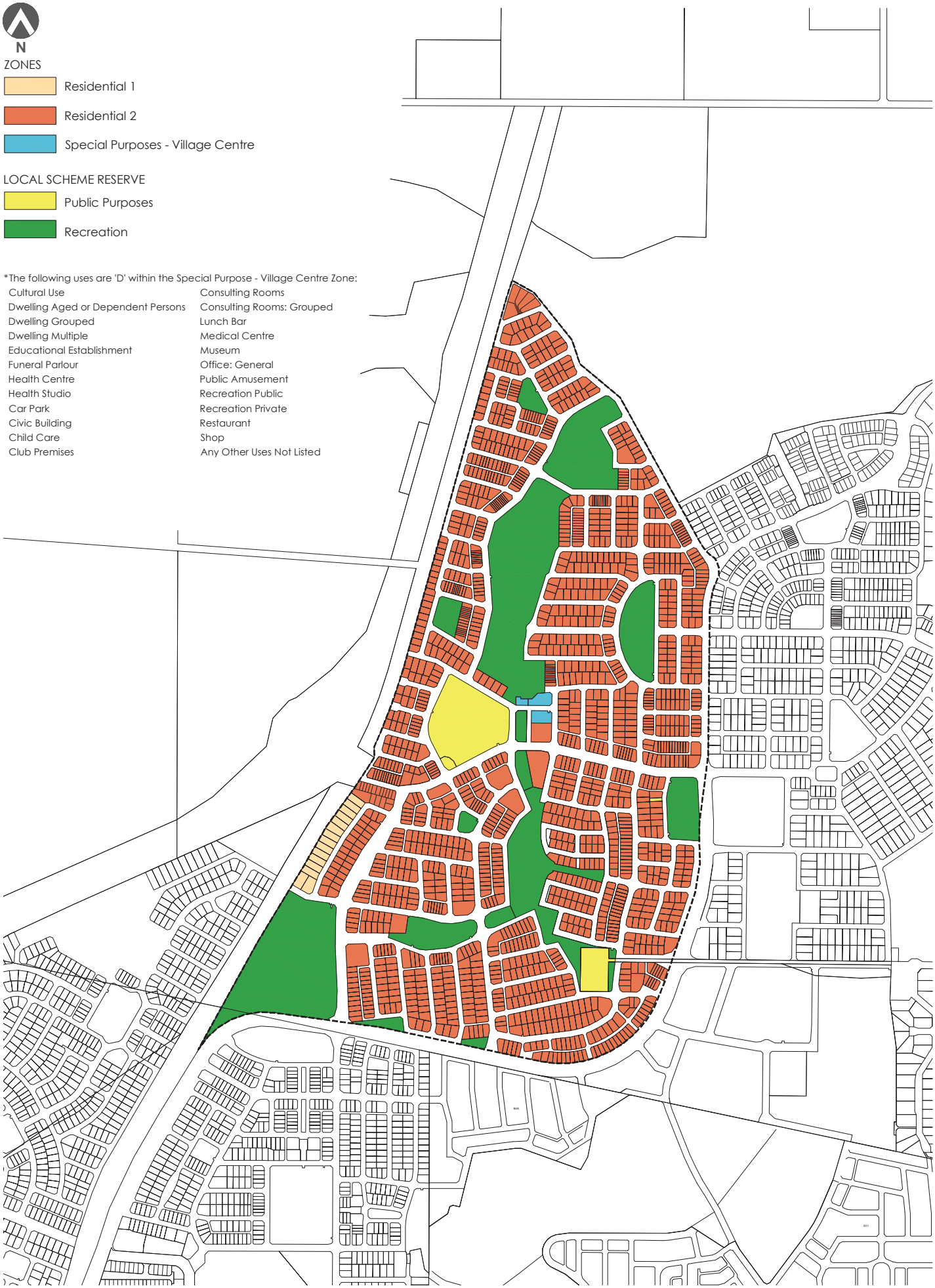
PROPOSED DENSITY SITES PLAN

Malvern Springs, Ellenbrook

City of Swan

JOBE CODE	DRAW NO.	REV.
EJVVL6	RD1 009	J

APPENDIX C ZONING PLAN



great places_

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CADASTRAL INFORMATION
SOURCE:
YYMMDD:
DWG REF:
PROJECTION:

AERIAL PHOTOGRAPHY
SOURCE:
YYMMDD:

SIZE A3

1:10,000

0 metres 100 200 300 400 500

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B	REVISE DESIGN - NTH LINK & HILLSIDE	150327	SB	EJ
A	BASE PLAN EJV VL6 RD3 003B	130109	SB	DD

ZONING CLASSIFICATION PLAN
Malvern Springs, Ellenbrook
City of Swan

REF NO. EJV VL6
DRAW NO. RD1 014
REV. F

APPENDIX D TRAFFIC REPORT

Ellenbrook Village 6

TRAFFIC REPORT

- Final 2
- August 2011

Ellenbrook Village 6

TRAFFIC REPORT

- Final 2
- August 2011

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Contents

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Draft 3	20/06/07	RMR	EXR	20/06/07	Updated with comments from Roland
Final	29/06/07	RMR		29/06/07	Issue Final
Draft 4	16/08/2011	E. Richardson	Steven Piotrowski	16/08/2011	Draft 4
Final 2	31/08/2011	E. Richardson	Steven Piotrowski	31/08/2011	Final 2

Distribution of copies

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Draft 3	Un-numbered	Electronic	Roberts Day Group (Tim Trefry)
Final	Un-numbered	Electronic	Roberts Day Group (Tim Trefry)
Draft 4	1	Electronic	Roberts Day Group (Tim Trefry)
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Project manager:	Emmerson Richardson
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Name of project:	Ellenbrook Village 6
Name of document:	Traffic Report
Document version:	Final 2
Project number:	PB50063.04

1. Introduction

1.1 Background

Sinclair Knight Merz was commissioned by Ellenbrook Management Pty Ltd to prepare this traffic report for Ellenbrook Village in 2005. This report was later revised in 2007 to reflect changes to the structure plan and this report revision has now been produced to take account of further changes to the structure plan yields and layout.

1.2 Purpose of This Report

The main objectives of this analysis are:

- To estimate the forecast traffic volumes;
- To recommend appropriate road hierarchy designations and typical cross sections consistent with *Liveable Neighbourhoods* (Edition 3);
- To recommend appropriate road reserve widths and intersection treatments;
- To make recommendations regarding public transport facilities and the pedestrian and cyclist network.

1.3 Structure of This Report

This report is divided into four sections, as follows:

1) Introduction (this section)
2) Proposed development;
3) Estimation of future traffic movements;
4) Network analysis;
5) Pedestrian and Cyclist Provision; and
6) Public Transport.

2. Proposed Development

Ellenbrook Village 6 is located north-east of the Town Centre, north of Coolamon village, as shown on **Figure 1**. It is bounded by The Broadway to the east, Coolamon to the south, and the Transit Corridor and the future Perth Darwin National Highway (PDNH) to the west and north.

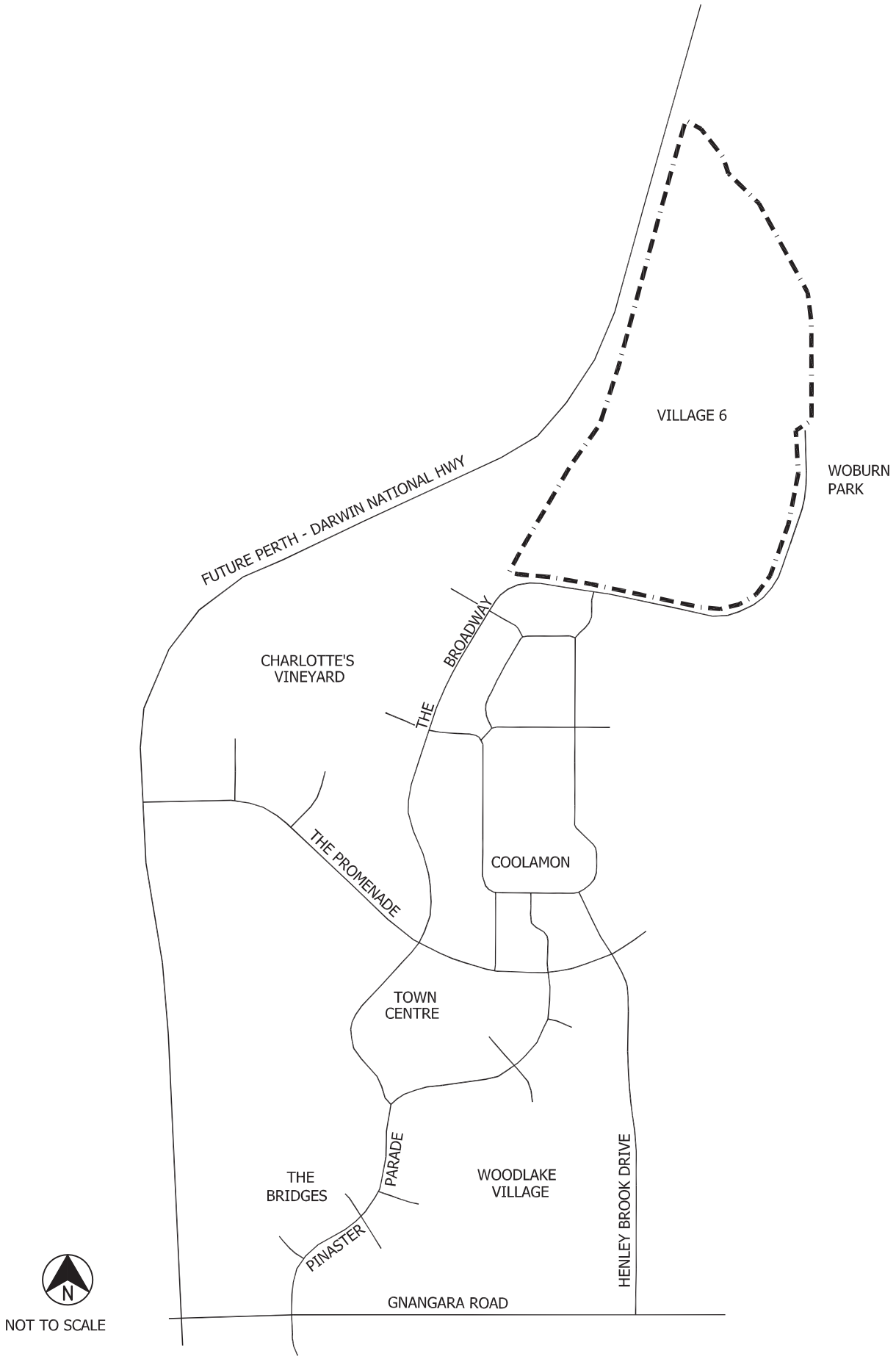
A development plan for Village 6 has been prepared by Roberts Day Group. Under this plan, Village 6 is comprised of the following land uses:

- Residential – approximately 1,954 dwellings;
- Primary School – estimated 400 enrolments; and
- Village centre – approximately 2,000m^2 to 4,000m^2 of retail.

When the Perth Darwin Highway is constructed beyond The Promenade, a connection to Village 6 may be established. The timing for the construction of the highway and the connection to Ellenbrook is unknown at this stage; therefore two traffic volume forecasts have been developed for the development; the ultimate scenario with the PDNH connection and the interim scenario without the PDNH connection.

Village 6 is proposed to have four major connections to The Broadway; including one four-way intersection with a direct connection to Coolamon and two four-way intersections with connections to Woburn Park. A single internal connection is provided to Charlotte's Vineyard.

The Broadway is proposed to be downgraded from a dual carriageway to a single carriageway at approximately the midway section of Village 6; continuing as a local road in this downgraded standard to the northern extreme of the Village 6. There are many minor intersections between local Village 6 roads and the downgraded Broadway road.



ELLENBROOK VILLAGE 6
LOCATION PLAN

AUGUST 2011

FIGURE 1

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3. Estimation of future traffic movements

3.1 General

Traffic movements on the road network were estimated using the EMME/2 transport modelling package.

The Ellenbrook district model has been progressively updated with the detailed planning of the various villages and town centre. This has allowed for traffic analysis of Ellenbrook Village 6 to maintain consistency with the district road network and external traffic movements, estimated as part of the overall Ellenbrook structure planning. The traffic flows used in this assessment have been extracted from the latest 2011 version of the Emme model, which includes updated land use yields for the Village 6 development.

3.1.1 EMME/2 Overview

EMME/2 is a traditional 4 step transportation model comprising:

- Trip generation;
- Trip distribution;
- Modal split; and
- Assignment

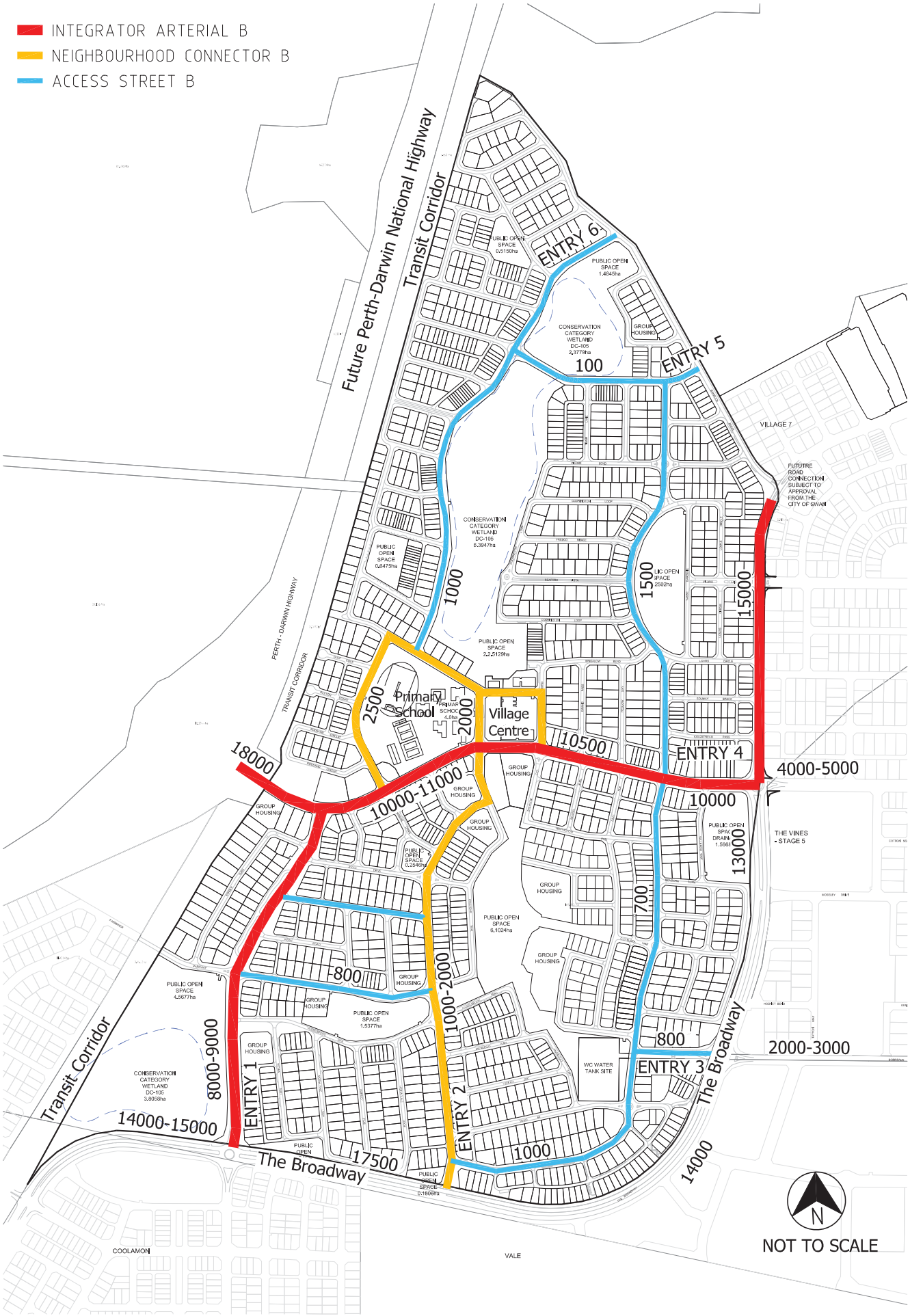
For this study, the trip generation and mode split components of the model were undertaken simultaneously. Trips are generated for the car driver trips only; demand for public transport is assumed to be separate from the motorised trip demand.

The model has been constructed for a 24 hour period.

3.2 Modelled Traffic Volumes and Road Hierarchy

Two traffic volume forecasts have been developed for the development; the ultimate scenario with the Perth Darwin National Highway (PDNH) connection and the interim scenario without the PDNH connection. The EMME/2 forecast traffic volumes and the recommended road hierarchy for the ultimate scenario (with the PDNH connection) are shown in **Figure 2**. The traffic forecasts for the interim scenario (without the PDNH) are shown in **Figure 3**. The road hierarchy is unchanged between the two scenarios.

The road hierarchy recommendations are based on the estimated traffic volumes and the likely road function. The road reserve requirements have been based on the principles of Liveable Neighbourhoods, adapted to suit the local traffic conditions.



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ELLENBROOK VILLAGE 6
FORECAST TRAFFIC VOLUMES
WITH PERTH-DARWIN HIGHWAY CONNECTION

AUGUST 2011

FIGURE 2

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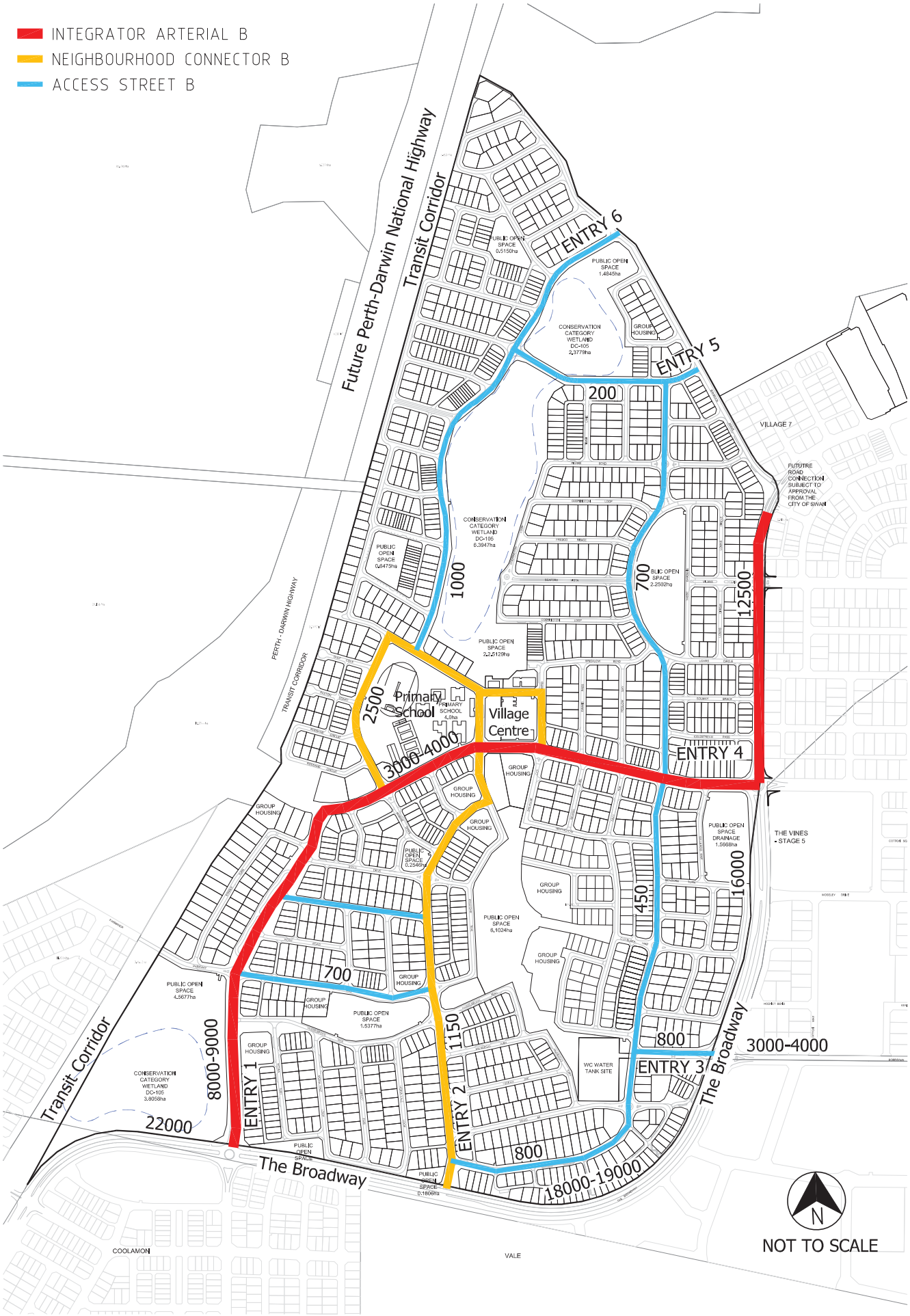

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ELLENBROOK VILLAGE 6
FORECAST TRAFFIC VOLUMES
WITHOUT PERTH-DARWIN HIGHWAY CONNECTION

AUGUST 2011

FIGURE 3

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4. Network Analysis

4.1 Overview of Transport Network

The Western Australian Planning Commission released *Liveable Neighbourhoods (Edition 3)* in October 2004 for use and public comment. *Liveable Neighbourhoods* sets out guidelines for the establishment of road hierarchies for new developments as well as for other areas of subdivision planning.

Liveable Neighbourhoods classifies roads according to character, function, land use integration as well as traffic volumes. Roads are grouped into two broad classifications, Arterial routes and Local Streets. Arterial routes are intended to provide "efficient and safe regional and local traffic movement while integrating community through development frontage and urban activity, wherever possible". Local Streets are intended to be community oriented with better provision for pedestrians. They should encourage local traffic while discouraging long distance through traffic.

The function and characteristics of roads appropriate within the Village 6 as defined in *Liveable Neighbourhoods* are summarised in **Table 3**.

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Table 3 Liveable Neighbourhoods – Road Functions and Characteristics

Street Type	Characteristics	Max Design Speed /Target Operating speed	Indicative Max Volume (vpd)	Pedestrian/ Cyclist Facilities
Integrator Arterial B – centres	2 lanes with central median, cycle lanes and parking	40-50	15,000	On-street bike lanes and separate dual – use paths
Neighbourhood Connector A (Median)	2 lanes with central median, cycle lanes and parking	50/50	7,000	Shared path on one side, footpath other side, on-street cycle lane only where volumes exceed 3,000 vpd
Neighbourhood Connector B (Minor)	2 lane undivided street, can accommodate buses. Includes parking plus shared path on one verge.	50/50	3,000	Shared path on one side, footpath other side, no dedicated on-street cycling provision
Access Street A (Avenue)	2 lanes with small central median, indented parking.	50/40	3,000	Footpath on at least one side, no dedicated on-street cycling provision
Access Street B (Wider Street)	Wider undivided access street for situations with increased parking and/or traffic demand.	50/40	3,000	Footpath on at least one side, no dedicated on-street cycling provision
Access Street C (Yield or Give-way Street)	Most common undivided access street with parking on both sides.	50/40	3,000	Footpath on at least one side, no dedicated on-street cycling provision
Access Street D (Narrow Yield or Give-way Street)	Narrow undivided access street for situations with low parking and/or traffic demand over short distances.	50/30	1,000	Footpath on at least one side, no dedicated on-street cycling provision

Traffic volume forecasts and recommended hierarchy classifications and road cross sections are discussed below for each of the major roads within Village 6.

Entry 1 is the major access into Village 6 from the south (via The Broadway). Entry 1 provides a direct connection between Village 6 and Coolamon. Traffic volumes of approximately 8000-9000 vehicles per day (vpd) are ultimately forecast. The recommended classification is Integrator Arterial B – Centres, with a 25m road reserve, 4.2m lanes and parking provided where required.

Entry 2 is a secondary access to Village 6 from the south. Traffic volumes of around 1000 - 2000 vpd are forecast to the southern end of this road in the ultimate scenario, with similar volumes in the interim period. A Neighbourhood Connector B classification is recommended, within an 18m road reserve with a 7.4m pavement width and parking provided where required.

Entry 3 provides access to the south western portion of Village 6 and provides a direct connection between Village 6 and Woburn Park (forming the western extension of Bordeaux Lane). Traffic volumes of around 800 vpd are forecast under both scenarios. An Access Street classification is considered appropriate, within a minimum 18m road reserve.

Entry 4 is the main east-west route through Village 6, and will ultimately connect to the Perth Darwin National Highway. Entry 4 provides an important connection between The Broadway, the Village Centre and the primary school and provides a direct connection to Woburn Park. Traffic volumes of between 7000 vpd to 11,000 vpd are forecast for the ultimate scenario, with the higher traffic volumes forecast to be experienced close to the PDNH. Traffic volumes of between 3000 vpd and 9000 vpd are forecast for Entry 4 before the PDNH connection is constructed. An Integrator Arterial B – Centres classification is considered appropriate, within a 25 road reserve. This classification will allow the road to function as a bus route and provides indented parking where required. This reserve may need to be widened in the vicinity of the PDNH and at the location of traffic signals abutting the village centre.

North of Entry 4, The Broadway is downgraded to a single carriageway road. An Integrator Arterial B – Centres classification is considered appropriate to provide a transition into a lower speed environment from The Broadway.

Entry 5 is forecast to carry 100 vpd and is recommended to be classified as an Access Street. **Entry 6**, one of the local roads to intersect with The Broadway, is forecast to carry around 500 vpd. An Access Street classification is considered appropriate.

All other roads within Village 6 have been identified as appropriate for an Access Street classification. These streets will have a road reserve width of 15.0m, reduced to 13.0m adjacent to POS (with off-set pavement) and pavement widths of 6.0.

Laneways require a minimum road reserve width of 6.01m with pavement widths of 5.4m to accommodate garbage trucks.

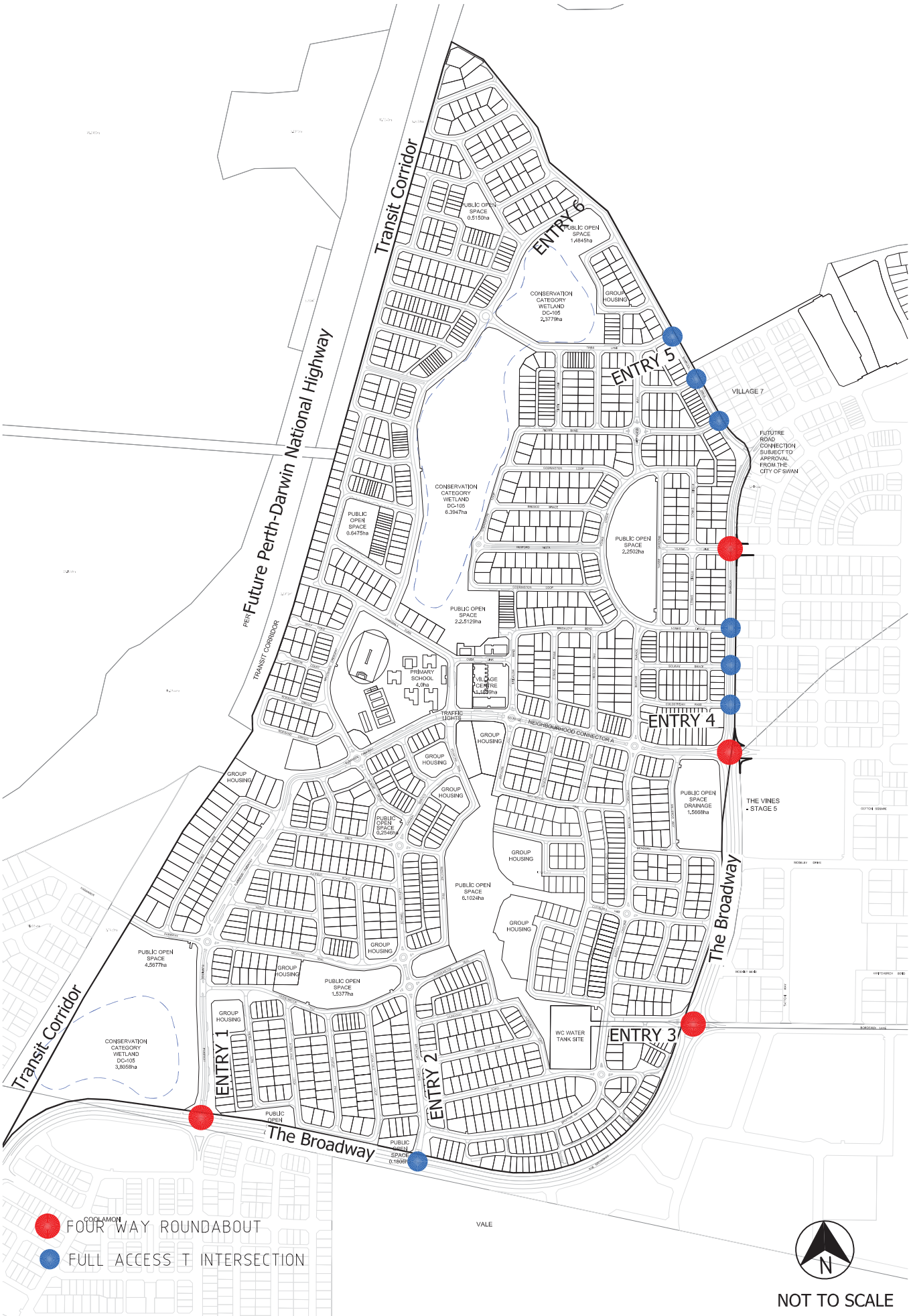
4.2 Intersection Treatments

4.2.1 External Intersections

The proposed treatments for the Village 6 external intersections are shown in **Figure 4**. All the four-way intersections (Entry 1, Entry 3 and Entry 4) are proposed to be roundabout controlled.

The intersection with Entry 2 is proposed to operate as a priority controlled T intersection with full access.

Most T intersections along the downgraded section of The Broadway are proposed to operate under priority control with full access, as shown in **Figure 4**.



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ELLENBROOK VILLAGE 6
EXTERNAL INTERSECTION TREATMENTS

AUGUST 2011

FIGURE 4

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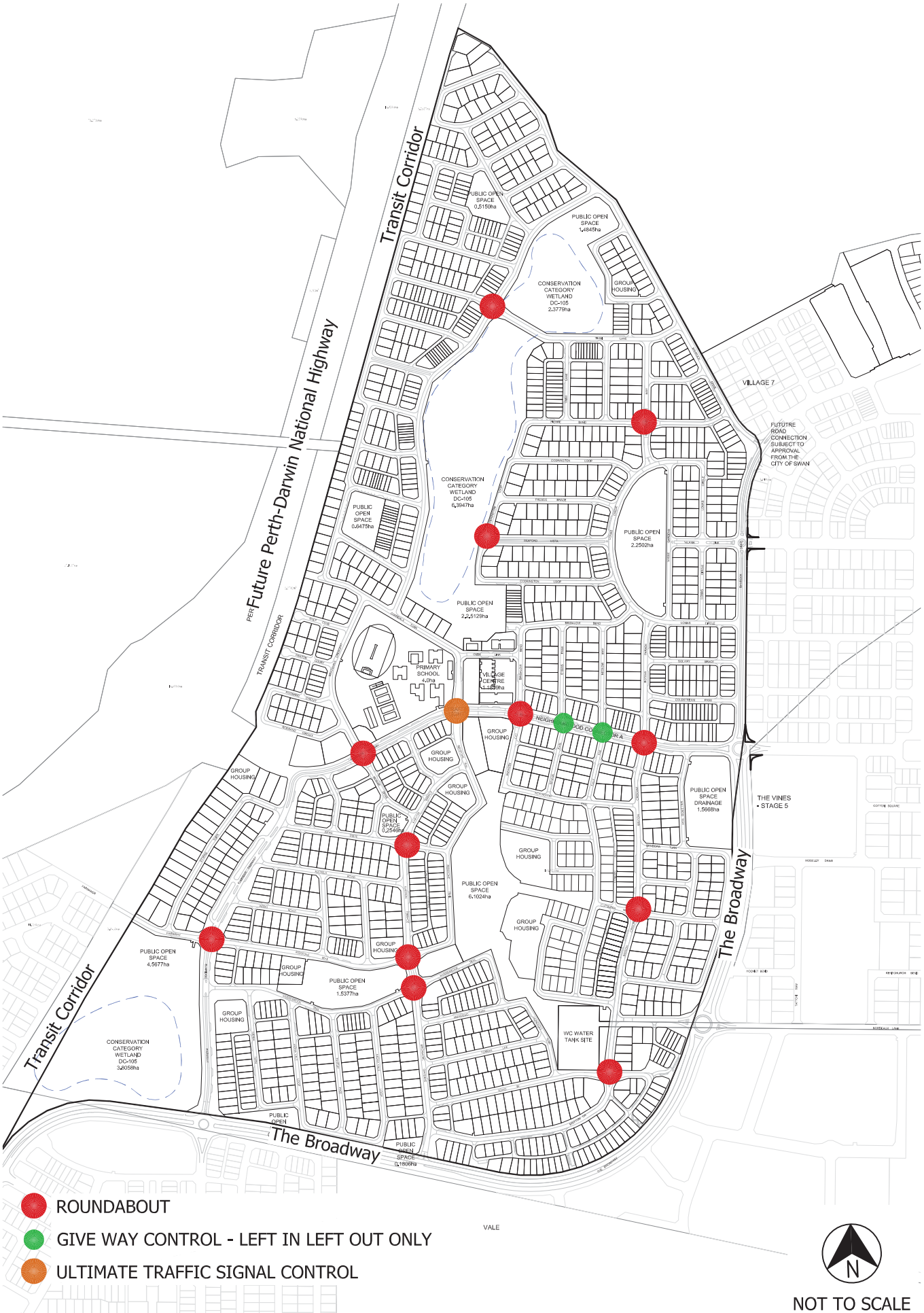
4.2.2 Intersections within Village 6

A number of four-way intersections have been proposed within the Village 6. The choice of intersection control between stop sign and roundabout control is dependent upon:

- Traffic volumes and the direction of turning traffic;
- Pedestrian crossing demands in the immediate area;
- Sight distances;
- Urban design and landscaping; and
- Road network legibility.

The proposed treatments for the internal intersections within Village 6 are shown in **Figure 5**.

Give-way control is considered appropriate for almost all of the four way intersections within Village 6 due to the low traffic volumes. Eleven (four-way) intersections have been identified as appropriate for roundabout control due to the higher forecast traffic volumes. Two further four-way intersections located along Entry 4 are proposed to operate under left in left out control due to the continuous median along that section of Entry 4. The four-way intersection on Entry 4 between the primary school and village centre will operate as traffic signal controlled.



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ELLENBROOK VILLAGE 6
INTERNAL FOUR-WAY
INTERSECTION TREATMENTS

AUGUST 2011

FIGURE 5

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5. Pedestrian and Cyclist Provision

5.1 Objective

Walking and cycling are an important role within the overall transportation infrastructure of an urban area. When integrated with major land uses, a strong walk/ cycle network can:

- Reduce private car dependency for residents;
- Increase accessibility to employment and other urban activities for residents;
- Reduce adverse environmental impacts of transport;
- Increase resource efficiency in a multi-modal transport system;
- Reduce transport-related accidents.

The objective of a pedestrian and cycle network is to provide for the convenient and safe movement of pedestrians and cyclists through and between urban cells in the study area, having regard for the need to service schools, shops, recreation and other land uses as well as public transport access points.

End of trip facilities should be provided for pedestrians and cyclists at activity centres and significant public facilities such as libraries. These facilities may include showers, lockers, water fountains and/or bicycle parking.

5.2 Pedestrians

Liveable Neighbourhoods recommends the provision of a footpath on at least one side of every street. Footpaths should be a minimum of 1.5m wide, increasing to 2m in the vicinity of schools, shops or other activity areas within Village 6.

Neighbourhood Connector roads are required to have a shared path on at least one side (width 2.5m), with a second shared path or a footpath on the other side.

Pedestrian comfort and safety should be considered in land use planning. Where possible buildings should provide pedestrian shelter from weather and active frontages should facilitate security through “eyes on the street”. Sufficient street lighting and safe pedestrian crossing points should be provided in areas of high pedestrian activity.

5.3 Cyclists

There are several different kinds of bicycle facility, on-road and off-road, which are appropriate for different road environments and different classes of cyclists.

On roads where low traffic volumes are expected (less than 3,000 vpd), and where the differential in vehicle and bicycle speeds is less than 20kph, cyclists and cars can safely share the road with no

specific cyclist provision. The introduction of the 50kph speed limit in built up areas has seen Neighbourhood Connector (B) and all Access Streets fall into this category.

On-street cycle lanes are recommended for Integrator Arterial B roads due to the moderate forecast traffic volumes. In Village 6, the 4.2m lanes on Integrator Arterial B roads provide adequate width for cycle movement. In addition, these roads feature a dual use path and/or are included in the Hike and Bike network (discussed below).

Shared paths are to be provided on one side of all Neighbourhood Connector roads (type A and B) to provide for those cyclists who feel uncomfortable riding on-street.

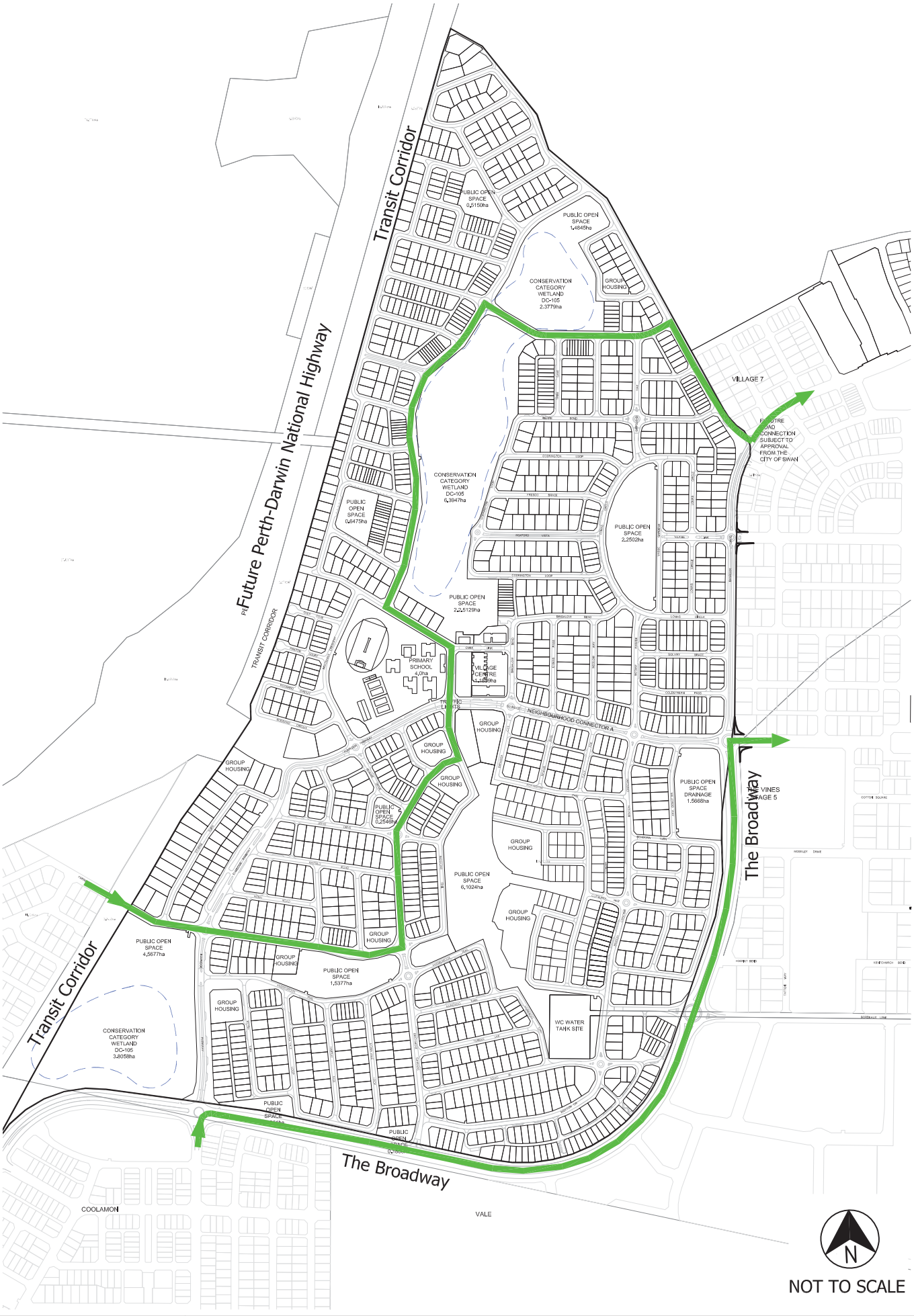
The Ellenbrook development features a regional Hike and Bike path network. The location of this network and its integration with the Village 6 site is illustrated in **Appendix A**.

6. Public Transport

Discussions were held with Transperth bus route planners to determine potential bus routes within Ellenbrook Village 6.

Although there is no certainty at this stage, likely routes through Ellenbrook Village 6 have been nominated to ensure that the relevant carriageways and intersections are constructed to a standard that will allow effective bus movement. These are identified in **Figure 6**.

In the previous revision of this report produced in 2007, Entry 5 was shown as a 4-way T-intersection providing direct access between Village 6 and Village 7. This access has now been removed at the request of the City of Swan and as a result the intersection at Entry 5 is now a T-Intersection. The bus route has therefore been modified to turn right from Entry 5 and left onto The Broadway.



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ELLENBROOK VILLAGE 6
PROPOSED BUS ROUTES

AUGUST 2011

FIGURE 6

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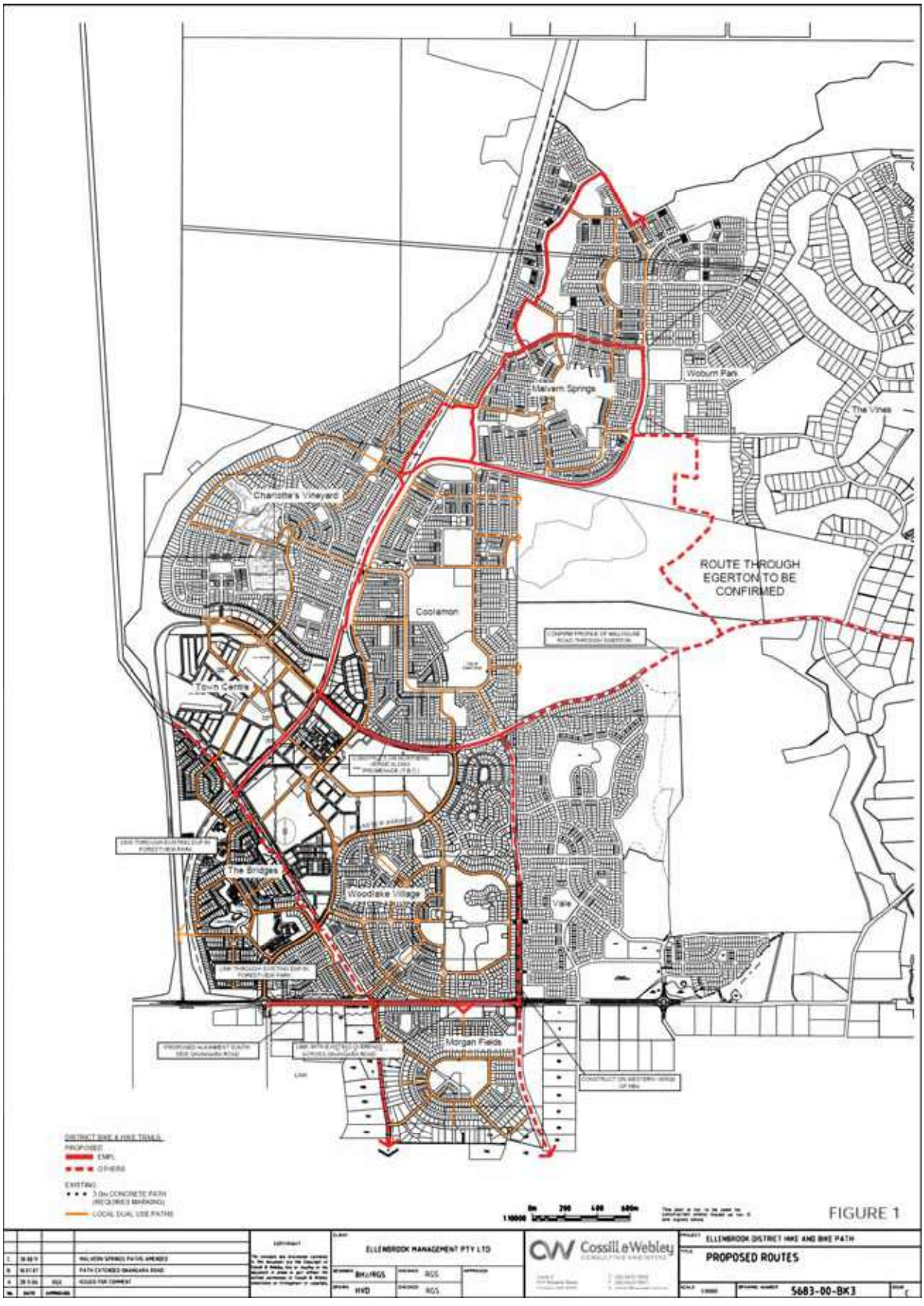
Appendix A Ellenbrook Hike and Bike network



APPENDIX E ENVIRONMENTAL ASSESSMENT

ELLENBROOK VILLAGE 6

ENVIRONMENTAL ASSESSMENT

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Report No: L04008
August 2005

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(Updated June 2007)

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1.0 INTRODUCTION

1.1 Proposed Development

Village 6 (the site) is located in the northern catchment of the Ellenbrook development area, adjacent to The Vines (Figure 1). The site extends over approximately 178ha and is comprised mostly of native bushland. The proposed development layout for Village 6 is shown in Figure 2.

1.2 Statutory Approvals

The Ellenbrook Project in its entirety, including Woodlake Village, Morgan Fields, The Bridges, Coolamon and Charlottes Vineyard which are already constructed, together with Village 6 and planned future stages in the north of the project area, was assessed by the Environmental Protection Authority (Assessment No. 551) and approved by the Minister for the Environment subject to conditions set out in Statement 288 dated 13th October 1992 and Statement 345 dated 3rd March 1994.

Ellenbrook Management Pty Ltd has reported its compliance with conditions to the DEP in a Performance and Compliance Report submitted to the DEP Audit Branch in 2002, and is continuing with this reporting process as appropriate.

The Development Plan for Village 6 is submitted as the latest stage of development at Ellenbrook where establishment of new urban development has been proceeding in accordance with approvals issued by the Minister for the Environment in 1992 and 1994 and in compliance with environmental management plans prepared to meet the conditions set in the Minister's approvals.

The EPA has advised, in a letter dated 27 October 2004 (Appendix B), that the project continues to be covered by the Minister's approval and that subsequent stages of subdivision within the approval project do not require any further referral to the EPA.

The relevant conditions and reporting requirements of the Minister's approval continue to apply to the project and will be complied with.

2.0 EXISTING ENVIRONMENT

2.1 Physical Environment

2.1.1 Topography, Landform and Soils

A dune ridge runs north-south through the centre of Village 6 at a maximum elevation of 66mAHD. This declines to 37mAHD at the eastern boundary and 45mAHD near the western boundary. A high point is also present in the north western corner that rises to 60mAHD (Figure 3).

Regional mapping indicates that soils at the site consist of Bassendean Sands and Guildford clays (Gozzard, 1986). The soil units present include:

- Bassendean Sand (S_8) which is very light grey at the surface and yellow at depth. This unit occupies the higher and steeper central part of the site.

- Bassendean Sand over Guildford Formation silty clay (S_{10}), is located near the western and eastern boundaries of the site on generally lower-lying areas with gentler grades.

- Peaty Clay (Cps) which is dark grey and black with variable sand content in the wetland areas.

The location of these areas is shown on Figure 3.

The peaty clay soil unit is identified as having a high risk of acid sulphate soils at depths less than 3m from the surface. The two sand units are rated as moderate to low risk of ASS occurring at depths generally greater than 3m (WAPC, 2003).

2.1.2 Groundwater

The northern catchment of Ellenbrook, including Village 6, drains northerly to Sawpit Gully and Ellen Brook. Both brooks ultimately discharge to the Swan River.

Groundwater modelling for Village 6 has been undertaken by JDA Consultant Hydrologists. Average annual maximum groundwater contours modelled in 2004 are presented on Figure 4.

The site is located on the eastern side of the Gnangara Mound, from which groundwater flows radially outward from the centre. Groundwater beneath Village 6 flows in an easterly direction and varies in elevation from 34mAHD at the eastern boundary to 46mAHD at the western boundary (JDA, 2004). This equates to depths of between 2m and 20m below ground level.

A Drainage and Nutrient Management Programme has been prepared for the Ellenbrook Northern Catchment (JDA, 2003) to guide development so that it meets the criteria and objectives set by the Minister for the Environment in January 1994. The DNMP for the northern catchment was approved by the DoE in June 2004.

2.1.3 Wetlands

The Department of Environment has identified a number of Conservation category wetlands within Village 6 (Figure 5). The three western most wetlands (Dc 95, Dc 105 & Dc 101) are mostly intact, although firebreaks and access tracks have been cleared through each of them. A large portion of the eastern most wetland extent (Pc144), which continues into The Vines Estate, has been historically cleared and no longer supports wetland attributes.

Analysis of water level data for the site has found the wetland areas no longer appear to be connected to the underlying groundwater (JDA, 2004). This may be a result of the declining water levels of the Gnangara Mound caused by a variety of factors such as increased abstraction for public water supply and utilisation by pine plantations. Any seasonal surface water is therefore likely to be a result of short-term perching caused by the peaty clay soil profiles beneath the wetland areas.

2.2 Biological Environment

2.2.1 Vegetation and Flora

The majority of the remnant vegetation at the site is from the Bassendean-North vegetation complex (Figure 6). Vegetation in the south eastern corner is from the

Southern River Complex and vegetation along the north eastern boundary is from the Yanga Complex (Heddle *et al*., 1980). These complexes are described as follows:

Bassendean Complex - North
This complex consists of a range of vegetation from low open forest and low woodland of banksia-pricklybark to a low woodland of *Melaleuca* spp., and sedgelands which occupy the moister sites.

Yanga Complex
The Yanga Complex occurs on the low-lying flats, where a low open-forest of swamp sheoak (*Casuarina obesa*) occurs, with patches of *Actinostrobus pyramidalis* and *Melaleuca* spp. including *M. lateritia* and *M. hamulosa*. On the drier site of Yanga the vegetation contains a mixture of low open forest of banksia-pricklybark and an open-woodland of marri-banksia, the latter being on the moister low-lying areas.

Southern River Complex
The Southern River Complex consists of an open woodland of marri-jarrah-banksia on the elevated areas and a fringing woodland of *E. rudis-M. rhaphiophylla* along the streams.

A vegetation survey of the Ellenbrook Estate was undertaken by Dr Arthur Weston, Ted Griffin and Malcolm Trudgen in 1992. It is noted a detailed survey throughout the entire estate was not conducted due to the extensive land area and time restrictions.

The vegetation units in the Village 6 area mapped during this survey are as follows:

- A1 – Banksia (dry)
- A2 – Banksia (moist)
- A3 – Adenanthos / Banksia
- C1 – Marri
- C2 – Hypocalymma
- D – Melaleuca preissiana, Agonis linearifolia
- E2 – Melaleuca preissiana – Pericalymma (west)
- E3 – M. preissiana

These units are described in Appendix A.

Priority flora species noted within Village 6 in the 1992 survey are presented on Table 1 (Weston *et al.,* 1993).

Table 1
Priority Flora Species Identified within Ellenbrook Village 6
(Weston *et al*., 1993)

Species	Current Priority Rating	Habitat
Aotus cordifolia	Priority 3	Winter-wet sedgelands & thickets
Conostephium minus	No longest listed as a priority species	Sandy soil in some Banksia woodland, usually low in the landscape
Daviesia physodes	No longest listed as a priority species	On & near margins on winter-wet areas
Eryngium subdecumbens ms	Priority 3	Winter-wet or –damp sites, often with sedges under *Acacia saligna*
Gonocarpus pithyoides	No longest listed as a priority species	Generally sandy soils; Banksia woodlands, heath
Restio stenostachyus	No longest listed as a priority species	In or at margins of shallowly winter-wet areas

2.2.2 Fauna

Native fauna that occur within the Ellenbrook area may currently utilise the site. Potential species of significance are listed on Table 2.

Of these species the Black-striped Minnow and Western Swamp Tortoise require open water and therefore cannot occur on the site. The remaining species are all mobile and will be able to relocate to surrounding reserves and bushland areas. The site does not contain any habitat areas that fauna species would exclusively depend upon.

Table 2
Threatened and Priority Fauna that may occur in the Ellenbrook area

Species	Level	Comments
Chuditch (*Dasyurus geoffroii*)	Schedule 1	Highly mobile and may utilise bush remnants and corridors. One specimen trapped in Ellenbrook Village 5 area in 2002.
Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*)	Schedule 1	Feeds in proteaceous scrubs and heaths and eucalypt woodlands as well as pine plantations. Breeds mainly in wheatbelt forests. Is likely to occur in the area in question.
Western Swamp Tortoise (*Pseudemydura umbrina*)	Schedule 1	Restricted habitat requirements and is restricted in distribution. Caught/trapped in Whiteman Park in 1956. No suitable habitat in Village 6.
Graceful Sunmoth (*Synemon gratiosa*)	Schedule 1	Has been recorded in a few locations form Wanneroo to Mandurah. Caught/trapped in Whiteman Park in 1997.
Peregrine Falcon (*Falco peregrinus*)	Schedule 4	Species is uncommon and prefers areas with rocky ledges, cliffs, watercourses, open woodland or margins with cleared land. It may occur in the area in question.
Black-striped Minnow (*Galaxiella nigrostriata*)	Priority 3	Typically occurs in shallow isolated pools in peat flats surrounding forested areas. No suitable habitat in Village 6.
Quenda (*Isoodon obesulus fusciventer*)	Priority 4	Prefers areas with dense understorey vegetation, particularly around swamps and along watercourses. Caught/trapped in Ellenbrook in 1989 and Whiteman Park in 1997.
Western Brush Wallaby (*Macropus irma*)	Priority 4	Occurs in areas of forest and woodland supporting a dense shrub layer. Night sighting in Ellenbrook in 1996.

2.3 Social Environment

2.3.1 Aboriginal Heritage

A search of the Department of Indigenous Affairs' heritage sites database did not identify any heritage areas within Village 6. However, given the known occurrence of sites in the general vicinity, the possibility exists that undiscovered artefacts may be present on the site. All contractors working on the development will be made aware of their responsibilities under the Aboriginal Heritage Act with regards to the discovery of Aboriginal heritage sites.

2.3.3 Surrounding Land Use

Village 6 is surrounded by The Vines Estate to the east, previous Ellenbrook stages to the south, the future Perth-Darwin Highway to the west and the Sawpit Gully conservation area to the north. None of these land uses require buffering or impinge upon the planned development of Village 6.

3.0 IMPACTS AND MANAGEMENT

3.1 Vegetation and Flora

3.1.1 Vegetation Complexes

The proposed development will involve clearing of approximately 170 hectares from the Bassendean Complex – North, 3 hectares of vegetation from the Yanga Complex and 5 hectares from the Southern River Complex. The conservation status of these vegetation complexes is reported in Bush Forever (WAPC, 2000) and outlined on Table 3.

Table 3
Conservation Status of Vegetation Complexes in the Swan Coastal Plain portion of the Perth Metropolitan Region

Vegetation Complex	*Original Extent*	*Area Remaining (% original extent)*	*Area currently reserved (% original extent)*	*Area reserved or proposed for reservation (% original extent)*
Bassendean Complex – North	22,933 ha	12,390 ha (54.0%)	6,842 ha (29.8%)	10,744 ha (46.8%)
Yanga Complex	5,775 ha	1,058 ha (18.3%)	267 ha (4.6%)	549 ha (9.5%)
Southern River Complex	31,148 ha	5,370 ha (17.2%)	1,775 ha (5.7%)	3,147 ha (10.1%)

The Yanga Complex is the only one of the three at the site that does not meet the State government's stated objective (based on recommendations by the International Union for Nature Conservation, IUCN) of reserving at least 10% of each vegetation complex in each region based on the area within current and proposed reserves.

The 9.5% achieved for this complex has been derived through Bush Forever and the previous MRS rezoning process. There is additional area of this complex remaining in various landholdings which would have been available for the government for potential inclusion in Bush Forever if it deemed necessary. The current reservation extent is the final outcome of the Bush Forever process and reflects the government's decision as to what is acceptable based on review of all relevant issues.

It is relevant to note that approximately 135ha of the Yanga Complex has been set aside for reservation in the Ellenbrook Northern Conservation area. Representation within the local area was an issue addressed when this conservation area was defined and handed over to the Department of Conservation and Land Management.

3.1.2 Vegetation Units

The extent of each vegetation unit within the development area is summarised on Table 4.

Table 4
Extent of Vegetation Units within Village 6

Vegetation Unit	*Area within Village 6 (ha)*	*Estimated Area to be retained within POS (ha)*
A1 – Banksia (dry)	100.1	1.0
A2 – Banksia (moist)	24.4	11.2
A3 – Adenanthos / Banksia	35.9	0
C1 - Marri	6.0	0
C2 – Hypocalymma	0.2	0.2
D – Melaleuca preissiana, Agonis linearifolia	1.9	0
E2 – Melaleuca preissiana – Pericalymma (west)	5.1	4.6
E3 – M. preissiana	2.0	1.6
Cleared	2.0	0

Remnant vegetation will be retained in the northern and south-western POS areas. The estimated extent of vegetation to be retained is included on Table 4. The removal of the remaining vegetation is consistent with the Minister for Environment's approval of the project in Statements 288 and subsequent clearance (through Statement 345) of Condition 4.1.

3.1.3 Other Significant Vegetation

No Declared Rare Flora have been identified within the Village 6 area, although a number of priority flora species have previously been identified. In line with recommendations made in the original vegetation survey report, a spring flora survey will be undertaken to search for Declared Rare Flora in areas of proposed disturbance and identify any management initiatives that are required.

3.2 Fauna

Several Threatened and Priority fauna species may be present in the Village 6 development area, as listed in Table 2. These include the Chuditch (Schedule 1), Carnaby's Black-cockatoo (Schedule 1), Peregrine Falcon (Schedule 4), Quenda (Priority 4) and Western Brush Wallaby (Schedule 4).

With the possible exception of the Quenda, these species are mobile and unlikely to depend entirely on the development area. Given the progressive clearing of the development area, individual animals present will be able to move to other areas of bushland in the Lexia Wetlands conservation area to the east, the Sawpit Gully conservation area to the north or the Vines estate to the east.

In accordance with Audit Commitment P5 in the Minister's Statement No. 288, trapping surveys will be carried out in the Village 6 area prior to development to determine the presence of Quenda and, if necessary, relocate any animals found. Trapping will focus on the areas of most likely habitat around damplands and will occur immediately prior to clearing in each area to determine whether any bandicoots are in residence at that time.

In the event that any bandicoots are found in areas to be cleared, consultation will occur with CALM to assess the feasibility of relocating those individuals present to Nature Reserves or National Parks.

3.3 Wetlands

The Village 6 Development will have effects on the wetlands as described below. The boundaries referred to below are the re-assessed extents as mapped in 2004.

- The northern elongated dampland (Dc105), which covers an area of approximately 10.6ha, will be retained within public open space. An area of active POS will be developed north of the dampland boundary. A management plan will be prepared for Dc105.

- 3.8ha of the south-western dampland (Dc95), which represents approximately 95% of the wetland, will be retained in POS. Drainage features will be provided in the POS located to the north of the dampland. A Wetland Management and Mitigation Plan for Dc95 has been prepared and approved by the Department of Environment.

- The southern (Dc101) and eastern (Pc144) wetlands will be filled to facilitate development.

Incorporation of these areas within the development proposal, and their proposed use for drainage, recreation and vegetation retention, is consistent with the Minister for Environment's approval of the project in Statement 288 and subsequent clearance (via Statement 345) of Condition 4.1.

3.4 Drainage and Nutrient Management

Due to the shallow depth to groundwater at the site, drainage controls will need to be put in place. Fill may also be required in some areas to ensure a minimum separation distance of 1.2m from the AAMGL to ground level.

Drainage for the proposed development will be designed in accordance with the Ellenbrook Development Northern Catchment Drainage and Nutrient Management Programme (JDA, 2004). Where appropriate of the drainage strategy will be to optimise the amount of stormwater which is locally managed by infiltration to the superficial aquifer, in accordance with DoE urban water management objectives.

The stormwater drainage system will include direction of stormwater into a pipe network with flow towards infiltration swales and basins. Consideration will be given to utilising open based side entry pits and manholes within the drainage system to promote infiltration. The infiltration swales and basins, which will be located within POS areas adjacent to the wetlands, will be designed to accommodate flows from storm events up to 1 to 2 year ARI. Overflow from the infiltration swales/basins will be overland through vegetated areas into the wetlands. The location of the proposed drainage basins is shown on Figure 7. In addition, flush kerbing will be installed on roads adjacent to the POS areas.

Finalisation of the drainage system design will be subject to Council requirements and groundwater levels.

3.5 Acid Sulphate Soils

The site is mapped as containing soils with high and moderate-low Acid Sulphate Soil (ASS) Risk. The most extensive high risk area is associated with the northern dampland (Dc105). This area will be conserved within the development and therefore risk of ASS is reduced.

ASS testing will be conducted following detailed drainage design when possible impacts on the water table can be assessed. These impacts are most likely to occur where dewatering is required for installation of services such as pumping stations.

Testing will be conducted in accordance with Department of Environment (DoE) guidelines and the results will be submitted to the DoE for review and comment.

3.6 Construction Impacts

The short-term impacts of construction, including noise and dust, will be managed according to industry best practice and in accordance with all applicable government regulations.

All static and mobile machinery employed during construction will be fitted with appropriate noise attenuation equipment and will comply with occupational noise regulations. Construction activities will be managed so as to comply with the Environmental Protection (Noise) Regulations 1997.

Dust arising from construction works and bare ground will be controlled so as to comply with requirements within the EPA's *EIA Guidance No. 18: Prevention of Air Quality Impacts from Land Development Sites*. In particular:

- All cleared areas will be stabilised by watering, mulching or equivalent means.
- No vegetation or other debris will be burned on the development site.
- Where necessary, watering will be employed to minimise dust generation while earthworks are in progress.

The developer will ensure that provisions are made, and responsibility accepted, for dust control in all contracts issued for site works.

4.0 COMPLIANCE WITH EXISTING STATUTORY ENVIRONMENTAL APPROVALS

The development of Village 6 in accordance with the Development Plan presented in this report has been assessed and approved by the Minister for Environment's Statements 288 and 345 and the Minister's clearances of conditions of approval that have since been issued.

The Minister's approval of the Ellenbrook proposal, as described in the Ellenbrook Public Environmental Review (Feilman Planning Consultants, 1992) and subsequently modified in accordance with the proponent's response to Condition 4.1 of Statement 288, created a major conservation area of approximately 600ha in the north of the project area.

Figure 8 depicts the location and extent of this conservation area, in relation to the location of Village 6 and the overall Ellenbrook project area.

This area includes wetlands, vegetation, flora and fauna habitat focussed on the Lexia Wetlands and the Sawpit Conservation Area in the north of the original Ellenbrook project area. This area has now been reserved for Regional Open Space in the Metropolitan Region Scheme, as required by the Minister for Environment.

On the basis of the conservation outcomes achieved within this reserved area, the balance of the land within the project area has been approved for urban development subject to management of groundwater, drainage and nutrient export in accordance with conditions set in the Minister's Statement and management plans subsequently compiled by the proponent and cleared by the Minister for Environment.

The Minister's Statement reflected the balance of conservation and residential development objectives required by the State Government for the project area, recognising the need to facilitate the supply of affordable housing land by allowing for complete urban development of the southern portion of the original proposal area, and balancing the impacts of this development by the establishment of a large conservation area for wetlands, damplands, vegetation, flora and fauna in the north of the proposal area.

In the time since the Minister's Statements approving development of the Ellenbrook area were published, the State Government has published *Bush Forever*, the strategic plan for conservation of bushland on the Swan Coastal Plain portion of the Perth Metropolitan Region.

The Bush Forever document and accompanying maps ratify the Minister's Statements 288 and 345 by identifying for conservation only those parts in the north of the original Ellenbrook project that have been reserved for Parks and Recreation in the Metropolitan Region Scheme.

5.0 REFERENCES

Environmental Protection Authority. 1997. *Environmental Protection (Noise) Regulations 1997*. EPA, Perth, Western Australia.

Environmental Protection Authority. 2000. *Guidance for the Assessment of Environmental Factors No. 18 – Prevention of air quality impact from land development sites*. EPA, Perth.

Feilman Planning Consultants. 1992. *Ellenbrook Public Environmental Review*. Ellenbrook Management Pty Ltd, Perth.

JDA Consultant Hydrologists. 2004. *Ellenbrook Development Northern Catchment – Drainage and Nutrient Management Programme*. Report prepared for Ellenbrook Management Pty Ltd.

Gozzard J.R. 1986. *Perth, Sheet 2034 III and 2134 III.* Perth Metropolitan Region Environmental Geology Series, Geological Survey of Western Australia.

Heddle E.M., Loneragan O.W. and Havel J.J. 1980. *Vegetation complexes of the Darling System Western Australia.* In Atlas of Natural Resources Darling System Western Australia. Department of Conservation and Environment, Perth, Western Australia.

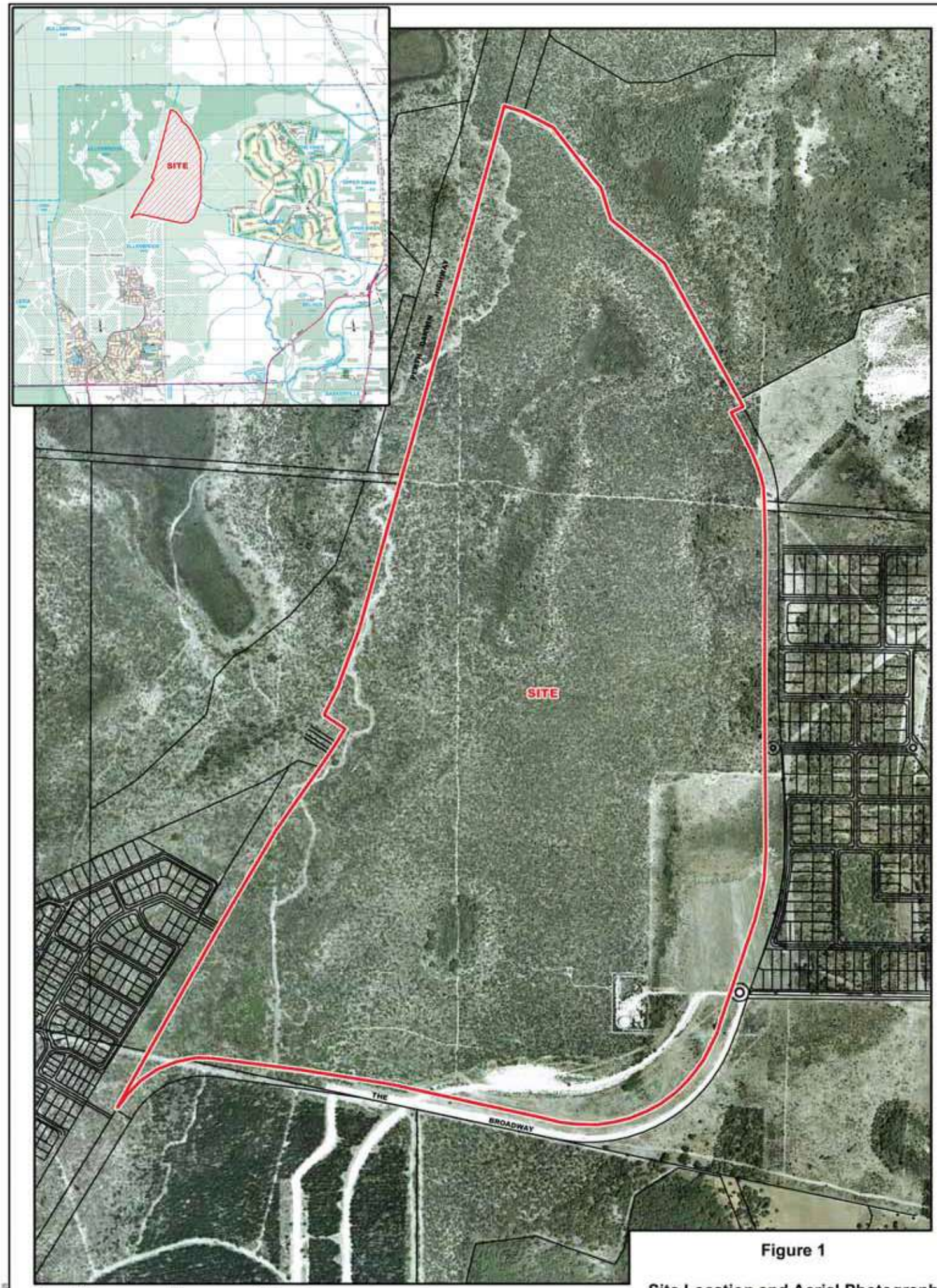
Water and Rivers Commission. 2003. *Perth Groundwater Atlas Online*. Water and Rivers Commission, Perth. http://www.wrc.wa.gov.au/infocentre/atlas/atlas_html/

Western Australian Planning Commission. 2000. *Bush Forever*. Western Australian Planning Commission, Perth.

Western Australian Planning Commission. 2003. *Acid Sulfate Soils – Planning Bulletin No. 64*. Western Australian Planning Commission, Perth.

Weston A., Griffin E.A. and Trudgen M. 1993. *Flora and Vegetation Conservation Values of the Ellenbrook Estate.* Report prepared for Bowman Bishaw Gorham.

FIGURES



Source: Roberts Day Group (Structure Plan), DLI (Aerial Photography)

Figure 1

Site Location and Aerial Photograph

RPS BOWMAN BISHAW GORHAM
ENVIRONMENTAL MANAGEMENT CONSULTANTS

Source: Roberts Day Group, 02/07/07

Figure 2

Proposed Development Layout

RPS BOWMAN BISHAW GORHAM
ENVIRONMENTAL MANAGEMENT CONSULTANTS

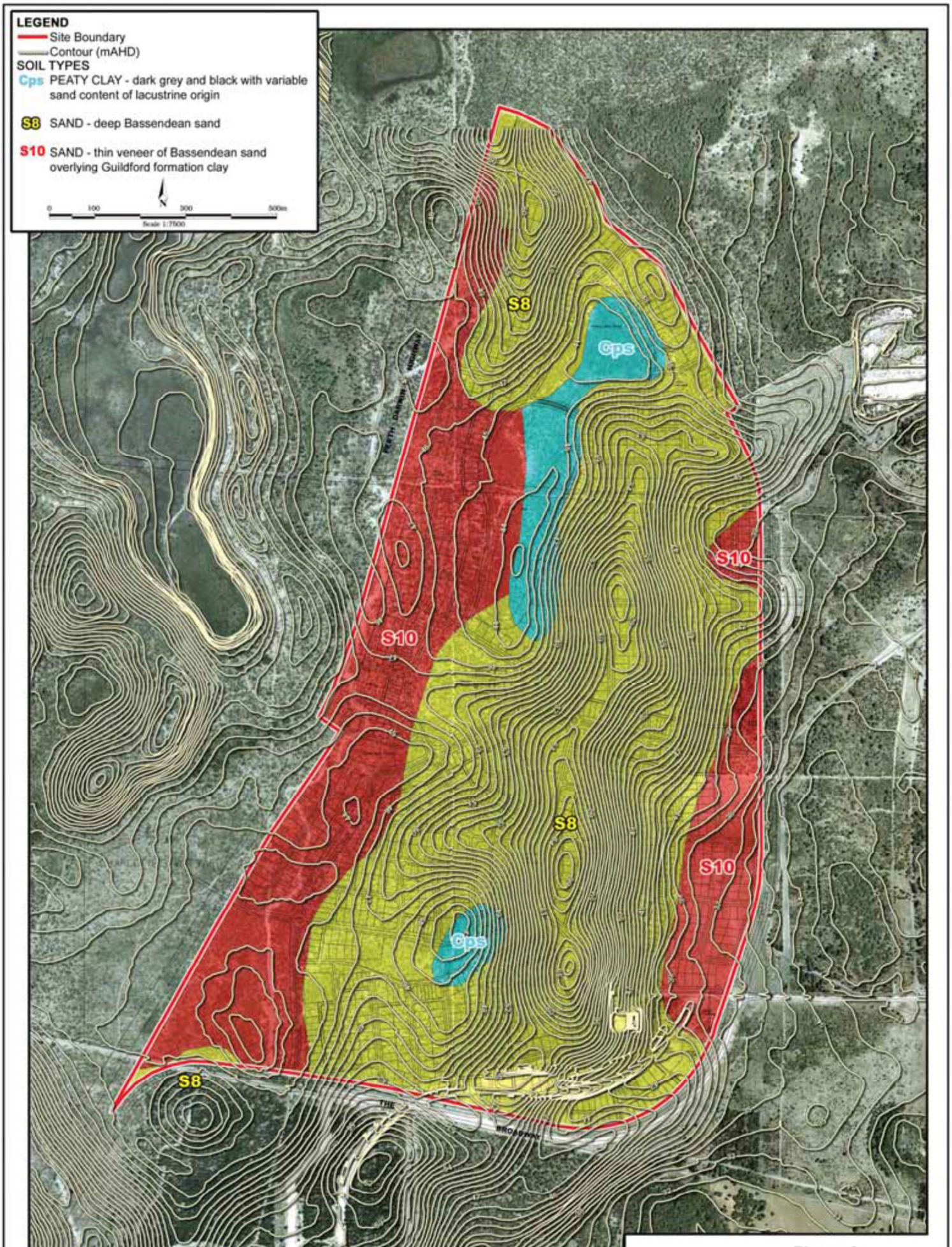


Figure 3

Topography and Soils

Source: Land and Water Quality Branch, Department of Environment

RPS BOWMAN BISHAW GORHAM
ENVIRONMENTAL MANAGEMENT CONSULTANTS

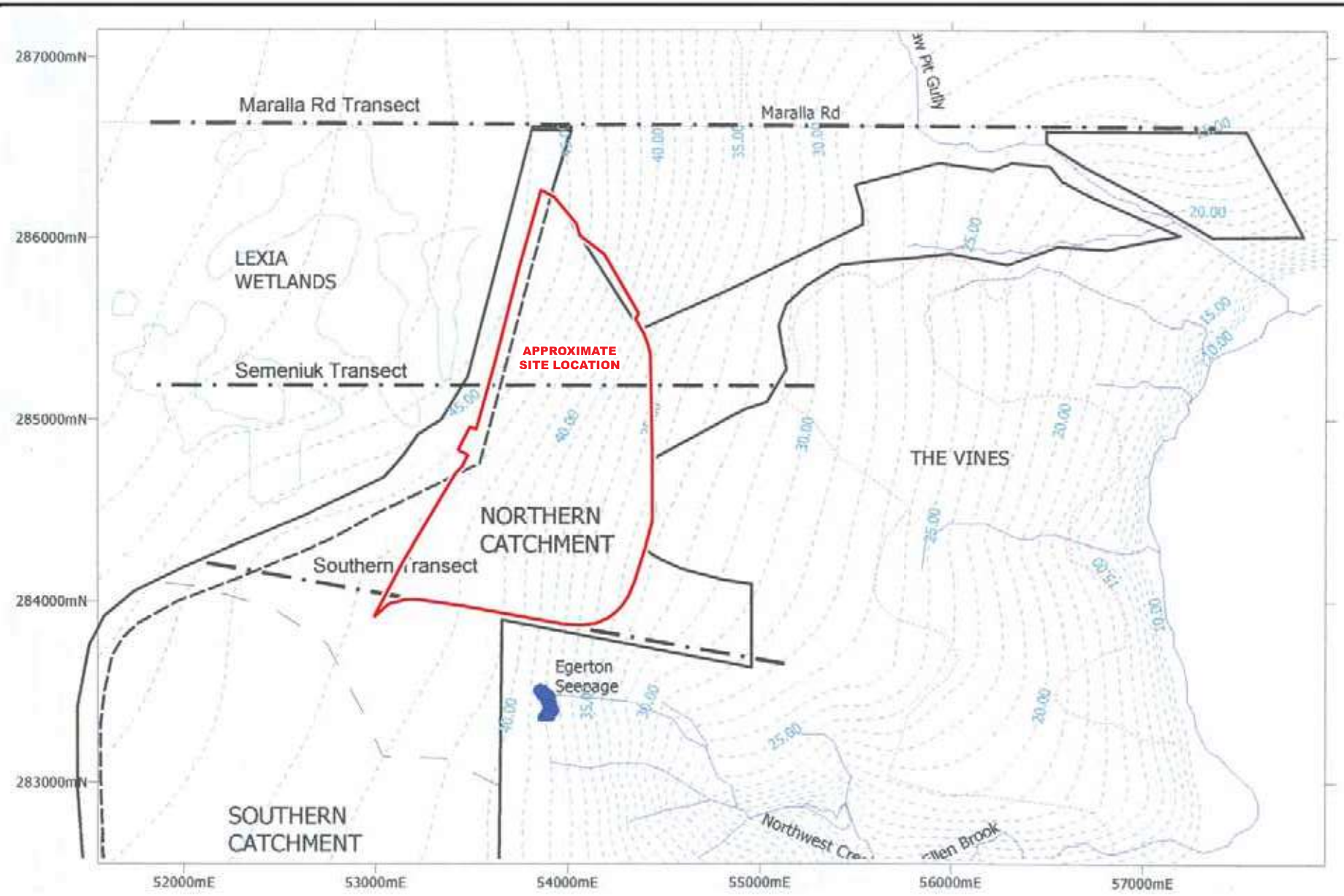


Figure 4

Modelled Groundwater Contours (AAMGL)

Source: JDA Consultant Hydrologists

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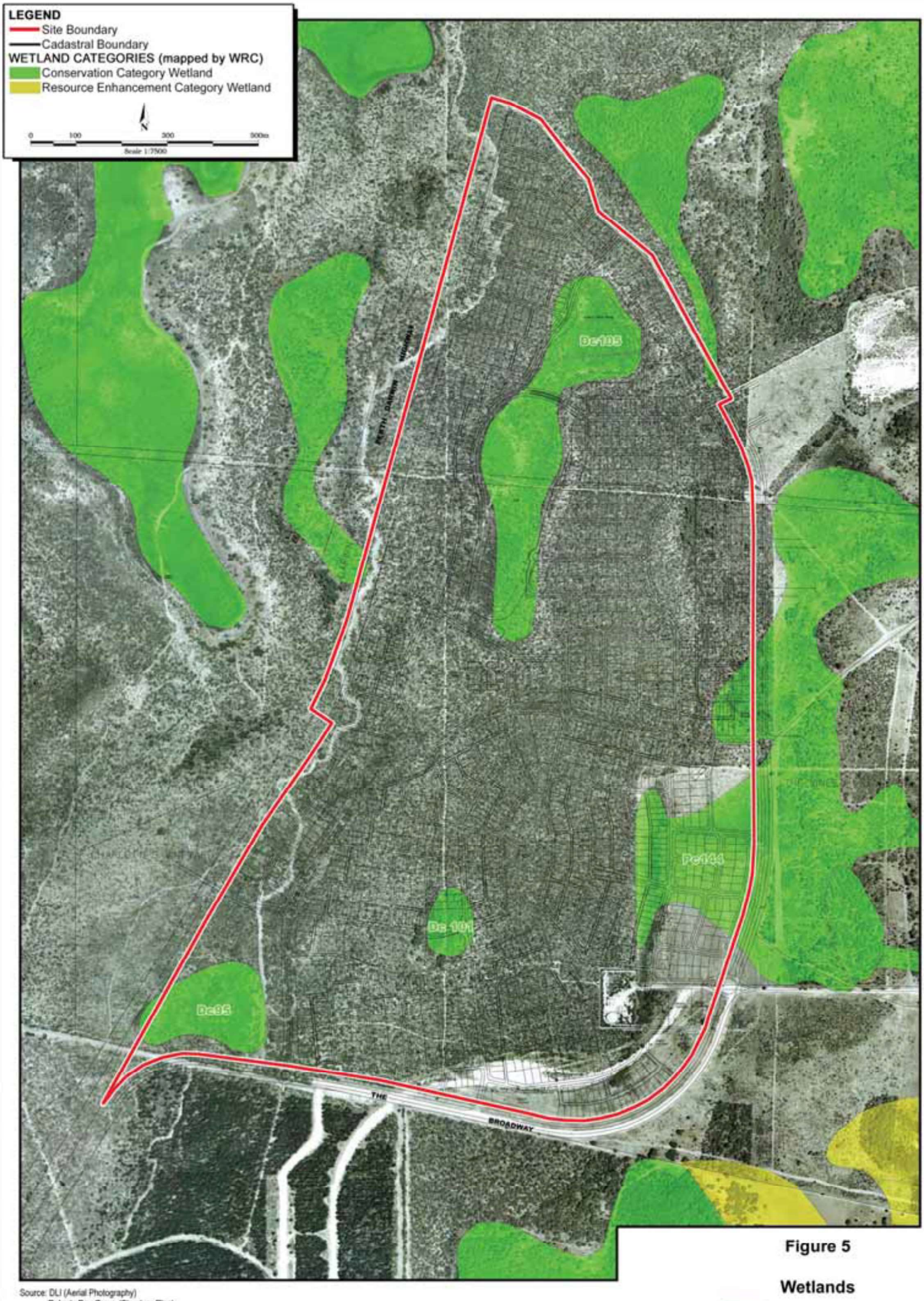
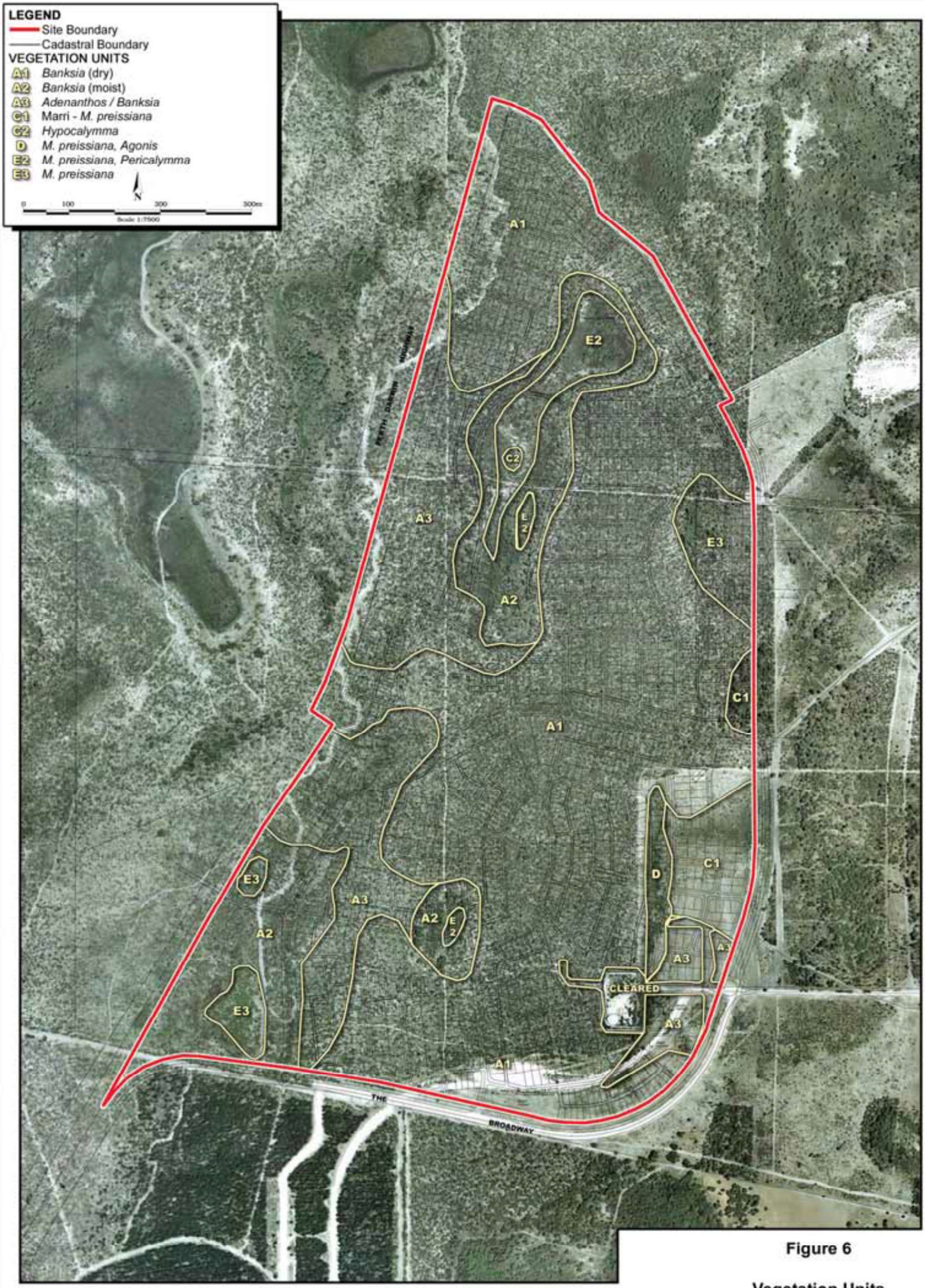


Source: DLI (Aerial Photography)
Roberts Day Group (Structure Plan)
Water and Rivers Commission (Wetlands)

Figure 5

Wetlands

RPS BOWMAN BISHAW GORHAM
ENVIRONMENTAL MANAGEMENT CONSULTANTS



Source: DLI (Aerial Photography)
Roberts Day Group (Structure Plan)
Weston *et al*, 1993 (Vegetation Mapping)

Figure 6

Vegetation Units

RPS BOWMAN BISHAW GORHAM
ENVIRONMENTAL MANAGEMENT CONSULTANTS

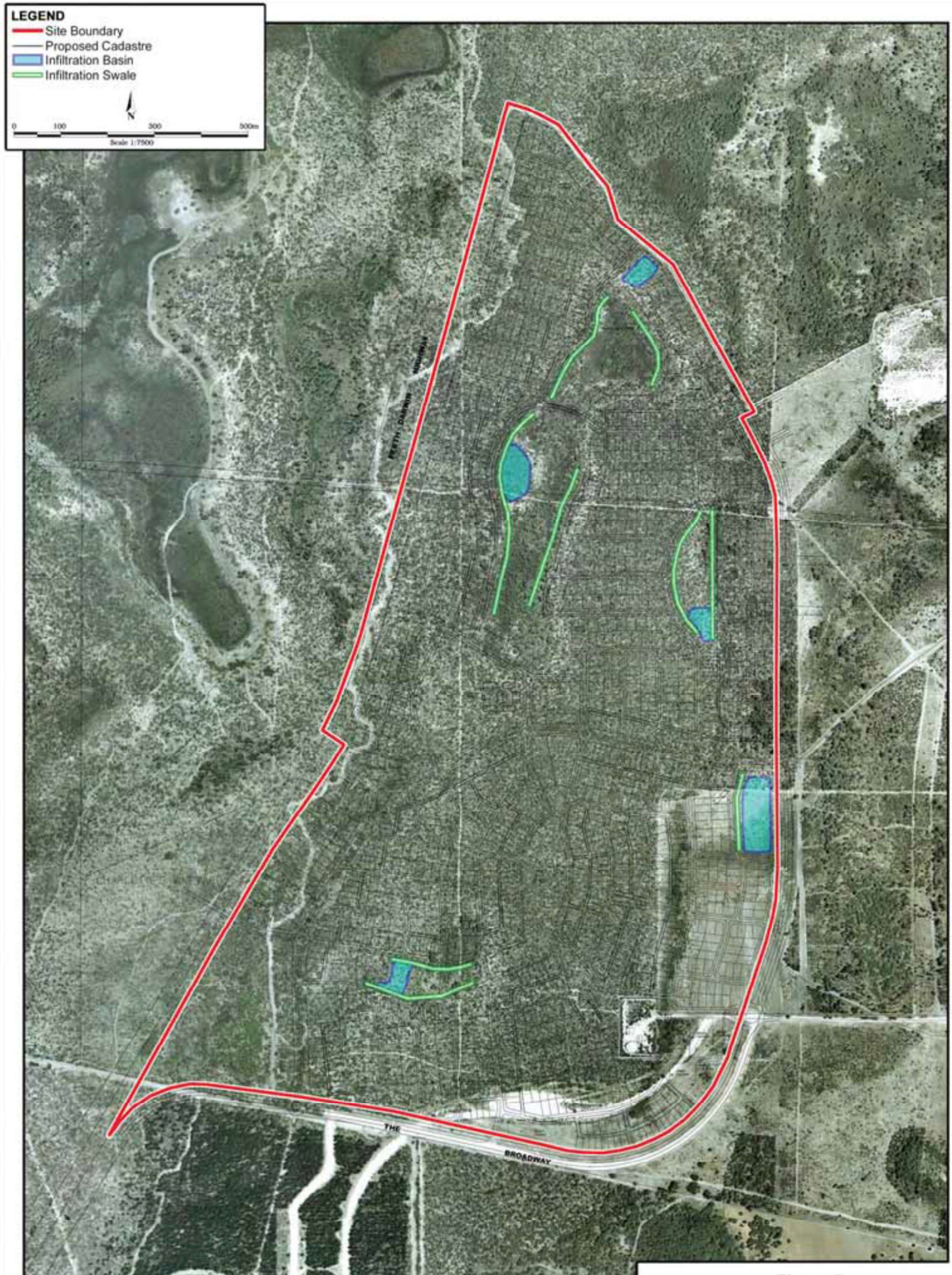


Figure 7

Proposed Drainage Infiltration Areas

Source: Roberts Day Group

RPS BOWMAN BISHAW GORHAM
ENVIRONMENTAL MANAGEMENT CONSULTANTS

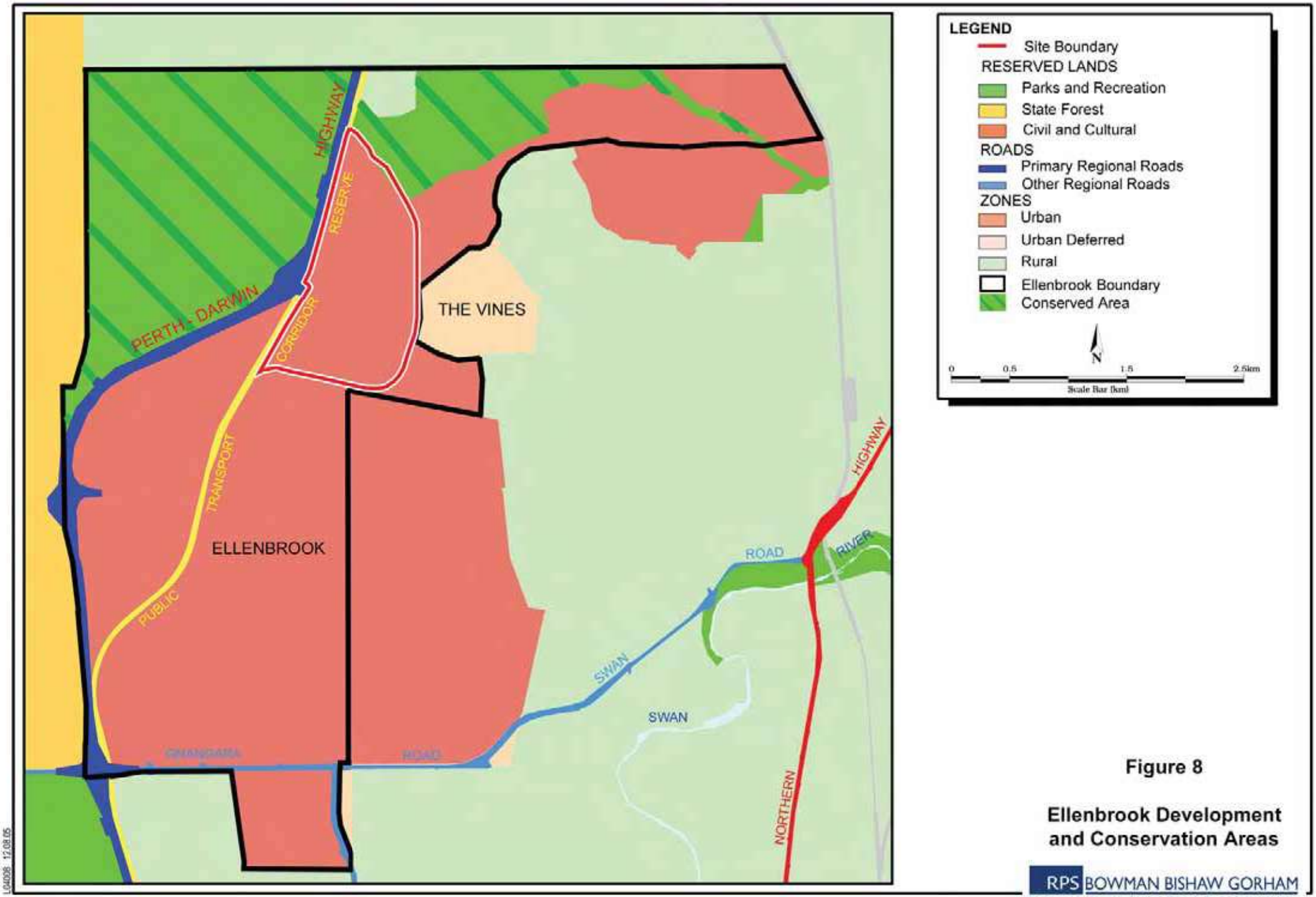


Figure 8

Ellenbrook Development and Conservation Areas

RPS BOWMAN BISHAW GORHAM
ENVIRONMENTAL MANAGEMENT CONSULTANTS

L04006 12.08.05

APPENDIX A

Vegetation Units

A1 *Banksia* Woodlands (dry)

Principally low woodland (open to closed) dominated by *Banksia attenuata* with *B. menziesii* and occasionally *Eucalyptus todtiana* and *Banksia ilicifolia*. These were mainly on dunes around the Lexia Wetlands but also on some sandy patches in the east of the estate. The soils on all sites appeared to be grey sands.

Important shrub species in most stands include *Eremaea pauciflora, Hibbertia hypericoides* and *Scholtzia involucrata.* Accompanying shrub species varied considerably, presumably depending on differences in the site characteristics. Drier sites, usually on dune crests, tended to have more *Regelia inops, Beaufortia elegans*, *Leucopogon kingianus* and *Conostephium minus.* While *Verticordia nitens* and *Adenanthos cygnorum* may be common in these areas, they also occur in apparently damper *Banksia* woodlands.

Melaleuca seriata was important in the *Banksia* woodlands on sandy plains. This shrub tended to be important also in vegetation types on sandy moist sites. (e.g. A2, B). Lilioid and sedge species were more important in these areas than on the dunes (e.g. *Dasypogon bromeliifolius, Xanthorrhoea preissii, X. brunonis* and *Patersonia occidentalis*).

A2 *Adenanthos cygnorum* in *Banksia* woodland

This vegetation type appeared to have a relatively dense cover of low trees, mainly *Banksia attenuata* and *B. menziesii* with some *B. ilicifolia. Adenanthos cygnorum* provided in places a quite dense tall shrub stratum. *Eremaea purpurea* was an important shrub in some areas. Most commonly these stands were in lower areas in the landscape but sometimes possibly on dunes. This occurred east of the Lexia wetlands and west of the Yanga formation. Muir (1983) suggested that these areas were well drained sands where there was abundant water available.

A3 *Banksia woodlands (moist)*

Mostly these woodlands were more open, with *Banksia ilicifolia* commonly the most important tree species. *B. attenuata, B. menziesii* and *E. todtiana* were also present as on dry sites. The occasional jarrah or marri tree could be present on low flats.

Many of the shrubs present on drier sites were also present here (e.g. *Hibbertia hypericoides, Petrophile linearis, Conostephium pendulum*, and *Bossiaea eriocarpa*). There were many species present in dry sites that were absent from these areas (see Appendix 4). A number of lilioid and sedge species were more important in these areas

than on the drier sites (e.g. *Phlebocarya ciliata, Dasypogon bromeliifolius, Xanthorrhoea preissii, X. brunonis* and *Patersonia occidentalis*).

C1 Marri, *Melaleuca preissiana* open forest

Downslope of one of the seepages in the east of the Estate was a stand of forest dominated by (at times, large old) trees of Marri and *Melaleuca preissiana* Except for the occasional *Nuytsia floribunda* other trees were absent. These sandy soils had an open understorey with *Macrozamia reidlei* being the most conspicuous. Sedge-like species (e.g. *Phlebocarya ciliata* and *Dasypogon bromeliifolius*) were important.

C2 *Hypocalymma, Melaleuca preissiana* heath or woodland

Between the *Banksia* woodlands and the various heath communities of the winter-wet areas, there was usually a band of this type, but at times it was very narrow. It appeared to be more typical of the Lexia wetlands. *Melaleuca preissiana* varied in importance from an occasional tree to woodland. The often dense shrub community was dominated by *Hypocalymma angustifolium. Xanthorrhoea preissii* was very important in this type where it was more than a very narrow strip. Sedges typical of damp areas (e.g. *Baumea* spp.) were also important in most stands.

D *Melaleuca preissiana, Agonis linearifolia* woodland

This vegetation type, and in particular *Agonis linearifolia*, was typical of the several soaks and springs on the western margin of the Yanga formation. There were a few trees of marri and *Banksia littoralis* in some areas. Shrubs other than *Agonis* included *Astartea fascicularis, Aotus gracillima* and occasionally *Acacia saligna*. Beneath the shrubs there was a dense sedge stratus including *Lepidosperma? longitudinale* and *Cyathochaeta avenacea*. Bracken (*Pteridium esculentum*) was common in some soaks.

E2 *Melaleuca preissiana, Pericalymma ellipticum* (western variant)

As in vegetation type E1, *Pericalymma ellipticum* dominates unit E2, which has occasional emergent trees of *Melaleuca preissiana* and *Banksia littoralis*. The stands of this unit are often very narrow and are not distinguishable as separate bands around some of the Lexia Wetlands.

The composition of the stands seen (including ones in Whiteman Park and Melaleuca Park) appeared more consistent than those of the vegetation type E1. They tended to have fewer species, including *Hakea varia, Astartea fascicularis* and *Calothamnus lateralis*. The latter of these were virtually absent from stands of vegetation type E1. Also, sedges tended to be less important than in E1.

E3 *Melaleuca preissiana*

In a couple of stands *Melaleuca preissiana* formed closed low forests. These were in areas not normally as wet as E1 or E2. An open stratum of *Baumea*? *juncea* was the most common plant beneath these stands but very few shrubs were present.

APPENDIX B

Advice from EPA on Approval Status

Environmental Protection Authority

Westralia Square,
141 St Georges Terrace, Perth, Western Australia 6000.
Telephone: (08) 9222 7000. Facsimile: (08) 9222 7155.
Postal Address: PO Box K822,
Perth, Western Australia 6842.
Website: www.epa.wa.gov.au

LWP Property Group Pty Ltd
Unit 1, 60 Coolamon Boulevard
ELLENBROOK WA 6069

Your Ref
Our Ref CRN 210541 89-68
Enquiries Alice O'Connor (9222 7136)
Email alice.oconnor@environment.wa.gov.au

ATTENTION: DANNY MURPHY and RUSSEL PERRY

ELLENBROOK VILLAGE 6

I refer to our meeting of 23 September 2004, during which issues relating to the proposed development of Ellenbrook - Village 6 were discussed.

It is confirmed that Conditions 4.1 and 4.2 (Ministerial Statement 288) and Condition 11 (Ministerial Statement 345) attached to the EPA's formal environmental assessment of "Ellenbrook urban rezoning, subdivision and development" (Bulletin 642) and the subsequent "Proposed change to Environmental Conditions" (Bulletin 722) have been cleared by the Minister for the Environment. The clearance was based, amongst other things, on the setting aside for conservation of

"lakes protected by the Environmental Protection (Swan Coastal Plain Lakes) Policy 1992, the fringing and surrounding vegetation".

Despite their high ecological values, the following Conservation category wetlands within the Village 6 area were not identified in the Environmental Review as additional areas requiring conservation:

- 8793 (previously referred to as Dc95, and identified as UFI 8795 in the *Geomorphic Wetlands Swan Coastal Plain* dataset);
- 8926 (identified as UFI 8928); and
- UFIs 8794, 8938 and 8939.

However, it is understood that as part of the mitigation strategy for the development of Ellenbrook Village 5, the Ellenbrook Management Board committed to conserve CCW 8793 (UFI 8795) and its associated dry land features in the south west of the Village 6 area. That commitment is reflected in Condition 3 of the Western Australian Planning Commission's approval of the Maralla Road development proposal (WAPC 124934), which requires preparation and implementation of a Wetland Management and Mitigation Plan.

It is understood that the DoE Swan Goldfields Agricultural Region has recently received the management plan and request for clearance of this condition. Issues associated with management of the south west wetland (UFI 8795) and its buffer will be raised by the DoE through that process.

Given the approvals which exist under the formal environmental impact assessment process, and that no Ministerial Conditions or prior commitments are applicable to Wetland 8926 (UFI 8928) and other wetlands within the Ellenbrook Village 6 area (other than described above), the

Department of Environment (DoE) does not object to the Preliminary Concept Plan dated September 2004. The DoE also recognises that whilst it was not required as part of the EPA's formal assessment, the LWP Property Group seeks to retain the conservation values associated with damplands in the northern part of the development. To assist with this objective, it is recommended that:

- an appropriate dryland buffer be determined and provided between the Conservation category wetlands and development;
- a Wetland Management Plan be prepared and implemented; and
- a hard edge pathway or road be provided to separate development from the wetland and its buffer.

It is noted that some wetlands within Village 6 will be lost, namely, UFIs 8794 and 8928.

Issues relating to Stage 5 of the Vines development were also discussed at the meeting of 23 September. We will provide separate advice on those issues as soon as we are able.

I hope this information adds value to your objectives to provide an environmentally sensitive urban village.

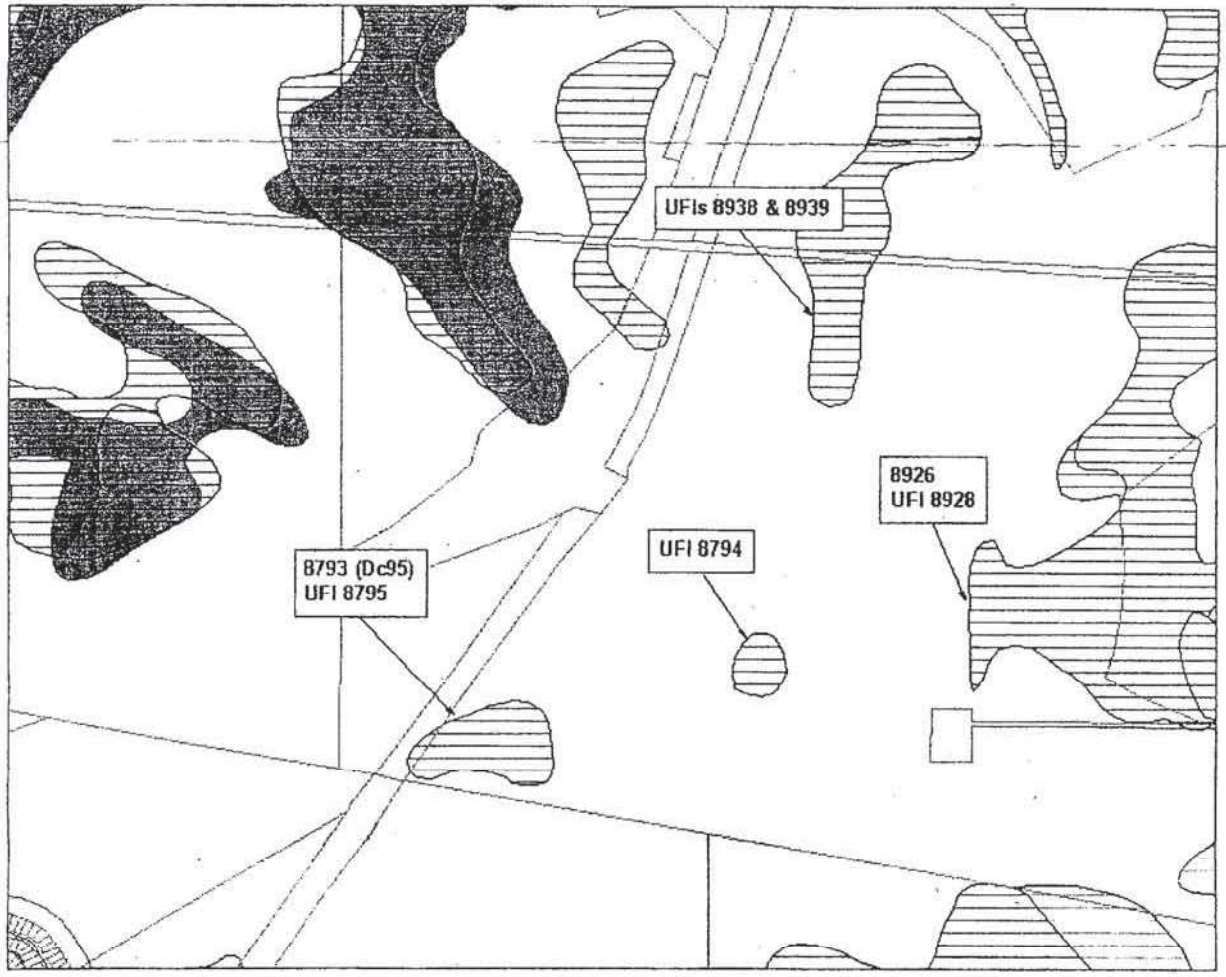
Yours faithfully

K J Taylor
DIRECTOR
ENVIRONMENTAL IMPACT ASSESSMENT DIVISION

27 October 2004

cc Department of Planning and Infrastructure (Attention: Sarah Cosstick)
Department of Conservation and Land Management (Attention: Norm Caporn)
DoE, Wetlands (Attention: Natalie Thorning)
DoE, Swan Goldfields Agricultural Region (Attention: Kathryn Schell)

ELLENBROOK VILLAGE 6 WETLANDS



Local Rd - Sealed
Cadastre - DLI 1/03/04
Local Government Authorities - DLI 8/07/04
Conservation
Resource Enhancement
EPP, Lakes - DEP 28/07/03

APPENDIX F REPORT ON ENGINEERING ASPECTS

ELLENBROOK MANAGEMENT PTY LTD

ELLENBROOK DEVELOPMENT
MALVERN SPRINGS DEVELOPMENT PLAN

REPORT ON ENGINEERING ASPECTS

REPORT NO. 5843-S1 (rev A)

REVISED JUNE 2007

Cossill & Webley
Consulting Engineers
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Subiaco WA 6008
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Fax: (08) 9422 5801

TABLE OF CONTENTS

1. INTRODUCTION

This report has been prepared by Cossill and Webley Pty Ltd, Consulting Engineers. It summarises the assessment undertaken by the firm, to date, on the engineering aspects of the proposed development of the sixth Village at Ellenbrook. Malvern Springs is within the Ellenbrook landholding north of Gnangara Road and abuts the northern boundary of the residential villages of Coolamon, Charlotte's Vineyard and eastern boundary of The Vines. Malvern Springs is bounded to the west and north by the Conservation Category 'Lexia' Wetlands.

The report has been prepared for Ellenbrook Management Pty Ltd as supporting documentation for the revised Development Plan prepared by Roberts Day.

Requirements covering siteworks, roads, drainage, sewerage, water supply and public utility services have been assessed as they relate to the Development Plan proposal.

The engineering assessment has been based on the Roberts Day Development Plan dated 28 May 2007 (ref EJV VL6 CON 14 rev C), which yields some 182 hectares in total. Components of Malvern Springs will include a Primary School, Village Centre and a large area of retained natural vegetation within public open space.

2. SITE DESCRIPTION

The site of the proposed Malvern Springs Village has a prominent north-south ridge near the centre of the site with a maximum elevation of approximately RL 66 metres. The land to the west of the ridge falls to an elevation of RL 43m. The natural contours of the land fall to the east to an elevation of RL 34m AHD.

An area of Conservation Category Wetland is located at the south west corner of the site. A Management Plan for the maintenance of the vegetation within this site during and following construction has been approved by the Department of Environment. There are two further areas of the site which have been identified for retained vegetation. These will be incorporated into the public open space of Malvern Springs.

Malvern Springs site contains a number of water extraction bores which are owned by The Vines and are used to reticulate the Golf Course. The position of these bores is fixed and will be contained within private land, however the pipe network will be redirected through the road system and will be located in road reserve.

The preliminary inspection of available geological and topographical data indicates that the ground conditions within Malvern Springs most likely comprise Bassendean Dune Sand overlying Guildford Formation. This is consistent with the conditions experienced to date within the site and for works completed within the adjoining Villages. There may be some peaty material on the eastern boundary of site adjacent to The Vines land. This is currently being investigated by Coffey Geoscience. The sands which make up the majority of the area are free draining and suitable for urban development of the nature proposed in the Development Plan. Within low areas of the site localised pockets of peaty sand may exist.

Post development average annual maximum ground water levels, as predicted by Jim Davies and Associates as part of the Drainage Management Programme for the Ellenbrook Development Northern Catchment, are generally significantly greater than the existing ground surface within the central areas of Malvern Springs site. The ground water does approach the surface levels to the east of the site. These levels will be used to determine finished surface levels and for sizing drainage facilities.

3. SITEWORKS

Siteworks comprising bulk earthworks for the proposed Malvern Springs development will include the removal of the peaty sand, if necessary, and the general re-contouring of the site to meet desirable maximum grades applicable to each land use. It is proposed to retain localised areas of the natural topography and vegetation and these landforms have been integrated into the Development Plan. Bulk earthworks will also be used to ensure adequate grades for drainage and sewerage and to provide acceptable slopes for building in accordance with marketing and maximum allowable engineering grades.

In general it is expected that Malvern Springs bulk earthworks will be designed to result in a balanced cut to fill from within the total Ellenbrook land holding.

4. ACCESS AND ROADS

Existing road access to this precinct of the Ellenbrook landholding, and the north-east corridor area, generally, is via Gnangara Road which is linked to the Perth and Midland central areas and other metropolitan areas by Lord Street, Reid Highway, Alexander Drive, Tonkin Highway, Beechboro Road and West Swan Road.

Expansions of the regional road network completed with financial assistance from Ellenbrook Management include the extension of Reid Highway between Tonkin Highway and Midland, the construction of Lord Street between Reid Highway and Gnangara Road. These links now form an important network for all residents and road users in the Perth north east corridor. Ellenbrook also contributed, along with the State Government and the City of Swan, to the construction of an access road within the Perth Darwin Highway reserve. This access road runs from Gnangara Road to the extension of The Promenade and will provide a direct and alternative route (to Pinaster Parade) in and out of Ellenbrook for Malvern Springs residents.

Access to the site is via The Broadway, which bounds the southern and south-western area of Malvern Springs. This arterial road was completed in December 2005 and now connects to Bordeaux Lane which enables access between The Vines and Ellenbrook. The Broadway links Malvern Springs to The Promenade and enables efficient access to the Ellenbrook Town Centre and to Gnangara Road.

In the longer term access to and from Malvern Springs growth to the north will be via extension of The Broadway, and ultimately the extension of the Perth Darwin Highway will enable access directly from Malvern Springs centre to Gnangara Road and through to Reid Highway. The development of the District Centre will link Malvern Springs through to Vale. Together these roads will provide a high level of road access for the area to and from the above regional road network.

Internally Malvern Springs development would be serviced by a system of local distributor roads and local access roads the traffic planning of which has been separately assessed and documented by Sinclair Knight Merz.

The roads have and will be designed in line with current Department of Planning and Infrastructure (DPI) policies for more innovative and varied approaches to commercial and residential street development. This may include the incorporation of traffic calming measures, to reduce vehicle speeds, road pavement and landscaping treatments aimed at creating a higher quality commercial and residential environment and improved traffic safety, as well as a high standard of access and permeability.

The road reserve and pavement widths will be varied to suit land use and local activities through out Malvern Springs. Road narrowing and reduced building set backs have and will be used selectively to highlight areas of increased activity and speed control.

4. ACCESS AND ROADS - continued

The detailed design of roads in Malvern Springs will be carried out in close consultation with the City of Swan and DPI with initial proposals for reserve and carriageway widths as follows:

Road Classification	Width (Metres)	
	Road Reserve	Carriageway
i) Integrator Roads		
. Boulevard	*22 – 30*	*2 x 4.2 + parking*
. Other	*18 - 22*	*6 - 7.4*
ii) Neighbourhood Connector (up to 7000 vehicles per day)	18 – 22	7.0 – 7.4
iii) Access streets (up to 3000 vehicles per day)	14 – 16.5	5.5 – 6
iv) Rear Lanes (Access to lots)	6	6

Road reserves widths will be locally reduced adjacent to public open space and where access streets are adjacent to district distributor or arterial roads.

On street parking embayments will be used where land uses and planning determine street access is required. Parking and access from localised off street bulk parking areas have also been identified.

The study by Sinclair Knight Merz will propose bus routes through Malvern Springs which will link Malvern Springs to the adjacent Ellenbrook residential villages. The provision in the plan for a dedicated public transit route suggests in the long term either a metro rail or express bus route may be located adjacent to the western edge of Malvern Springs.

5. DRAINAGE

Drainage within Malvern Springs development will be designed in accordance with the approved strategy detailed within the Ellenbrook Northern Catchment Drainage and Nutrient Management Programme (DNMP) February 2004 prepared for the project by Bowman Bishaw and Gorham, Cossill and Webley and Jim Davies and Associates. Further direction and guidance would be taken from the Drainage Technical Review Committee set up in accordance with the Northern Catchment DNMP.

Consistent with the requirements of the Department of Water and in accordance with the measures referred above an Urban Water Management Plan (UWMP) has been prepared for the southern half of the Village and is currently being implemented. An UWMP is currently being prepared for the northern sector of the Village and will incorporate any improvements developed from the southern plan.

In general the drainage strategy comprises retention on site with the incorporation of retention basins. Where ever possible the retention basins will be designed as landscaped depressions either within the existing low lying areas or wetlands or within public open space areas.

Several of the retention basins proposed in this area will be adjacent to retained vegetation. It is proposed that rainfall from storms with a frequency of 1 in 2 year will be contained within these dedicated basins and the basin will have an overflow capability into the retained vegetation for longer return-period storms. The excess water will be able to recharge within the wetland and potentially rejuvenate the vegetation. The detail of this system will be finalised with the City of Swan at the detailed design phase.

Surface drainage within the subdivision areas would be via a conventional system of road gullies and underground pipes draining to the retention / infiltration basins where recharge into the ground water will be possible. At source infiltration will also be achieved by adopting ‘open based pits’ subject to prevailing groundwater conditions and incorporation of road drainage swales (verge or central median) where conditions are favourable (eg road grade, extent of frontage, lot size, etc).

The pipe system would be designed to cater for run-off from storms with a frequency of up to 1 in 5 years in local streets and 1 in 10 years for district roads with flows from less frequent events, up to 1 in 100 years, provided for in overland floodways comprising road reserves, drainage channels and swales, linear open space, etc. Where possible and with the support of the City of Swan, drainage facilities will be designed to incorporate best management practices and water sensitive design principles.

In areas of high post-development groundwater, sub-soil drainage and earthworks filling would be carried out to provide adequate clearance between the groundwater and building levels. Sub-soil drains would be constructed at or above the pre-development average annual maximum groundwater levels, in line with the environmental criteria for the project.

The performance of the drainage management facilities, outlined above, would be monitored against the established criteria as part of an ongoing Environmental Management Programme (EMP). The management of the monitoring program is the responsibility of the Technical Review Committee set up to implement and manage the Ellenbrook Northern Drainage Nutrient Management Plan.

6. SEWERAGE

The Water Corporation has made provision for the sewerage of the Ellenbrook development in its planning for servicing the overall north-east corridor.

The sewerage strategy for Malvern Springs is divided into two main catchments. The western catchment (west of the ultimate ridge line) will flow into a proposed permanent Sewer Pump Station. It is proposed that this pump station will be located near the Primary School playing grounds and will pump the sewage from Malvern Springs into the existing deep main sewer on The Broadway (adjacent to the northern end of Coolamon). The sewer catchment on the eastern side of the ridge will flow under gravity to an existing pump station on Bordeaux Lane near The Vines. This Sewer Pump Station currently pumps sewage from The Vines to Westgrove Drive, Coolamon but ultimately will be graded out and gravity discharged to a new pump station to be located within Vale.

The Sewer Pump Station within Malvern Springs will be constructed by the Water Corporation through a developer constructed works agreement between Ellenbrook and the Water Corporation.

7. WATER SUPPLY

As with sewerage, the Water Corporation has made provision for water supply to the Ellenbrook development in its planning for servicing the overall north-east corridor.

To date the planning has based on a local supply, from the Gnangara groundwater mound beneath the State Forest, west of Ellenbrook, supplemented by connection to the metropolitan system within the north-east and north-west corridors.

The Water Corporation completed a trunk water main link from the Wanneroo system in January 1999. This main operates as a transfer main in both directions from the Wanneroo and Lexia systems depending on ground water production and local demand at any point in time. The first stage of the Lexia ground water treatment plant has recently been completed.

Special water headwork's have been agreed with the Water Corporation for the Ellenbrook project. The Water Corporation has agreed to provide the necessary trunk infrastructure to service the development based on an agreed rate and orderly pattern of development.

The planning for the water supply to the northern areas of Ellenbrook, including Malvern Springs, has recently been reviewed by the Water Corporation following concerns with ground water levels in the Lexia groundwater storage. During the second half of 2007 the Water Corporation will be extending their large diameter distribution mains from The Promenade north along The Broadway beyond the southern entry to Malvern Springs.

The initial water service for Malvern Springs will be via a 250mm diameter water main connection to Coolamon.

8. OTHER PUBLIC UTILITY SERVICES

Underground reticulated electricity supply for Malvern Springs will be sourced from the existing high voltage feeds from the Coolamon Village. Sites for switching and transformer padmounts will be defined during the subdivisional planning phase.

Telephone supply can be provided by the extension the reticulation system from Woodlake Village. Telstra may require an exchange within Malvern Springs to service the Ellenbrook Development in this northern area.

Reticulated Natural gas has been supplied to the Ellenbrook development via a connection to the existing Dampier-Bunbury pipeline at a "gate station" which is located within the old state forest 65 section of Ellenbrook. This supply was installed for the initial stages of Woodlake Village and has been extended to serve Coolamon and Charlotte's Vineyard and will also provide a supply for Malvern Springs from The Broadway.

APPENDIX G BUSHFIRE MANAGEMENT PLAN

Bushfire Management Plan

For a proposed urban development at Malvern Springs (Ellenbrook)

Prepared by York Gum Services October 2012

1. Introduction

This Bushfire Management Plan addresses the requirements for bushfire preparedness and bushfire damage mitigation at a proposed urban development for Stages 17 and 18 Malvern Springs, Ellenbrook WA ("the property"). The plan is prepared on behalf of Ellenbrook Management by Roger Underwood of York Gum Services.

The purpose of this plan is:

- to provide support for a subdivision application for stages 17 and 18 Malvern Springs and the amendment of a previously approved development plan; and
- to provide the basis for minimising bushfire damage on the site.

The plan sets out the principles and objectives which will underpin the development, provides background information on the property and its climate and vegetation, and an analysis of the fire hazard and threat. The plan sets out the measures which are proposed to minimise the occurrence of bushfires on the property, and the damage that bushfires might cause and clarifies the responsibilities for plan implementation and review.

The plan includes commitments by the developer in respect to site design and fire management, but also recognises that future lot owners will need to accept a level of responsibility for their own preparedness and fire safety.

Finally, the developer recognises that time could elapse before site development commences. For this reason, an interim fire management regime has been adopted for the site.

Attached to this plan is an Appendix that demonstrates compliance with the *Planning for Bush Fire Protection Guidelines.*

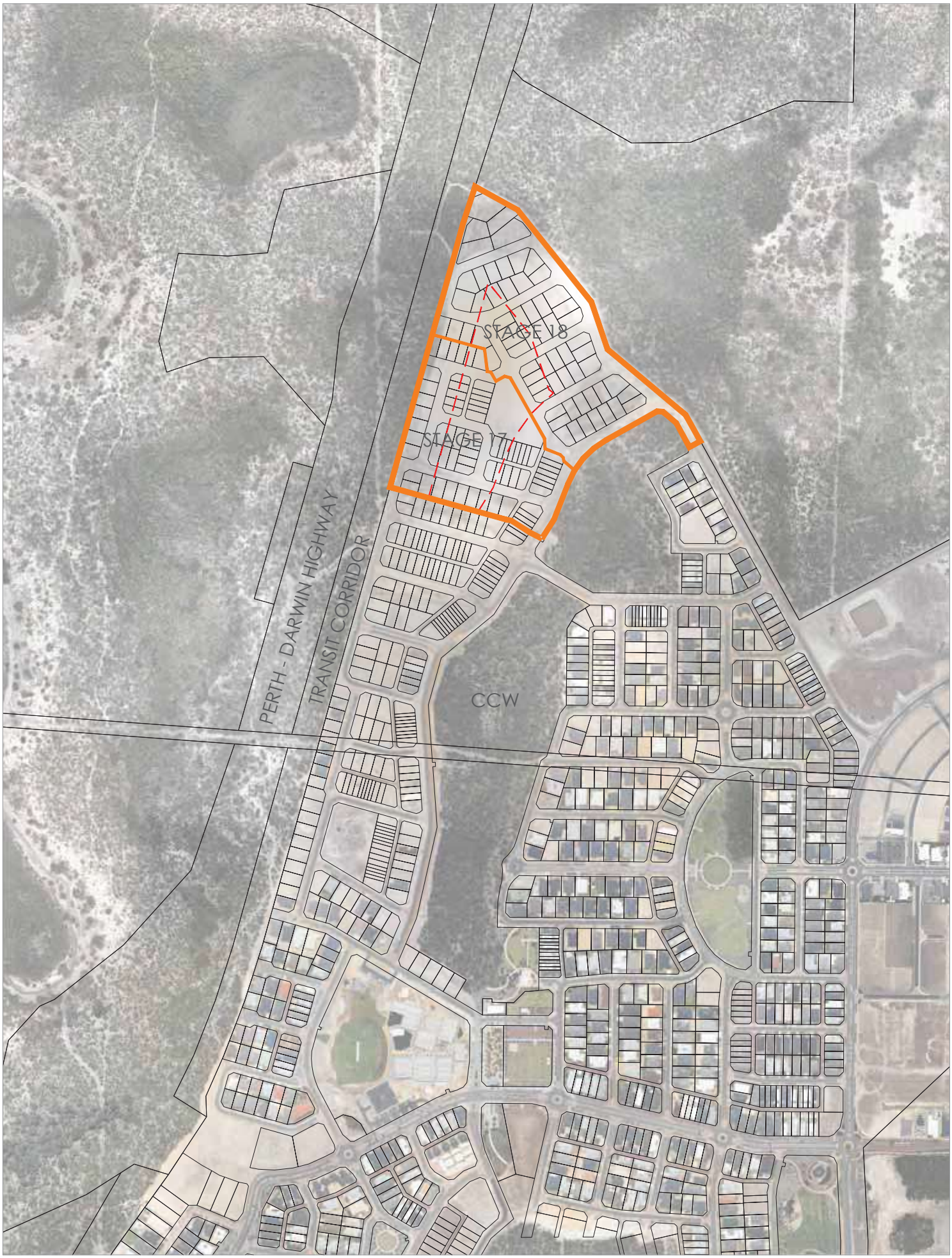
2. Aims

The aims of this Bushfire Management Plan are to

- Reduce the incidence and the impact of bushfires on the urban residential area to be developed at Malvern Springs, Ellenbrook;
- To provide a blueprint for measures to be adopted which will optimise bushfire preparedness and damage mitigation at the site; and
- To ensure compliance with the bushfire planning requirements of the 'Planning for Bush Fire Protection Guidelines' (Western Australian Planning Commission, 2010) and FESA.

3. Objectives and Principles

The objectives of this plan are to set out the principles on which fire management at the site is to be based, to define the values to be protected on the site and to provide guidelines on how these values are to be protected.



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C	PROPOSED CLEARING AREA	121121	SJ	TT
B	UDPATE NORTHERN DESIGN RD1 005A	120309	SJ	DD
A	BASED ON EJV VL6 RD1 002A	120221	SJ	DD

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VL6 / MALVERN SP.

FIGURE 1 - Location Plan
Malvern Springs Stage 17 and 18
Ellenbrook
City of Swan

0 metres 50 100 150 200 250
SCALE 1:5000 SHEET A3

REFERENCE NUMBER	DRAWING NUMBER	ISSUE
EJV VL6	RD1 003	A

The developer has adopted the following principles to underpin bushfire management at this site:

- Current and future bushfire threats will be identified and, as far as possible, mitigated;
- Planning will be undertaken in the light of an understanding of bushfire threats to human, economic and environmental/conservation values;
- Development will be in compliance with a formal bushfire management plan that must satisfy, as far as is practical, the bushfire management requirements of the 'Planning for Bush Fire Protection Guidelines' (Western Australian Planning Commission, 2010) and FESA;
- The developer will set out measures to be adopted to minimise the risk of bushfire damage at the site before development begins.

The developer recognises an obligation to alert potential lot buyers of the bushfire threat in this area and to provide lot buyers with copies of this management plan.

4. Description of the Area

4.1 General

Malvern Springs represents the 6th village in Ellenbrook and is located immediately north of Coolamon Village and Charlotte's Vineyard. The Perth-Darwin National Highway and Transit Corridor reservations abut the western boundary of the village. A regional wetland/conservation area is located to the west of the village beyond the highway reservation. A protected Conservation Category Wetland (CCW) on the eastern boundary of the site is reserved 'Recreation' and will be vested in the City of Swan.

The general geography of the area and the location within it of Malvern Springs is shown on Figure 1.

Land to the south of Malvern Springs is residential with homes on small lots, interspersed with retained wetlands.

4.2 Climate

The climate of the area is Mediterranean, with hot, dry summers and cool wet winters. Annual rainfall is approximately 750 mm, the bulk of which falls between April and October.

Summer winds tend to be from the east in the morning and from the southwest in the afternoon. Occasional strong northerly winds will accompany the movement of a low pressure trough.

Thunderstorms occur most summers, often generating lightning strikes plus occasional torrential rain.

4.3 Topography

The area is generally flat with a slight southerly aspect, and rises to a slight pinch in the north-western corner.

4.4 Bushfire fuels

The entire site has been cleared down to bare earth, and at the time of preparation of this management plan, contains no bushfire fuels.

The adjacent bushland carries banksia and jarrah trees and an understory of shrubs, interspersed with occasional wetlands with paperbark and marri trees. All of this bushland accumulates bushfire fuels in the absence of fire, and is highly flammable when dry. Flammability increases with time since last fire, and whilst it will not generally carry a hot fire in the first 2-3 years after a fire, by the time 6-8 years has elapsed, fires will be intense and difficult to control.

4.5 Land use

The property is designated for urban development in its entirety. The residential areas adjoin native bushland and a Recreation Reserve. A 'Public Purposes – Special Uses' Reserve (Transit Corridor) and Primary Regional Road Reserve (Perth-Darwin National Highway) abut the site to the west.

4.6 Assets

At the time of preparation of this management plan the area has no assets. These will be progressively developed on the site over time, and eventually will include: human lives, houses and other buildings and their contents, motor vehicles and community and social infrastructure.

4.7 Access

Current access is via sealed roads constructed within adjoining residential areas.

To the west and immediately adjoining the property is a designated transit corridor on which it is planned to construct a rapid transit system and a Primary Regional Road Reserve representing the Perth-Darwin National Highway, linking the Ellenbrook development with the city to the south.

4.8 Water supply

The area currently has no water supply, other than as delivered by water trucks. The delivery of urban development will ensure provision of a reticulated/water supply to the site.

4.9 The proposed development

The proposed development will comprise 131 residential lots, ranging in size from 225m^2 to 1683m^2.

All lots will be serviced by sealed roads, underground power and reticulated water supply.

5. Fire Problem

5.1 Bush fire history

Before clearing the area is known to have experienced many fires, either wildfires or fuel reduction burns over the last century.

5.2 Bush fire risk

The risk of a fire starting on the property at the time of writing this management plan is zero as it has been totally cleared to bare earth. The risk will increase slightly over time, with the

presence of undeveloped blocks, and then decline as houses are built and irrigated gardens developed.

5.3 Bush fire hazard

The bushfire hazard on the site where houses are to be constructed at the time of writing this management plan is nil as it is totally cleared. The adjoining bushland has been mapped as having an Extreme Hazard by the City of Swan, as shown in Figure 2.

5.4 Bushfire threat

The bushfire threat to the sections of this property is high-extreme where it directly adjoins bushland on the north eastern side. These areas are likely to be impacted by embers and radiant heat from a bushfire approaching from the east, north-east, north or west.

Areas not directly adjoining the bushland perimeter are not likely to be subjected to radiant heat, but are likely to be impacted by embers carried into the housing area by strong fire winds.

The proximity of bushland to the west of the property will recede following construction of the transit corridor and Perth-Darwin National Highway on the adjacent transport corridor, but all houses within the suburb will need to be protected against potential ember attack.

5.5 Assessment of Bushfire Attack Level (BAL)

All lots within 100 metres of the bushfire hazard according to Table 2.4.3 'Determination of Bushfire Attack Level (BAL) – FDI 80 (1090K) of AS3959-2009:

- The bushland is woodland (Category B);

Western Boundary

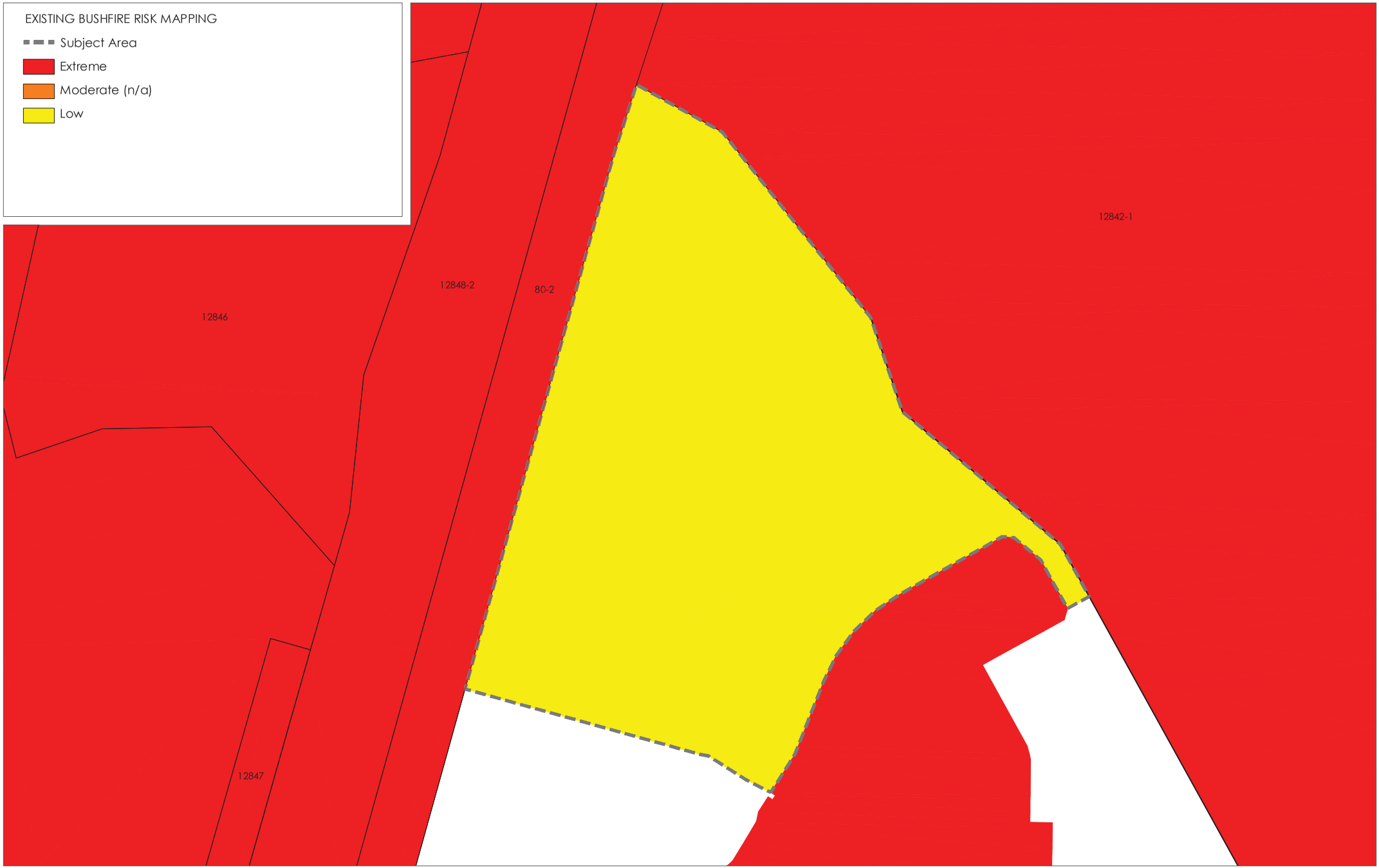
- Lots on the western side of the site are at a higher level than the bushland;
- For the purposes of identifying the BAL the lots on the western boundary are identified as having a 'Downslope >0 to 5 degrees' in accordance with Table 2.4.3 of AS 3959-2009;
- To achieve a BAL of 19, houses on lots abutting the western border will need to be set back at least 25 metres from the edge of the bushland. This cannot be achieved until vegetation within the Transit Corridor has been cleared;

North Eastern and Eastern Boundary

- Lots on the north east and eastern side are roughly level with the bushland;
- For the purposes of identifying the BAL the lots on the north eastern and eastern boundary are identified as 'All upslopes and flat land (0 degrees)' in accordance with Table 2.4.3 of AS 3959-2009;
- To achieve a BAL of 19, houses on the north eastern and eastern boundary of the site will need to be setback at least 20 metres from the edge of the bushland.

5.6 Fire fighting resources in the area

The area is well served for fire detection, as it is overlooked by Fire Lookout Towers operated by the Department of Environment and Conservation (DEC), and has access to fire spotting



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A	BASED ON EJV VL6 RD1 002A	120221	SJ	DD

AERIAL PHOTOGRAPHY
Source: Nearmap
Date: 28th January 2012

CADASTRAL INFORMATION
Source: Whelans
Date: Nov 2011
Dwg Ref: malvern-111125.dwg
Projection: PCG 84

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PROJECT
Malvern Springs

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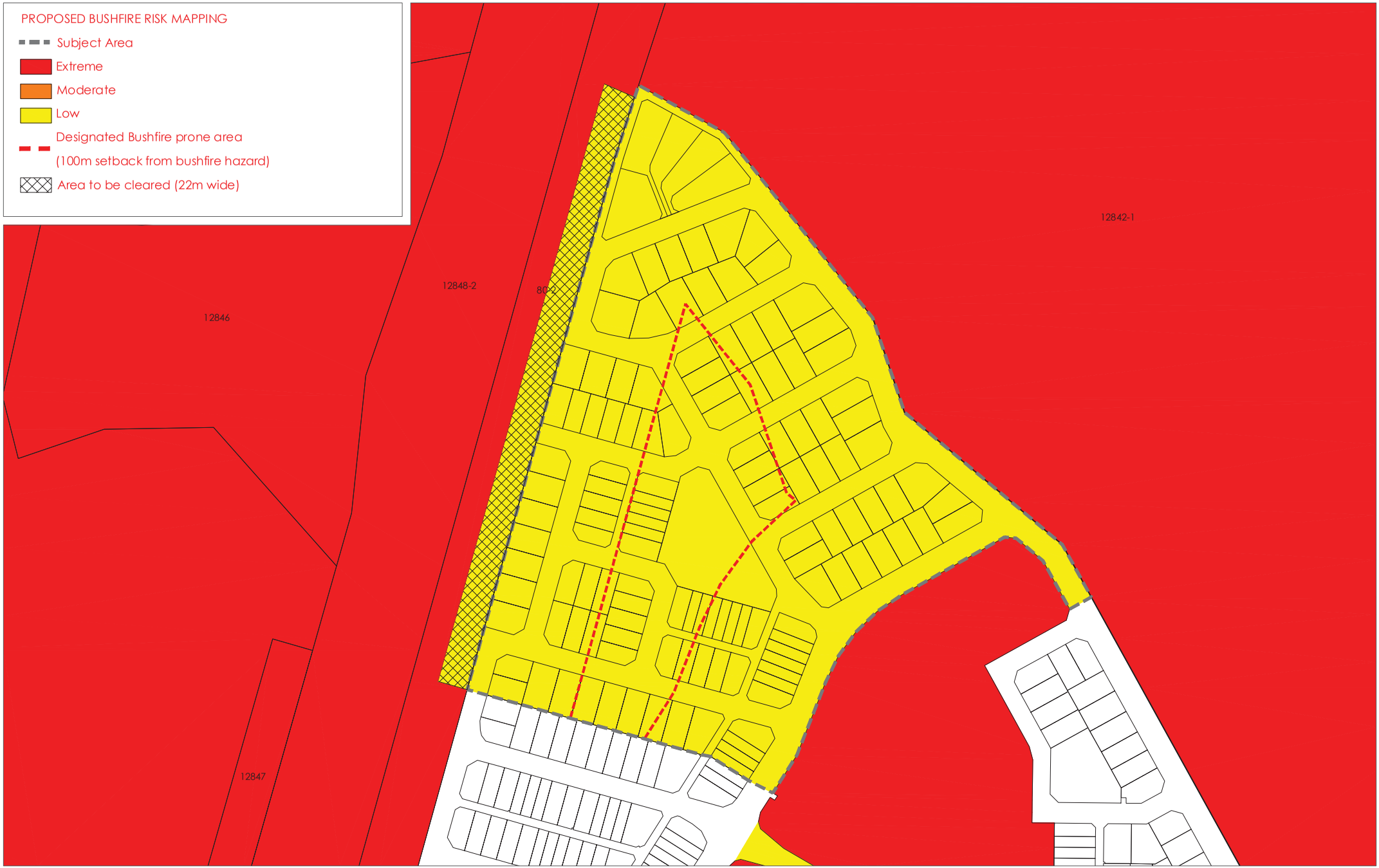
FIGURE 2 - Bushire Management Risk Pre-Subdivision
Malvern Springs Stages 17 and 18
City of Swan

0 metres 25 50 75 125

SCALE 1:1250 SHEET A1

REFERENCE NUMBER	DRAWING NUMBER	ISSUE
EJV VL6	RD1 003	C



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AERIAL PHOTOGRAPHY
Source: Nearmap
Date: 28th January 2012

CADASTRAL INFORMATION
Source: Whelans
Date: Nov 2011
Dwg Ref: malvern-111125.dwg
Projection: PCG 84

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FIGURE 3 - Bushire Management Risk Post-Subdivision
Malvern Springs Stages 17 and 18
City of Swan

0 metres 25 50 75 125
SCALE 1:1250 SHEET A1

REFERENCE NUMBER	DRAWING NUMBER	ISSUE
EJV VL6	RD1 003	C

aircraft in the hills to the east. The high population in the area should also ensure fires are rapidly detected and reported.

There is a FESA Fire Station at Ellenbrook on Gnangara Road, approximately 10 minutes driving time from the site.

DEC firefighters are located at Wanneroo, 20 minutes away to the west, and they have heavy equipment and trained operators on standby for fighting fires in bushland. There are volunteer bushfire brigades under the auspices of the City of Swan located to the east.

Water bombing fixed wing aircraft and helicopters are located at Jandakot airfield and could be at the site within 20 minutes of a call-out for a fire at or near the site.

5.7 Summary of bush fire potential issues

The residential lots to be developed on this site will contain values potentially threatened by a bushfire approaching from the east, north and west. Fires in bushland in this region can be fierce and throw spotfires long distances. Whilst it is unlikely that the suburb will sustain a running fire, houses and other assets will be vulnerable to embers generated by an intense fire on a windy day.

Rapid fire detection and availability of firefighters within minutes of a fire report will allow most fires to be dealt with efficiently, but the principal threat remains: a high intensity fire on a bad day sweeping down from the north or north-west.

For lots adjoining the bushland on the north east and eastern boundary it will be necessary to set back houses a minimum distance of 20 metres from the edge of the bushland, and houses will need to be built to prescribed standards to avoid vulnerability to bushfire damage.

For lots adjoining the bushland on the western boundary it will be necessary to set back dwellings a minimum distance of 25 metres from the edge of the bushland. The construction of dwellings can only occur on these lots following the clearing of vegetation within the Transit Corridor (see section 6 below). It is recommended that the following methodology is utilised to clear and maintain the transit corridor:

- The transit corridor (as it effects Stage 17 and 18 Malvern Springs) is to be cleared, the top soil removed and a layer of mulch provided, prior to any subdivisional works occurring;
- The transit corridor (as it effects Stage 17 and 18 Malvern Springs) is to be slashed and cleared annually by Ellenbrook Management in the months of August through to October;
- Ellenbrook Management must notify the City of Swan once slashing and clearing has occurred who will then be required to undertake an inspection of the works. The inspection must involve a representative from the City of Swan, the City's bushfire expert, Ellenbrook Management and an appointed bushfire consultant.

6. Bushfire Mitigation Strategies

6.1 Interim bushfire management

The developer acknowledges that time might elapse before all of the lots are sold and house construction commences. In the interim, the developer undertakes to control regrowth and weeds on unsold blocks so that they do not represent a fire hazard over summer months.

6.2 Protection of human lives and assets

The following measures will be adopted to protect, as far as is possible, the lives of residents and their assets from bushfire damage in this development:

6.2.1 BAL 19

For all lots identified as having a BAL of 19 (Shown in Figure 4), a notification in the form of a section 70A notification, pursuant to the Transfer of Land Act 1893 (as amended) is to be placed on the Certificates of Title.

The notification will advise of the existence of an approved Detailed Area Plan and that development of the lot will be required to be in accordance with the Detailed Area Plan. The Detailed Area Plan for lots will refer to this Bushfire Management Plan and will require:

(i) the dwelling of the lot will be setback at least 25 metres from the edge of the bushland for lots on the western boundary;

(ii) the dwelling of the lot will be setback at least 20 metres from the edge of the bushland for lots on the north eastern and eastern boundary; and

(iii) dwellings constructed on these lots must comply with Section 3 and 6 of Australian Standards ASA 3959-2009 ("Construction of Houses in Bushfire-prone Areas"):

In addition to Section 3 and 6 of ASA 3959-2009 the following requirements will apply:

- Rotary roof ventilators to be fitted with metal gauze spark screens with a minimum aperture size of 1.8 mm.
- Roof-mounted evaporative air conditioners to have the openings to the cooling unit fitted with metal gauze spark guards.

6.2.2 BAL 12.5

For all lots identified as having a BAL of 12.5 (shown in Figure 4), a notification in the form of a section 70A notification to the Transfer of Land Act 1893 (as amended) is to be placed on the Certificates of Title.

The notification will advise of the existence of an approved Detailed Area Plan and that development of the lot will be required to be in accordance with the Detailed Area Plan. The Detailed Area Plan for lots will refer to this Bushfire Management Plan and will require houses constructed on these lots must comply with the Section 3 and 5 of Australian Standards ASA 3959-2009 ("Construction of Houses in Bushfire-prone Areas"):

In addition to Section 3 and 5 of ASA 3959-2009 the following requirements will apply:

- Rotary roof ventilators to be fitted with metal gauze spark screens with a minimum aperture size of 1.8 mm.
- Roof-mounted evaporative air conditioners to have the openings to the cooling unit fitted with metal gauze spark guards.

6.2.3 Further Advice

The developer will advise all other lot owners (in a covering letter accompanying this Management Plan) that houses should have enclosed eaves and no gaps between rafters; that rotary roof ventilators be fitted with metal gauze spark screens with a minimum aperture size

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C	PROPOSED CLEARING AREA	121121	SJ	TT
B	UDPATE NORTHERN DESIGN RD1 005 A	120309	SJ	DD
A	BASED ON EJV VL6 RD1 002A	120221	SJ	DD

AERIAL PHOTOGRAPHY
Source: Nearmap
Date: 28th January 2012
Accuracy: +/- 5m

CADASTRAL INFORMATION
Source: Whelans
Date: Nov 2011
Dwg Ref: malvern-111125.dwg
Projection: PCG 84

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FIGURE 4 - AS3959 Design Requirements Plan
Malvern Springs Stages 17 and 18
City of Swan

0 metres 25 50 75 125
SCALE 1:1250 SHEET A1

REFERENCE NUMBER	DRAWING NUMBER	ISSUE
EJV VL6	RD1 003	D

of 1.8 mm; and roof-mounted evaporative air conditioners have the openings to the cooling unit fitted with metal gauze spark guards (a FESA Approved equivalent may be used in lieu of the above recommendations.

The developer will provide a copy of this Bushfire Management Plan and a copy of the document "Homeowners Bushfire Survival Manual Guidelines" to each initial lot purchaser.

6.3 Hazard management

The developer will ensure the entire property is clear of vegetation at the commencement of the development (as it currently is) and will maintain low fuel on vacant lots during the process of development.

6.4 Bush fire risk management

The developer will advise lot purchasers owners of the extreme risk of fires starting in bushland adjacent to the property, and of the necessity to be alert for fire ignitions and to immediately advise the authorities of a bushfire.

The developer will recommend to lot owners that they establish a "Bushfire Ready Group" or Homeowners Association, who can encourage fire watching and reporting, and discuss fuels management on adjoining bushland with DEC and the City of Swan. The developer will advise lot owners that they should seek to encourage DEC and the City of Swan to undertake fuel reduction burning under safe conditions in bushland adjoining the property, and set up mechanisms for cooperation across the boundaries of the areas.

6.5 Future development

Future development impacting on this property will be the construction of the Ellenbrook transit corridor and highway to the west and future residential development of Village 7B, south of Maralla Road. Both eventualities will reduce potential bushfire problems on the site.

6.6 Access/egress and strategic fire breaks

Every lot will be serviced by a sealed road. There will be multiple points of access and egress.

There will be a sealed road between lot boundaries and bushland at all points on the subdivision with the exception of one steep area in the north-east corner. At this point the developer will install a dual-use, sealed, fire access (6 metres wide). The access road will be wide enough to permit access by a short wheelbased fire appliance (e.g. Land Cruiser trayback with pump and water tank) in an emergency.

6.7 Water supply

All lots will be supplied with pressurised reticulated water supply.

The developer will install fire hydrants 200 metres apart on all roads, the hydrants to meet the specifications of FESA.

6.8 Power supply

All lots will be supplied with electricity from the grid, via underground powerlines.

6.9 Public education and community awareness

The developer will provide all initial lot buyers with a copy of this Bushfire Management Plan, plus a copy of the booklet A Homeowner's Guide to Bushfire Safety and bushfire literature from the City of Swan.

The developer will also encourage lot buyers to form (or join) a Bushfire Ready Action Group, or Residents Association, that will work to raise bushfire awareness, promote rapid reporting of bushfires and sensible action in the event of a fire. Such a group could also provide a focal point for liaison with DEC and the City of Swan in relation to fuel reduction burning in bushland adjacent to the residential area.

6.10 Fire safer areas

The developer will request the City of Swan to designate, within or near the Ellenbrook city, areas where residents who are not prepared, or unable to stay and defend their properties, can safely gather in the event of a large regional bushfire sweeping in from the north or west. The City of Swan will be asked to signpost these areas, and to run an education program for residents at the start of every summer.

6.11 Implementation of fire management plan

Responsibility for implementation of this plan will be:

The developer: for all commitments set out in Section 6 of this management plan;

The lot buyers: for construction of houses meeting the specifications set out in this plan, and for subsequent coordination of bushfire awareness; and

The City of Swan: approval and monitoring the implementation of this Management Plan.

7. Disclaimer

The Consultant preparing this Bushfire Management Plan takes no responsibility for the impacts of a future bushfire on any values at the Malvern Springs residential subdivision. He has done his best in this strategy to alert residents to the threat of bushfires, and to suggest measures to minimise these threats and potential bushfire damage, but there may occur an unusual combination of events or human actions or lack of actions which could not reasonably have been expected at the time of preparing the Plan. The Consultant takes no responsibility for the standard of bushfire preparedness or damage mitigation undertaken by lot owners in the future.

Compliance checklist for performance criteria and acceptable solutions

Appendix 4 from *Planning for Bushfire Protection*

Malvern Springs at Ellenbrook

Element 1: Location

Does the proposal comply with the performance criteria by applying acceptable solution A1.1?

Yes The land on which houses will be constructed will be fully cleared of all vegetation

No

If no, please explain in writing how the proposal satisfactorily complies with performance criterion P1 for this area of non-compliance, and attach this explanation to the rear of this checklist.

Element 2: Vehicular access

Does the proposal comply with the performance criteria by applying acceptable solution A2.1?

Yes There will be multiple points of access and egress on fully engineered surfaced roads

No

If no, please explain in writing how the proposal satisfactorily complies with performance criterion P2 for this area of non-compliance, and attach this explanation to the rear of this checklist.

Does the proposal comply with the performance criteria by applying acceptable solution A2.2?

Yes Not applicable

No

If no, please explain in writing how the proposal satisfactorily complies with performance criterion P2 for this area of non-compliance, and attach this explanation to the rear of this checklist.

Does the proposal comply with the performance criteria by applying acceptable solution A2.3?

Yes Not applicable

No

If no, please explain in writing how the proposal satisfactorily complies with performance criterion P2 for this area of non-compliance, and attach this explanation to the rear of this checklist.

Does the proposal comply with the performance criteria by applying acceptable solution A2.4?

Yes Not applicable

No

If no, please explain in writing how the proposal satisfactorily complies with performance criterion P2 for this area of non-compliance, and attach this explanation to the rear of this checklist.

Does the proposal comply with the performance criteria by applying acceptable solution A2.5?

Yes Not applicable

No

If no, please explain in writing how the proposal satisfactorily complies with performance criterion P2 for this area of non-compliance, and attach this explanation to the rear of this checklist.

Does the proposal comply with the performance criteria by applying acceptable solution A2.6?

Yes Not applicable

No

If no, please explain in writing how the proposal satisfactorily complies with performance criterion P2 for this area of non-compliance, and attach this explanation to the rear of this checklist.

Does the proposal comply with the performance criteria by applying acceptable solution A2.7?

Yes Not applicable

No

If no, please explain in writing how the proposal satisfactorily complies with performance criterion P2 for this area of non-compliance, and attach this explanation to the rear of this checklist.

Does the proposal comply with the performance criteria by applying acceptable solution A2.8?

Yes Not applicable

No

If no, please explain in writing how the proposal satisfactorily complies with performance criterion P2 for this area of non-compliance, and attach this explanation to the rear of this checklist.

Does the proposal comply with the performance criteria by applying acceptable solution A2.9?

Yes Not applicable

No

If no, please explain in writing how the proposal satisfactorily complies with performance criterion P2 for this area of non-compliance, and attach this explanation to the rear of this checklist.

Does the proposal comply with the performance criteria by applying acceptable solution A2.10?

Yes Not applicable

No

If no, please explain in writing how the proposal satisfactorily complies with performance criterion P2 for this area of non-compliance, and attach this explanation to the rear of this checklist.

Element 3: Water

Does the proposal comply with the performance criteria by applying acceptable solution A3.1?

Yes The development will be fully serviced with reticulated pressurised water

No

If no, please explain in writing how the proposal satisfactorily complies with performance criterion P3 for this area of non-compliance, and attach this explanation to the rear of this checklist.

Does the proposal comply with the performance criteria by applying acceptable solution A3.2?

Yes Not applicable

No

If no, please explain in writing how the proposal satisfactorily complies with performance criterion P3 for this area of non-compliance, and attach this explanation to the rear of this checklist.

Does the proposal comply with the performance criteria by applying acceptable solution A3.3?

Yes Not applicable

No

If no, please explain in writing how the proposal satisfactorily complies with performance criterion P3 for this area of non-compliance, and attach this explanation to the rear of this checklist.

Element 4: Siting of development

Does the proposal comply with the performance criteria by applying acceptable solution A4.1?

Yes Not applicable. The area on which the development is to occur will be fully cleared. Allowance is made for set-backs where appropriate and housing construction standards are prescribed to meet the requirements for a BAL of 19 or 12.5 where houses adjoin bushland.

Lots adjoining the transport corridor to the west will not be sold until the corridor is cleared, thus ensuring the prescribed setback from bushland in this area.

No

If no, please explain in writing how the proposal satisfactorily complies with performance criterion P4 for this area of non-compliance, and attach this explanation to the rear of this checklist.

Does the proposal comply with the performance criteria by applying acceptable solution A4.2?

Yes

No

If no, please explain in writing how the proposal satisfactorily complies with performance criterion P4 for this area of non-compliance, and attach this explanation to the rear of this checklist.

Does the proposal comply with the performance criteria by applying acceptable solution A4.3?

Yes Not applicable. BPZ not needed as no dwellings will be constructed within bushland

No

If no, please explain in writing how the proposal satisfactorily complies with performance criterion P4 for this area of non-compliance, and attach this explanation to the rear of this checklist.

Note: Please indicate the extent of the building protection zone on the plans submitted.

Does the proposal comply with the performance criteria by applying acceptable solution A4.4?

Yes Not applicable. No HSZ required as no dwellings to be constructed within bushland.

No

If no, please explain in writing how the proposal satisfactorily complies with performance criterion P4 for this area of non-compliance, and attach this explanation to the rear of this checklist.

Note: Please indicate the extent of the hazard separation zone on the plans.

Does the proposal comply with the performance criteria by applying acceptable solution A4.5?

Yes Not applicable

No

If no, please explain in writing how the proposal satisfactorily complies with performance criterion P4 for this area of non-compliance, and attach this explanation to the rear of this checklist.

Note: Please provide details of the proposed shielding to be implemented as part of the development.

Element 5: Design of development

Does the proposal comply with the performance criteria by applying acceptable solution A5.1?

Yes Not applicable. The design is fully compliant with Elements 1-4, including the constraint to withhold the sale of lots on the western side until the adjoining transport corridor is cleared.

No

If no, please explain in writing how the proposal satisfactorily complies with performance criterion

P5 for this area of non-compliance, and attach this explanation to the rear of this checklist.

Does the proposal comply with the performance criteria by applying acceptable solution A5.2?

Yes Not applicable

No

If no, please explain in writing how the proposal satisfactorily complies with performance criterion P5 for this area of non-compliance, and attach this explanation to the rear of this checklist.

Applicant Declaration

I declare that the information provided is true and correct to the best of my knowledge.

Full name: .....Roger John Underwood

Applicant signature: 

Date: .....19/10/2012.

APPENDIX G ADDENDUM BUSHFIRE MANAGEMENT PLAN

Level 1, 50 Subiaco Square Road Subiaco WA 6008 PO Box 243 Subiaco WA 6904
Phone (08) 9380 3100 Fax (08) 9380 4606
177 Spencer Street Bunbury WA 6230 PO Box 287 Bunbury WA 6231
Phone (08) 9792 4797 Fax (08) 9792 4708

To: Emma Jeans

Company: RobertsDay Planning

Fax/email: Emma.Jeans@robertsday.com.au

Date: 17 February 2016

Project No: RDP15189.01

Inquiries: D Panickar

FMP Addendum
Fire management planning for Northlink area

Background

RobertsDay are assisting in the development of Malvern Springs village in Ellenbrook. A Bushfire Management Plan was prepared for Stages 17 and 18 of the development site in 2012 (York Gum Services 2012). Since 2012, an additional parcel of land has become available for development (Northlink area) which RobertsDay have prepared a development plan for. RobertsDay have requested Strategen prepare an addenda to the existing Bushfire Management Plan to support the subdivision of Northlink and the amendment to the previously approved development plan.

Existing environment

All information relating to the existing environment relevant to the subject lots is outlined in the approved York Gum Services (2012) FMP. This information includes:

- site location
- climate
- topography
- on-site vegetation
- land use
- site assets
- water supply
- site access
- bushfire history
- assessment of the vegetation class and bushfire hazard level
- location of bushfire hazards
- depiction of the 100 m wide area where AS 3959–2009 and Bushfire Attack Level (BAL) ratings need to be applied.

Bushfire hazards

The only significant stand of remnant vegetation within 100 m of the Northlink area is located adjacent to its western boundary. This vegetation is comprised of *Banksia* woodland occurring downslope from the Northlink area at an angle between 0 to 5 degrees. Total available fuel loads were assessed at 15-18 t/ha (tonnes per hectare).

Bushfire risk treatment and mitigation

The following subsections outline how the bushfire risk to future life and property assets within the Northlink area will be mitigated to achieve a suitable, effective and compliant bushfire management outcome. This will be achieved by meeting performance criteria and associated acceptable solutions in accordance with PFBFP Guidelines. The fire management responses proposed within the Northlink area are incidental measures to allow lots contained within to achieve full fire management compliance, particularly with regards to the location of Building Protection Zones (BPZs).

The recommended fire management measures are illustrated on an aerial image of the subject lots in Figure 1 to assist with implementation of the FMP.

Development location

Strategic location, layout and management of future development at the planning stage can reduce future fire threat and risk to critical life and property assets.

All lots within the Northlink area will be contained within a fully cleared area (Plate 1). For the 32 lots that cannot achieve a minimum 100 m separation distance to 'Extreme' bushfire hazard areas; AS 3959–2009 and increased building construction standards will need to be applied in accordance with a BAL assessment, as outlined in Table 1 and Figure 1.

The 32 affected lots can achieve a rating of BAL 29 or lower, which is compliant with acceptable solution A1.1. However, this will require the maintenance of an already cleared area immediately adjacent to the western boundary of the Northlink area.

The following methodology is recommended for maintenance within the cleared area:

- regrowing vegetation must be slashed and cleared annually by the developer in the months of August through to October with fuel loads maintained to within 2 t/ha
- the developer must notify the CoS once slashing and clearing has occurred
- CoS must undertake an inspection of clearing and slashing works following each annual event in accordance with the CoS annual firebreak notice (Appendix 1).

Table 1: Bushfire Attack Level (BAL) assessment

Factor	Characteristics
Fire Danger Index (FDI)	A blanket FDI rating of 80 is adopted for Western Australian environments, as outlined in Australian Standard *AS 3959–2009 Construction of Buildings in Bushfire Prone Areas* (SA 2009) and endorsed by Australasian Fire and Emergency Service Authorities Council (AFAC).
Effective slope under classified vegetation	Vegetation will be located between 0 to 5 degrees downslope of proposed lots on the western boundary of the Northlink area.
Vegetation class	• all remnant vegetation within the Northlink area has been cleared • woodland vegetation occurs to the west of the Northlink area.
Distance from classified vegetation	32 proposed lots are located within 100 m from classified vegetation, thus triggering application of AS 3959-2009.
Applicable BALs	BALs applicable to affected lots are depicted in Figure 1. A total of 32 lots have been classified as requiring heightened construction standards – specifically: • BAL29: 3 lots (17-25 m from woodland vegetation) • BAL 19: 5 lots (25-35 m from woodland vegetation)* • BAL12.5: 24 lots (35-100 m from woodland vegetation). All other lots within the project area are considered to be BAL-Low, where there is insufficient risk to warrant specific construction requirements.

*Includes one lot which contains an 8 m wide building exclusion zone where no part of the building envelope can be located

Plate 1: The Northlink area

Vehicular access

A2.1 Two access routes

The Northlink area contains an internal road network which provides a total of five links to surrounding roads (i.e. Elmridge Parkway and Rodstand Circuit). This outcome is compliant with *Acceptable Solution A2.1 Two Access Routes* by ensuring all residents and visitors of the development are provided with at least two vehicular access routes connecting to the surrounding public road network at all times.

A2.2 Public roads

All public roads and private driveways will be constructed to specifications in accordance with Main Roads WA and DFES requirements which aligns with *Acceptable Solution A2.2 Public Roads*.

A2.3 Cul-de-sacs

This acceptable solution is not applicable to the development as no cul-de-sacs are proposed.

A2.4 Battle axes

This acceptable solution is not applicable to the development as no battle-axe lots are proposed.

A2.5 Private drive-ways

This acceptable solution is not applicable to the development as no private driveways (as per A2.5 design requirements) are proposed.

A2.6 Emergency access ways

This acceptable solution is not applicable to the development as no emergency access ways (as per A2.6 design requirements) are required or proposed.

A2.7 Fire service access routes

This acceptable solution is not applicable to the development as no fire service access routes (as per A2.7 design requirements) are proposed.

A2.8 Gates

This acceptable solution is not applicable to the development as no gates (as per A2.8 design requirements) are required or proposed.

A2.9 Firebreak widths

Maintenance of cleared vegetation immediately adjacent to the western boundary of the Northlink area will provide compliant separation distances between classified woodland vegetation and proposed lots within the Northlink area.

A2.10 Signs

This acceptable solution is not applicable to the development as no signs (as per A2.10 design requirements) are required or proposed.

Water supply

Water supply services will be extended throughout the subject lots from adjacent developed areas, which will result in provision of a reticulated water supply for all proposed residences. A network of hydrants will also be provided along the internal road network at locations which meet relevant water supply authority, CoS and DFES requirements.

The above measures will ensure the development meets performance criteria for water supply (Element 3) by adopting *Acceptable Solution A3.1 Water Supply: Reticulated Areas*.

Siting of development

A total of 32 lots within the Northlink area cannot achieve the full 100 m separation distance to 'Extreme' bushfire hazards to the west. As a result, these lots will require application of AS 3959–2009 and increased building construction standards (depicted on DAPs) to comply with *Acceptable Solution A4.1 Hazard separation – moderate to extreme bushfire hazard level*. The BAL assessment for the 31 lots is discussed in the following points and summarised in Table 1.

1. Fire Danger Index (FDI): A blanket rating of FDI 80 is adopted for Western Australian environments, as outlined in *AS 3959–2009 Construction of Buildings in Bushfire Prone Areas* (SA 2009) and endorsed by Australasian Fire and Emergency Service Authorities Council (AFAC).
2. Slope: The average slope under classified vegetation contained within vegetation to the west of the Northlink area is between 0–5 degrees (i.e. vegetation is down-slope from proposed lots).
3. Vegetation class: The vegetation class to the west of the Northlink area is "Woodland".
4. Distance between development areas and classified vegetation: The minimum distance between the proposed lots and classified vegetation is 17 m (Figure 1).

A strategic firebreak (comprised of areas previously cleared of vegetation) will be accommodated adjacent to the western boundary of the Northlink area. This solution complies with acceptable solution *A4.3 Building Protection Zone*. Fuel loads throughout the BPZ will be required to be maintained annually by the developer at less than 2 t/ha. Additionally, lots adjacent to the western boundary of the Northlink area must not be sold until this BPZ is implemented.

The above measures will ensure the subject lots meet performance criteria for siting of development (Element 4) by adopting acceptable solutions A4.1 and A4.3. Acceptable solution A4.4 cannot be achieved so AS 3959–2009 has been implemented accordingly. Acceptable solutions A4.2 and A4.5 are not applicable to the subject lots.

Design of development

The bushfire management concept, as indicated in Figure 1 is expected to reduce the vulnerability of life and property assets from the effects of bushfire and greatly assist bushfire prevention and suppression operations. Given the proposed development is considered to comply with Element 4, Siting of development (following implementation of the strategic firebreak adjacent to the western boundary of the Northlink area), no special design requirements are necessary.

Additional bushfire risk mitigation

The following measures will be implemented in addition to those outlined previously to provide a more thorough level of bushfire protection to residents, visitors and built assets of the subject lots:

1. Annual fuel inspections: undertaken by CoS at their discretion in accordance with the current City of Swan Annual Firebreak Notice under the provisions of the *Bush Fires Act 1954*. Failure to comply with this FMP addendum and the specified requirements of the current City of Swan Annual Firebreak Notice may result in the issuing of fines.
2. Landowner education and awareness: landowners should obtain a copy of local government and DFES bushfire information booklets that are currently available. In addition, attendance by landowners at annual DFES bushfire awareness briefings would be advantageous.
3. Section 70 Notification on Title: should be placed on Titles of those lots affected by BALs/increased building construction requirements to ensure prospective landowners are aware that an FMP exists over the land and that additional building requirements apply.

Summary of bushfire risk mitigation and works program

A summary of the bushfire risk treatment and mitigation measures described in this FMP addendum, as well as a works program, is provided in Table 2. These measures will be implemented to ensure the ongoing protection of proposed life and property assets is achieved for the subject lots. Additional optional measures are also provided and can be adopted by residents to further mitigate their risk to life and property from uncontrolled bushfires. Timing and responsibilities are also defined to assist with implementation of each management measure.

Table 2: Summary of bushfire risk mitigation measures and works program for the Northlink area

Bushfire risk mitigation	Recommended works	Mandatory	Optional	Timing	Responsibility
Development location	Implement development in accordance with the fire management concept outlined in Figure 1 to ensure development of the subject lots will not be located on land subject to either an 'Extreme' bushfire hazard level or require construction standards applicable to BAL 40 or BAL FZ.	Yes	No	During implementation of the development	Developer
Vehicular access	Implement the proposed vehicular access network.	Yes	No	During implementation of the development	Developer
	Construct all public roads, emergency access ways, gates and signs in accordance with Main Roads WA, CoS and DFES requirements.	Yes	No	During implementation of the development	Developer
Water supply	Provide a reticulated water supply to the subject lots through extension of the existing reticulated water supply from adjacent developed areas.	Yes	No	During implementation of the development	Developer
	Provide a network of hydrants along the internal road network at locations which meet relevant water supply authority, CoS and DFES requirements.	Yes	No	During implementation of the development	Developer
Siting of development	Apply BAL ratings and the corresponding building construction standards to all buildings within specified lots in accordance with Figure 1.	Yes	No	During building construction	Builder, prospective landowners
	Implement the strategic firebreak adjacent to the western boundary of the Northlink area in accordance with Figure 1.	Yes	No	During implementation of the development	Developer
	Maintain available fuel loads within the strategic firebreak at less than 2 t/ha annually.	Yes	No	Annually prior to the onset of the designated bushfire season	Developer
Design of development	Comply with AS 3959–2009 in accordance with the BAL assessment and ratings depicted in Figure 1.	Yes	No	During implementation of the development	Developer
Annual fuel hazard inspections	Comply with the current City of Swan Annual Firebreak Notice.	Yes	No	Annually prior to the onset of the designated bushfire season	Developer, prospective landowners
	Undertake an inspection of fuel hazards across the development area to assess compliance with the FMP and City of Swan Annual Firebreak Notice.	No	Yes	Annually prior to the onset of the designated bushfire season	CoS
	Issue work orders or fines where compliance with the *Bush Fires Act 1954*, FMP addendum or City of Swan Annual Firebreak Notice has been compromised.	No	Yes	Annually prior to the onset of the designated bushfire season	CoS
Landowner education and awareness	Obtain bushfire information booklets and attend annual DFES bushfire awareness briefings.	No	Yes	Annually	Prospective landowners
Section 70 Notification on Title	Place Section 70 Notification on Titles for those lots affected by BALs/increased building construction requirements to ensure prospective landowners are aware that an FMP exists over the land and that additional building requirements apply.	Yes	No	On creation of Title	Developer
Optional building requirements	Advise against the installation of evaporative air-conditioners throughout the development.	No	Yes	During building construction	Builder, prospective landowners

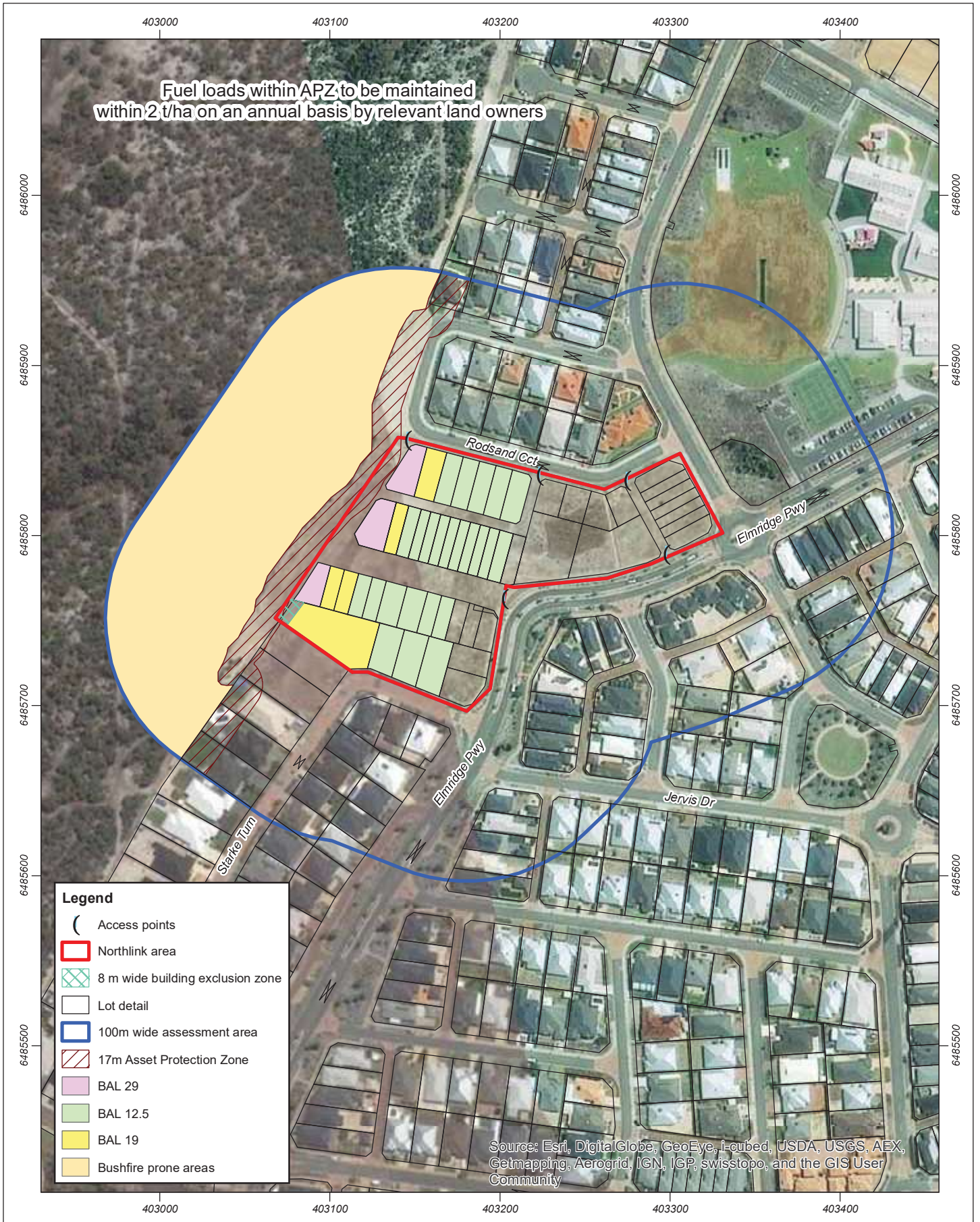

Figure 1: Fire Management Plan: FMP addendum

Scale 1:3,000 at A4

1

0 20 40 60 m

Coordinate System: GDA 1994 MGA Zone 50
Note that positional errors may occur in some areas
Date: 16/02/2016
Author: DWhite
Source: Aerial image: ESRI online, approx. 2010. Subdivision: Client 01/2016.

Path: Q:\Consult\2015\RDP\RDP15189\ArcMap_documents\M001\RevA\RDP15189_01_M001_Rev2_F001.mxd

STRATEGEN
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FMP addendum compliance checklist

A compliance checklist for performance criteria and acceptable solutions in accordance with PFBFP Guidelines is outlined in Table 3.

Table 3: FMP addendum compliance checklist

Element	Acceptable solution	Compliance	Yes/No	Explanation (if no)
1. Location	A1.1 Development location	Does the proposal comply with performance criteria P1 by applying acceptable solution A1.1?	Yes	
2. Vehicular access	A2.1 Two access routes	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.1?	Yes	
	A2.2 Public roads	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.2?	Yes	
	A2.3 Cul-de-sacs	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.3?	N/A	No cul-de-sacs proposed
	A2.4 Battle axes	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.4?	N/A	No battle axe lots proposed
	A2.5 Private driveways	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.5?	N/A	No private driveways as per A2.5 design requirements proposed
	A2.6 Emergency access ways	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.6?	N/A	No emergency access ways as per A2.6 design requirements proposed
	A2.7 Fire service access routes	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.7?	N/A	No fire service access routed as per A2.7 design requirements proposed
	A2.8 Gates	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.8?	N/A	No gates as per A2.8 design requirements proposed
	A2.9 Firebreak widths	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.9?	Yes	
	A2.10 Signs	Does the proposal comply with performance criteria P2 by applying acceptable solution A2.10?	N/A	No signs as per A2.10 design requirements proposed
3. Water	A3.1 Reticulated areas	Does the proposal comply with performance criteria P3 by applying acceptable solution A3.1?	Yes	
	A3.2 Non-reticulated areas (a)	Does the proposal comply with performance criteria P3 by applying acceptable solution A3.2?	N/A	Northlink area will be reticulated

Element	Acceptable solution	Compliance	Yes/No	Explanation (if no)
	A3.3 Non-reticulated areas (b)	Does the proposal comply with performance criteria P3 by applying acceptable solution A3.3?	N/A	Northlink area will be reticulated
4. Siting of development	A4.1 Hazard separation – moderate to extreme bush fire hazard level	Does the proposal comply with performance criteria P4 by applying acceptable solution A4.1?	Yes	
	A4.2 Hazard separation – low bush fire hazard level	Does the proposal comply with performance criteria P4 by applying acceptable solution A4.2?	N/A	
	A4.3 Building protection zone	Does the proposal comply with performance criteria P4 by applying acceptable solution A4.3?	Yes	
	A4.4 Hazard separation zone	Does the proposal comply with performance criteria P4 by applying acceptable solution A4.4?	No	AS 3959–2009 has been implemented accordingly
	A4.5 Reduction in bush fire attack level due to shielding	Does the proposal comply with performance criteria P4 by applying acceptable solution A4.5?	N/A	
5. Design of development	A5.1 Compliant development	Does the proposal comply with performance criteria P5 by applying acceptable solution A5.1?	Yes	
	A5.2 Non-compliant development	Does the proposal comply with performance criteria P5 by applying acceptable solution A5.2?	No	Development is compliant

Note: Performance criteria and acceptable solutions are in accordance with Planning for Bush Fire Protection Guidelines (Edition 2) (WAPC et al. 2010).

Applicant Declaration

I declare that the information provided is true and correct to the best of my knowledge.

Full name: Roger Banks

Applicant signature: 

Date: 11/08/2015

References

Standards Australia (SA) 2009, *Australian Standard AS 3959–2009 Construction of Buildings in Bushfire-prone Areas*, Standards Australia, Sydney.

York Gum Services 2012, *Bushfire Management Plan: For a proposed urban development at Malvern Springs (Ellenbrook)*, report prepared for Ellenbrook Management, October 2014.

Western Australian Planning Commission, Department of Planning and Fire and Emergency Services Authority (WAPC et al.) 2010, *Planning for Bush Fire Protection Guidelines (Edition 2)*, Western Australian Planning Commission and Fire and Emergency Services Authority, Perth.

Appendix 1
City of Swan Annual Firebreak Notice

BUSHFIRES ACT 1954

City of Swan

FIREBREAK NOTICE

Notice to Owners and/or Occupiers of land situated within the City of Swan.
As a measure to assist in the control of bush fires, and pursuant to Section 33 of the Bush Fires Act 1954, all owners and occupiers of land within the City of Swan are required on or before **2 November 2014**, or within 14 days of becoming an owner or occupier of land if after that date, to clear firebreaks or take measures in accordance with this notice and maintain those firebreaks and measures to the required condition up to and including the **30th day of April, 2015** .

1. All Land with an area under 5,001m2 (land under 1/2 Hectare)

1) Maintain grass to a height of no greater than 5cm.
2) Install and maintain a Building Protection Zone, in accordance with the requirements specified in clause 13 of this notice.
3) Any parcel of land having an area less than 5,001m2 that is substantially developed that may include land that:
    a) Predominantly consists of non-flammable managed vegetation, reticulated lawns and gardens and other non-flammable features; or
    b) Areas that are sufficiently Parkland Cleared

   may maintain grass to a height of no greater than 5cm, or remove all flammable materials in lieu of clearing firebreaks.
4) Areas of natural vegetation to be maintained at or below 8 tonnes per hectare.
5) Where a property is affected by an approved Bushfire Management Plan as a condition of subdivision or development, property owners shall comply with all requirements and responsibilities outlined within that plan.

2. All land with an area of 5,001m2 or greater (land over ½ Hectare)

1) Install a 3 metre firebreak immediately inside and adjacent to all external property boundaries.
2) Properties over 100 hectares require additional firebreaks to divide the land into areas not exceeding 100 hectares.
3) Slash or mow unmanaged grass (grass that is 50cm or higher) to a height no greater than 10cm immediately adjacent firebreaks to a minimum width of 3 metres.
4) Install and maintain a Building Protection Zone, in accordance with the requirements specified in clause 13 of this notice.
5) Natural Vegetation within 100 metres of Buildings, Attached and Adjacent Structures and Essential Infrastructure shall be maintained at or below 8 tonnes per hectare, by *passive* methods of fuel reduction that does not permanently remove or reduce the quantity or occurrence of the native plants, shrubs and trees within the subject area.
6) Where a property is affected by an approved Bushfire Management Plan as a condition of subdivision or development, property owners shall comply with all requirements and responsibilities outlined within that plan.

3. Plantations

1) Install and maintain external and internal firebreaks, firebreaks that form compartments (cells), firebreaks and hazard reduction measures that protect neighbouring communities and essential infrastructure in accordance with the requirements of a Fire Management Plan approved in writing by the City; or
2) Where no such approved Fire Management Plan exists,
    a) Unless the City approves an alternative plan in writing in accordance with clause 3(2)(b), install and maintain external and internal firebreaks and firebreaks that form

compartments (cells), and carry out all other firebreaks and hazard reduction measures which are required in accordance with the requirements and specifications within the Department of Fire & Emergency Services 'Guidelines for Plantation Fire Protection' 2011 publication; or

b) If it is considered impractical for any reason to carry out the plantation requirements outlined above in clause 3(2)(a), plantation owners and managers may apply in writing to the City to implement an alternative plan or measures in accordance with clause 4 of this notice. A Fire Management Plan may be required to be developed and submitted as part of the application.

4. Application to Vary Firebreak and Hazard Reduction Requirements

1) If it is considered impractical for any reason to clear firebreaks in a manner or location required by this notice, or to carry out on the land any fire hazard reduction work or measures required by this notice, you may apply in writing on or before the **15th day of October, 2014** for approval to provide firebreaks in alternative positions or to take alternative measures to abate fire hazards on the land.
2) If permission is not granted in writing by the City prior to the **2nd day of November, 2014** you shall comply with the requirements of this notice.
3) When permission to provide alternative firebreaks or fire hazard reduction measures has been granted, you shall comply with all conditions on the endorsed permit and maintain the land to the required standard throughout the period specified by this notice.
4) Where the City has in writing approved a Bushfire Management Plan as a condition of subdivision and the Bushfire Management Plan depicts an array of alternative firebreak positions and alignments, a property owner may, as an alternative to general boundary firebreaks, elect to provide an alternative firebreak(s) depicted on the Bushfire Management Plan. However, if the alternative firebreak is not constructed by the date required by this notice, then general firebreak requirements shall apply.

5. Fuel Dumps and Depots

Remove all inflammable material within 10 metres of fuel dumps, fuel ramps or where fuel drums, whether containing fuel or not, are stored.

6. Hay Stacks

Clear and maintain a firebreak completely surrounding any haystack on the land, within 60 metres of the haystack.

7. Strategic Firebreaks

1) Where under a written agreement with the City, or where depicted on an approved Bushfire Management Plan strategic firebreaks are required on the land, you are required to clear and maintain strategic firebreaks a minimum of 6 metres wide along the agreed alignment to provide restricted vehicular access to emergency and authorised vehicles, unimpeded by obstructions including boundary fences unless fitted with gates and signage approved in writing by the City.
2) Gates may only be secured with City of Swan Fire Service padlocks.
3) Strategic firebreaks shall be graded to provide a continuous 4 wheel drive trafficable surface a minimum of 4 metres wide.
4) All branches must be pruned and obstacles removed to maintain a 4 metre vertical height clearance above the full 6 metre width of the firebreak.

8. Emergency Access Ways

1) Where under a written agreement with the City, or where depicted on a Bushfire Management Plan Emergency Access Ways are required on private land, you are required to clear and maintain a vehicular access way a minimum of 6 metres wide along the agreed alignment.
2) Emergency access ways must be unimpeded by obstructions including boundary fences unless fitted with gates and signage approved in writing by the City.
3) Gates on Emergency Access Ways must remain unlocked at all times.
4) Emergency Access Ways shall be graded and have suitable drainage to provide a minimum 6 metre wide continuous trafficable surface suitable for all types of 2 wheel drive vehicles.
5) All branches must be pruned and obstacles removed to maintain a 4 metre vertical height clearance above the full 6 metre width of the trafficable surface.

9. Firebreak Construction

1) Firebreaks are to be developed and maintained clear of all obstacles and flammable materials to create a minimum of 3 metre wide trafficable surface suitable for 4 wheel drive vehicles.
2) Overhanging branches must be pruned to provide a 4 metre vertical clearance above the full width of the firebreak surface.
3) Boundary Firebreaks must be aligned immediately inside and adjacent to the external property boundaries.
4) Alternative Firebreaks that are approved in writing by the City, or as depicted within a Bushfire Management Plan approved in writing by the City, are to be constructed to the same standard as general firebreaks and must be constructed along the specified alignment.
5) Firebreaks must not terminate in a dead end.
6) Firebreaks may be constructed by ploughing, grading, raking, burning, chemical spraying or any other approved method that achieves the required standard.

10. Driveways

Where building sites are situated more than 50 metres from a public road,

1) Driveways must be maintained clear of all permanent obstacles and flammable materials to create a minimum 3 metre wide trafficable surface suitable for all types of 2 wheel drive vehicles.
2) Overhanging branches must be pruned to provide a 4 metre vertical clearance above a minimum 3 metre width over the driveway.

11. Fuel Reduction - Unmanaged Grasses

1) All grass within Building Protection Zones, and on all land less than 5,001m2 in area, is required to be mowed and maintained under 5cm in height over the entire area.
2) On land 5,001m2 or greater, and not including Building Protection Zone areas,
    a) Maintain grass under 10cm within Hazard Separation Zones.
    b) Slash or mow unmanaged grass (grass that is 50cm or higher) to a height no greater than 10cm immediately adjacent firebreaks to a minimum width of 3 metres.
    c) If the land described above in 10(2)(b) is stocked, the grass must be reduced to a height of no greater than 10cm high by the **1st day of December 2014.**

Subject to clause c), all grassed areas required by this notice to be maintained at or below a required height must be maintained in that condition between **2 November until the 30 April the following year.**

12. Fuel Reduction - Natural Vegetation

1) Available bushfire fuels must be maintained at or below:
   a) Building Protection Zones - 2 tonnes per hectare
   b) Hazard Separation Zones - 8 tonnes per hectare **This requirement only applies where HSZs are depicted within a Fire Management Plan approved in writing by the City.*
   c) Natural Vegetation - 8 tonnes per hectare for areas of natural vegetation within 100 metres of Buildings, Attached and Adjacent Structures and essential infrastructure.
2) Passive Fuel Reduction within natural vegetation may be achieved by burning, raking, pruning, weed management, removal of dead materials and any other approved method.
3) Permanent removal or partial clearing of natural vegetation including individual or groups of native grasses, shrubs or trees may only be carried out in accordance with the minimum requirements of this notice.
4) Permanent clearing of natural vegetation structures including individual plants, shrubs or trees, that exceeds the requirements of this notice or the specifications outlined within a Bushfire Management Plan approved in writing by the City, is only permitted in accordance with the provisions and exemptions outlined within the Environmental Protection Act 1986, or with the approval of the Department of Environment Regulation and the City of Swan.

Note: Advice and resources on how to measure and manage native vegetation fuel loads are available from the Department of Fire and Emergency Services or the City of Swan.

13. Building Protection Zones Specification

The Building Protection Zone for habitable buildings and related structures must meet the following requirements:

1) Building Protection Zones for habitable buildings must extend a minimum of 20 metres out from any external walls of the building, attached structures, or adjacent structures within 6 metres of the habitable building, unless varied under an approved Bushfire Management Plan.
2) On sloping ground the Building Protection Zone distance shall increase at least 1 metre for every degree in slope on the sides of the building/structure that are exposed to down slope natural vegetation.
3) Recommendation Only - Building Protection Zones predominantly consist of non-flammable managed vegetation, reticulated lawns and gardens and other non-flammable features.
4) All grass is maintained to or under 5cm.
5) Fuel loads must be reduced and maintained at 2 tonnes per hectare or lower.
6) 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. Clearing or thinning existing trees to create distances greater than 10 meters separation between tree crowns within a Building Protection Zone is not required or supported by this notice and requires approval from the Department of Environment and Regulation and the City of Swan.
7) A small group of trees within close proximity to one another may be treated as one crown provided the combined crowns do not exceed the area of a large or mature crown size for that species.
8) Trees are to be low pruned (or under pruned) to at least a height of 2 metres from ground.
9) No tree, or shrub over 2 metres high is planted within 2 metres of a building, especially adjacent to windows.
10) There are no tree crowns or branches hanging over buildings.
11) Clear and prune scrub to reduce to a sparse density (able to walk through vegetation with relative ease with minimal deviation around trees and shrubs).
12) Install paths or clear flammable or dry vegetation, debris and materials immediately adjacent to the building.

13) Wood piles and flammable materials stored a safe distance from buildings.

14. Burning

If the requirements of this notice are carried out by burning, such burning must be carried out in accordance with the relevant provisions of the Bush Fires Act 1954.

15. Compliance

1) In addition to the requirements of this notice, further works which are considered necessary by an Authorised Officer of the City may be required as specified in writing in a subsequent notice addressed to the land owner.
2) Where the owner or occupier of the land fails or neglects to comply with the requirements of this notice or a subsequent notice addressed to the land owner, the City of Swan may enter onto the land with workmen, contractors, vehicles and machinery to carry out the requisitions of the notice at the expense of the land owner.
3) Failure to comply with this notice and subsequent written notices may result in a penalty not exceeding $5,000, or the issue of a $250 infringement notice and liability for any costs incurred by the City in relation to works undertaken on behalf of the land owner.
4) Adherence to measures outlined within an approved Bushfire Management Plan developed as a condition of subdivision does not provide land owners and occupiers with any exemptions to the requirements of this notice unless this notice specifically states otherwise.

16. Definitions

'Alternative Firebreak' is a firebreak that is in an alternative position or alignment to the external boundaries of a property.

'Alternative Firebreak Application' is an application that may be made by a land owner to install firebreaks in an alternative position, or to carry out an alternative measures in lieu of general firebreaks.

'Available Fuel' is the bush fuel consisting of live and dead vegetation and debris that will actually burn under prevailing conditions. Fuel available for burning depends on temperature, moisture in the air and within the vegetation and curing of vegetation. In summer there is a significant increase in available fuel.

'City' means the City of Swan

'Buildings, Attached and Adjacent Structures' means habitable buildings that are used as a dwelling, workplace, place of gathering or assembly, a building that is a car park, or a building used for the storage or display of goods or produce for sale by whole sale in accordance with classes 1-9 of the Building Code of Australia. The term building includes attached and adjacent structures like garages, carports verandas or similar roofed structure(s) that are attached to, or within 6 metres of the dwelling or primary building.

'Building Protection Zone (BPZ)' is a low fuel area that is reduced of flammable vegetation and materials surrounding buildings and essential infrastructure to minimise the likelihood and impact that direct flame contact, radiant heat or ember attack may have on buildings and assets in the event of a bushfire. This area must extend out from the external walls of a building or asset a minimum of 20 metres.

'Bushfire Management Plan' or 'Fire Management Plan' is a comprehensive plan that may be placed on the certificate of title(s) of land, that has been developed as a condition of development or subdivision primarily for the purpose of determining the land suitability, design features and infrastructure that will increase bushfire safety within the location. Bushfire Management Plans may become outdated with regards to property owner fire safety advice and responsibilities due to seasonal changes and evolving fire safety strategies. Up to date advice and strategies are administered within local government areas as a legal requirement through the annual firebreak

notice regulation. Fire Management Plans are not a legal requirement unless specifically referenced as a requirement within this notice, or a written notice addressed directly to a land owner.

'Emergency Access Way' is a two wheel drive trafficable, 6 metre wide access route to provide local residents, general public and emergency services alternative links to road networks at the end of cul-de-sacs or areas where access is limited during an emergency incident.

'Essential Infrastructure' or Critical Infrastructure means assets, infrastructure, systems and networks that provide essential services necessary for social and economic wellbeing and is typically public infrastructure. Assets and infrastructure, usually of a public nature, that generate or distribute electricity, water supply, telecommunications, gas and dams are typical assets that are essential to society and are often located in, or traverse areas that are prone to bushfires.

'Firebreak' is an area of land cleared of flammable material to minimise the spread or extension of a bushfire. For the purpose of this notice the term firebreak is a strip of land 3 metres wide that also provides a trafficable surface and 4 metres vertical clearance for emergency and authorised vehicle access. Boundary firebreaks are installed immediately adjacent the external boundaries of a property.

'Fire Hazard or Bushfire Hazard' means accumulated fuel (living or dead) such as leaf litter, twigs, trash, bush, dead trees and scrub capable of carrying a running fire, but excludes standing living trees and isolated shrubs.

'Hazard Separation Zone (HSZ)' if required by this notice and in accordance with a Fire Management Plan, means an area extending out from a Building Protection Zone a distance of 80 metres unless otherwise specified, to create a graduated fuel reduction and separation from natural vegetation that is unmodified in structure and density.

'Natural Vegetation' means natural areas of forest, woodland, shrubland, scrub, mallee and mulga.

'Parkland Clearing' means areas of natural vegetation that has been significantly cleared of understory and tree density reduced to create a grassland or low vegetation area that can be walked through unimpeded with isolated, grouped or well spaced trees.

'Passive Fuel Reduction' means lowering the amount of available fuel that will burn under prevailing conditions by means that will not *permanently* reduce or modify the structure or life cycle of plant, shrub, scrub or tree communities within an treated area. This is typically achieved by undertaking a cool, controlled burn of an area during cooler, damper months, or by physical removal of built up leaf litter, dead materials, weeds and slashing long dry grasses without damaging live native plants within the area.

'Plantation' is any area of native or exotic planted trees that exceeds three hectares in a gazetted town site, or elsewhere a stand of trees of 10 hectares or larger that has been planted and managed intensively for their commercial and environmental value. A plantation includes roads, firebreaks and small areas of native vegetation.

'Strategic Firebreak' is a firebreak that is 6 metres wide established to provide strategic access and links to road networks whilst providing a wider control/containment line to protect town sites, estates and similar exposures during bushfire operations.

'Unmanaged Grasses' is undisturbed or very lightly grazed grasses with a height of 50cm or greater.

By order of the Council,

MJ Foley
CHIEF EXECUTIVE OFFICER
CITY OF SWAN

APPENDIX H REGROWTH MAINTENANCE PROGRAM

APPENDIX I ACOUSTIC ASSESSMENT

Rochdale Holdings Pty Ltd A.B.N. 85 009 049 067 trading as:
HERRING STORER ACOUSTICS
Suite 34, 11 Preston Street, Como, W.A. 6152
P.O. Box 219, Como, W.A. 6952
Telephone: (08) 9367 6200
Facsimile: (08) 9474 2579
Email: hsa@hsacoustics.com.au

PROPOSED SUBDIVISION
MALVERN SPRINGS, ELLENBROOK
LOTS 7245 and 7246 ELMRIDGE PARKWAY &
LOTS 6577, 6578, 6579 and 6580 STARKE TURN

STATE PLANNING POLICY 5.4 ACOUSTICAL ASSESSMENT

JULY 2015

OUR REFERENCE: 19378-3-10216-04

DOCUMENT CONTROL PAGE

ACOUSTIC ASSESSMENT

MALVERN SPRINGS, ELLENBROOK

Job No: 10216-04

Document Reference: 19378-3-10216-04

FOR

ROBERTS DAY

DOCUMENT INFORMATION			
Author:	Tim Reynolds	**Checked By:**	Paul Daly
Date of Issue :	6 July 2015		

REVISION HISTORY

Revision	Description	Date	Author	Checked
1	Amended text for side fences	26/08/15	TR	PLD
2	Revised Subdivisional Plan	03/02/16	TR	PLD

DOCUMENT DISTRIBUTION

Copy No.	Version No.	Destination	Hard Copy	Electronic Copy
1	1	Roberts Day (Attn : Emma Jeans)		✓
1	2	Roberts Day (Attn : Emma Jeans)		✓
1	2	Roberts Day (Attn : Emma Jeans)		✓

CONTENTS

APPENDICIES

1. INTRODUCTION

Herring Storer Acoustics was commissioned by Roberts Day to carry out an acoustical assessment of noise received at Lots 7245 and 7246 Elmridge Parkway and Lots 6577, 6578, 6579 and 6580 Starke Turn with the Malvern Springs, Ellenbrook subdivision.

As part of the study, the following was carried out:

- Determine by noise modelling the noise that would be received at residences within the development from vehicles travelling on the future Perth-Darwin Highway.
- Assess the predicted noise levels for compliance with the appropriate criteria.
- If exceedances are predicted, comment on possible noise amelioration options for compliance with the appropriate criteria.

For information, a locality plan is attached in Appendix A.

2. SUMMARY

The noise modelling indicates that noise received within the proposed sub-division from vehicles travelling along the Perth-Darwin Highway in the future would without any mitigation, exceed the "Noise Limits" as outlined in the policy. With the inclusion of a 1.8 metre high barrier located at the boundary of the subdivision, noise received at the residence would be within the 5 dB(A) margin (i.e. somewhere between the Noise Targets and Noise Limits). Therefore, to comply with the planning policy, it is recommended that in addition to the barrier, "Quiet House" design be implemented for those residences as noted on Figure C1 in Appendix C.

Finally, those residences requiring Notifications of Titles are also shown on Figure C1 in Appendix C.

Note : Given the location of the development and the projected market, we understand that 2 storey residence are unlikely, hence the Quiet House Design is for single storey residence only. If double storey residences are proposed, then it is recommended that specialist acoustic advice be sort by the proponent.

3. CRITERIA

The WAPC released on 22 September 2009 State Planning Policy 5.4 *"Road and Rail Transport Noise and Freight Considerations In Land Use Planning"*. Section 5.3 – Noise Criteria, which outlines the acoustic criteria, states:

> "5.3 - NOISE CRITERIA
>
> *Table 1 sets out the outdoor noise criteria that apply to proposals for new noise-sensitive development or new major roads and railways assessed under this policy.*
>
> *These criteria do not apply to—*
>
> - *proposals for redevelopment of existing major roads or railways, which are dealt with by a separate approach as described in section 5.4.1; and*
> - *proposals for new freight handling facilities, for which a separate approach is described in section 5.4.2.*

The outdoor noise criteria set out in Table 1 apply to the emission of road and rail transport noise as received at a noise-sensitive land use. These noise levels apply at the following locations —

- *for new road or rail infrastructure proposals, at 1 m from the most exposed, habitable façade of the building receiving the noise, at ground floor level only; and*
- *for new noise-sensitive development proposals, at 1 m from the most exposed, habitable façade of the proposed building, at each floor level, and within at least one outdoor living area on each residential lot.*

Further information is provided in the guidelines.

Table 1: Outdoor Noise Criteria

Time of day	*Noise Target*	*Noise Limit*
Day (6 am–10 pm)	$L_{Aeq(Day)}$ *= 55 dB(A)*	$L_{Aeq(Day)}$ *= 60 dB(A)*
Night (10 pm–6 am)	$L_{Aeq(Night)}$ *= 50 dB(A)*	$L_{Aeq(Night)}$ *= 55 dB(A)*

The 5 dB difference between the outdoor noise target and the outdoor noise limit, as prescribed in Table 1, represents an acceptable margin for compliance. In most situations in which either the noise-sensitive land use or the major road or railway already exists, it should be practicable to achieve outdoor noise levels within this acceptable margin. In relation to the Lot 9000 sites, however, there is an expectation that the design of the proposal will be consistent with the target ultimately being achieved.

Because the range of noise amelioration measures available for implementation is dependent upon the type of proposal being considered, the application of the noise criteria will vary slightly for each different type. Policy interpretation of the criteria for each type of proposal is outlined in sections 5.3.1 and 5.3.2.

The noise criteria were developed after consideration of road and rail transport noise criteria in Australia and overseas, and after a series of case studies to assess whether the levels were practicable. The noise criteria take into account the considerable body of research into the effects of noise on humans, particularly community annoyance, sleep disturbance, long-term effects on cardiovascular health, effects on children's learning performance, and impacts on vulnerable groups such as children and the elderly. Reference is made to the World Health Organization (WHO) recommendations for noise policies in their publications on community noise and the Night Noise Guidelines for Europe. See the policy guidelines for suggested further reading.

5.3.1 Interpretation and application for noise-sensitive development proposals

In the application of these outdoor noise criteria to new noise-sensitive developments, the objective of this policy is to achieve –

- *acceptable indoor noise levels in noise-sensitive areas (for example, bedrooms and living rooms of houses, and school classrooms); and*
- *a reasonable degree of acoustic amenity in at least one outdoor living area on each residential lot*[1]*.*

1 For non residential noise-sensitive developments, (e.g. schools and child care centres) consideration should be given to providing a suitable outdoor area that achieves the noise target, where this is appropriate to the type of use.

If a noise-sensitive development takes place in an area where outdoor noise levels will meet the noise target, no further measures are required under this policy.

In areas where the noise target is likely to be exceeded, but noise levels are likely to be within the 5dB margin, mitigation measures should be implemented by the developer with a view to achieving the target levels in a least one outdoor living area on each residential lot[1]. Where indoor spaces are planned to be facing any outdoor area in the margin, noise mitigation measures should be implemented to achieve acceptable indoor noise levels in those spaces. In this case, compliance with this policy can be achieved for residential buildings through implementation of the deemed-to-comply measures detailed in the guidelines.

In areas where the outdoor noise limit is likely to be exceeded (i.e. above $L_{Aeq(Day)}$ of 60 dB(A) or $L_{Aeq(Night)}$ of 55 dB(A)), a detailed noise assessment in accordance with the guidelines should be undertaken by the developer. Customised noise mitigation measures should be implemented with a view to achieving the noise target in at least one outdoor living or recreation area on each noise-sensitive lot or, if this is not practicable, within the margin. Where indoor spaces will face outdoor areas that are above the noise limit, mitigation measures should be implemented to achieve acceptable indoor noise levels in those spaces, as specified in the following paragraphs.

For residential buildings, acceptable indoor noise levels are $L_{Aeq(Day)}$ of 40 dB(A) in living and work areas and $L_{Aeq(Night)}$ of 35 dB(A) in bedrooms[2]. For all other noise-sensitive buildings, acceptable indoor noise levels under this policy comprise noise levels that meet the recommended design sound levels in Table 1 of Australian Standard AS 2107:2000 Acoustics—Recommended design sound levels and reverberation times for building interiors.

These requirements also apply in the case of new noise-sensitive developments in the vicinity of a major transport corridor where there is no existing railway or major road (bearing in mind the policy's 15-20 year planning horizon). In these instances, the developer should engage in dialogue with the relevant infrastructure provider to develop a noise management plan to ascertain individual responsibilities, cost sharing arrangements and construction time frame.

If the policy objectives for noise-sensitive developments are not achievable, best practicable measures should be implemented, having regard to section 5.8 and the guidelines."

The Policy, under Section 5.7, also provides the following information regarding "Notifications on Titles" :

"5.7 - NOTIFICATION ON TITLE

If the measures outlined previously cannot practicably achieve the target noise levels for new noise-sensitive developments, this should be notified on the certificate of title.

2 For residential buildings, indoor noise levels are not set for utility spaces such as bathrooms. This policy encourages effective "quiet house" design, which positions these non-sensitive spaces to shield the more sensitive spaces from transport noise (see guidelines for further information).

Notifications on certificates of title and/or advice to prospective purchasers advising of the potential for noise impacts from major road and rail corridors can be effective in warning people who are sensitive to the potential impacts of transport noise. Such advice can also bring to the attention of prospective developers the need to reduce the impact of noise through sensitive design and construction of buildings and the location of outdoor living areas.

The notification is to ensure that prospective purchasers are advised of –

- *the potential for transport noise impacts; and*
- *the potential for quiet house design requirements to minimise noise intrusion through house layout and noise insulation (see the guidelines).*

Notification should be provided to prospective purchasers and be required as a condition of subdivision (including strata subdivision) for the purposes of noise-sensitive development as well as planning approval involving noise-sensitive development, where noise levels are forecast or estimated to exceed the target outdoor noise criteria, regardless of proposed noise attenuation measures. The requirement for notification as a condition of subdivision and the land area over which the notification requirement applies, should be identified in the noise management plan in accordance with the guidelines.

An example of a standard form of wording for notifications is presented in the guidelines."

4. MODELLING

To determine the noise received within the subdivision from the proposed Perth-Darwin Highway, acoustic modelling would be carried out using SoundPlan, using the Calculation of Road Traffic Noise (CoRTN) algorithms. Noise modelling was undertaken in accordance with the "Implementation Guidelines" for the State Planning Policy 5.4. The input data, as used for previous assessments, for the model included:

- Ground contours as obtained from previous assessment.
- Other traffic data as listed in Table 4.1.
- A +2.5 dB adjustment to allow for façade reflection.

TABLE 4.1 - NOISE MODELLING INPUT DATA

Parameter	Value
Traffic flows for 2031	13800vpd
Heavy Vehicles (%)	16
Speed (km/hr)	110
Receiver Level (m)	+1.5 above ground
Façade Correction	+ 2.5 dB(A)
Road Surface	Chip Seal

As the Perth-Darwin Highway has not been constructed, to determine the difference between the day period and night time noise levels, as required under the policy, reference to the DEFRA publication has been taken. Using the determination as outlined in the DEFRA publication, the difference between the $L_{A10,18hr}$ and the $L_{Aeq,8hr}$ and the $L_{Aeq,16hr}$ has been taken to be 8 and 2 dB(A) respectively. It was assumed that these differences would apply in the year 2031.

Note: As noise monitoring of existing road traffic noise emanating from the Perth-Darwin Highway is not possible at this time, as outlined in the Implementation Guidelines, the standard correction of -1.7 dB has been applied to the noise model.

We note that with the difference between the $L_{Aeq,8hr}$ and the $L_{Aeq,16hr}$ being 5 dB(A), achieving compliance with the day period criteria will also achieve compliance with the night period criteria.

Noise contour calculations were undertaken for the following scenarios:

1. Acoustic input data as outlined above, but without any noise amelioration.

2. Acoustic input data as outlined above, but with residential lots have a 1.8 metre high boundary fence constructed on the boundary to the road reserve.

The noise contour plots for the above scenarios are attached in Appendix B.

Additional to the above, to determine the lots requiring "Quiet House" design additional noise modelling was undertaken was the residence on the lots. The results of this modelling are shown on Figure B3 in Appendix B.

5. DISCUSSION / RECOMMENDATIONS

Under the WAPC State Planning Policy 5.4, for this development, the Noise Limits as listed in Table 1 are the appropriate noise criteria for this development. For this subdivision, the difference between the $L_{Aeq(16hr)}$ and the $L_{Aeq(8hr)}$ would be greater than 5 dB(A). Therefore, if compliance with the day period noise limit is achieved, then compliance with the night period noise limits would also be achieved.

For residential premises, the Policy states that residence should be designed to meet the following acceptable internal noise levels:

Living and Work Areas	$L_{Aeq(Day)}$ of 40 dB(A)
Bedrooms	$L_{Aeq(Night)}$ of 35 dB(A)

Additionally, it is recommended that noise mitigation measures be implemented so at least one outdoor living area complies with the Target Noise Level of an $L_{Aeq(Day)}$ of 55 dB(A) or an $L_{Aeq(Night)}$ of 50 dB(A).

Noise modelling indicates that noise received within the proposed sub-division from vehicles travelling along the future Perth-Darwin Highway would, without the inclusion of noise mitigation, exceed the WAPC State Policy 5.4 "Noise Limits". Therefore, to comply with the requirements of the Policy, it is recommended that a 1.8 metre high barrier be located at the boundary of the road reserve and "Quiet House" design be implemented for those residences as noted on Figure C1 in Appendix C.

Finally, those residences requiring Notifications of Titles are also shown on Figure C1 in Appendix C.

Notes :

1 Given the location of the development and the projected market, we understand that 2 storey residences are unlikely, hence the Quiet House Design is for single storey residence only. If double storey residences are proposed, then it is recommended that specialist acoustic advice be sort by the proponent.

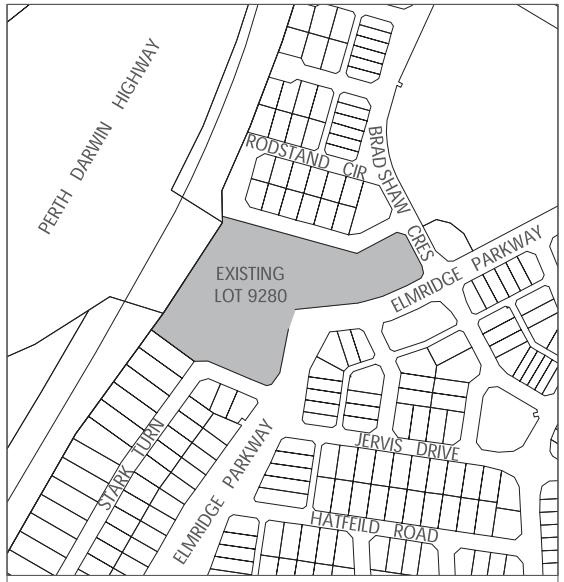
2 The above advice is based on the Sub Division Plan as attached in Appendix A.

3 Information regarding deemed to Satisfy “Quiet House” requirements are attached in Appendix D. It is also noted that alternative construction would be possible if a suitably qualified acoustical consultant assessed the individual building requirements at the time of building licence approval.

4 It is understood that the lots as noted on Figure C1 in appendix C will have side fences. These fences are likely to mitigate noise and reduce the “Quiet House” design requirements. Hence it is suggested that individual assessment for these lots be undertaken.

APPENDIX A

SUBDIVISIONAL LAYOUT



LOCATION PLAN SCALE 1:5000

LEGEND

- SUBJECT LAND
- EXISTING LOT BOUNDARY
- PROPOSED LOT BOUNDARY
- 56 CONTOURS

Existing Lot	1
Proposed Single Residential Lots	49
Proposed Group Housing Sites	2
Total	51

Lot Breakdown

Area Range		No. Range
180	234	23
235	319	16
320	449	7
450	499	2
1000	1499+	3

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planning design place

ellenbrook

CADASTRAL INFORMATION
SOURCE: WHELANS
YYMMDD: 130913
DWG REF:
PROJECTION: PCG84

SIZE A3
1:1000 0 metres 10 20 30 40 50

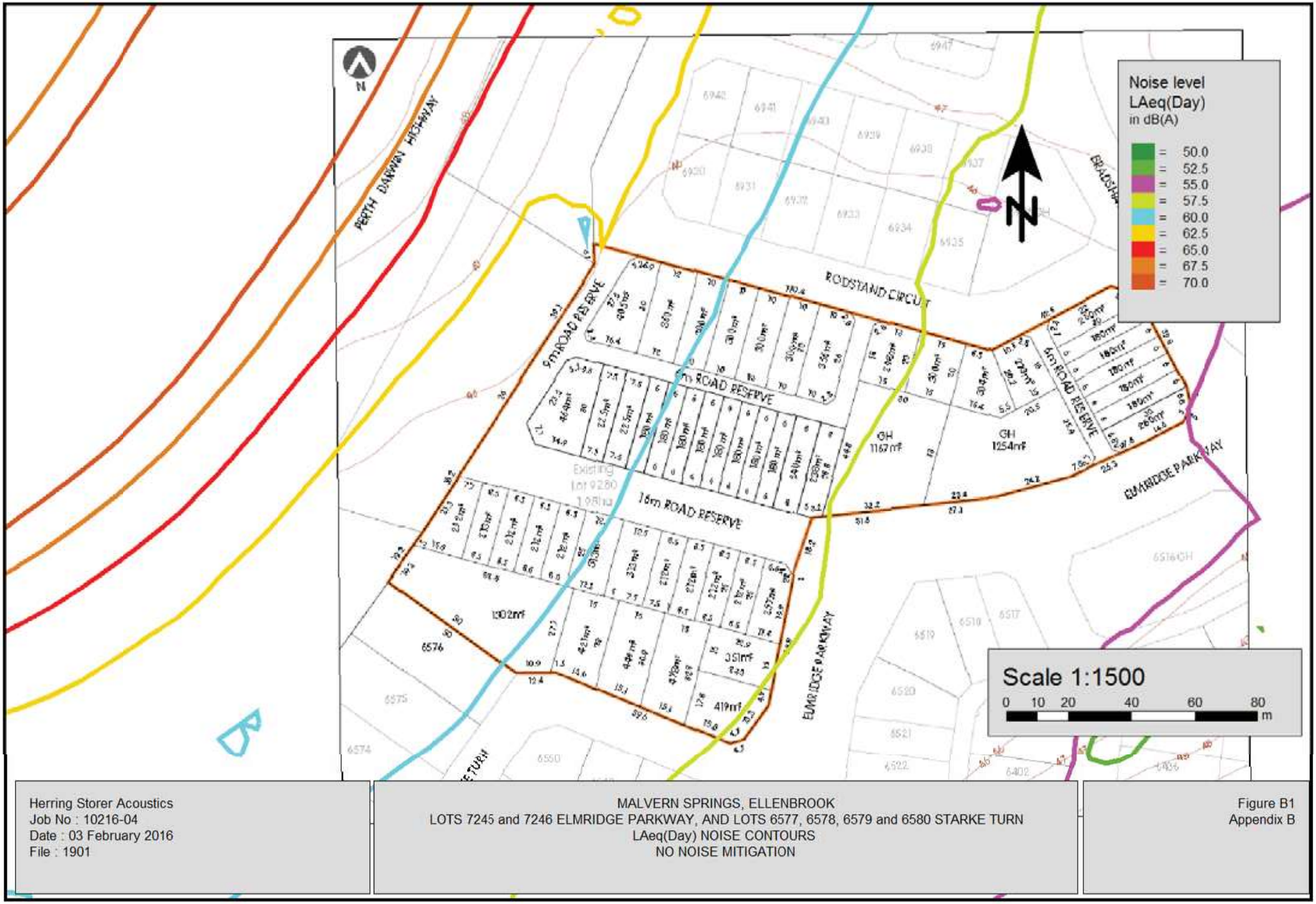
REV	DESCRIPTION	YYMMDD	DRAWN	APPR'D
A	SUBDIVISION PLAN	150923	RF	EJ

SUBDIVISION PLAN
Lot 9280 The Broadway, Ellenbrook
Malvern Springs, Ellenbrook

REF NO.	DRAW NO.	REV.
EJV VL6	RD1 301	A

APPENDIX B

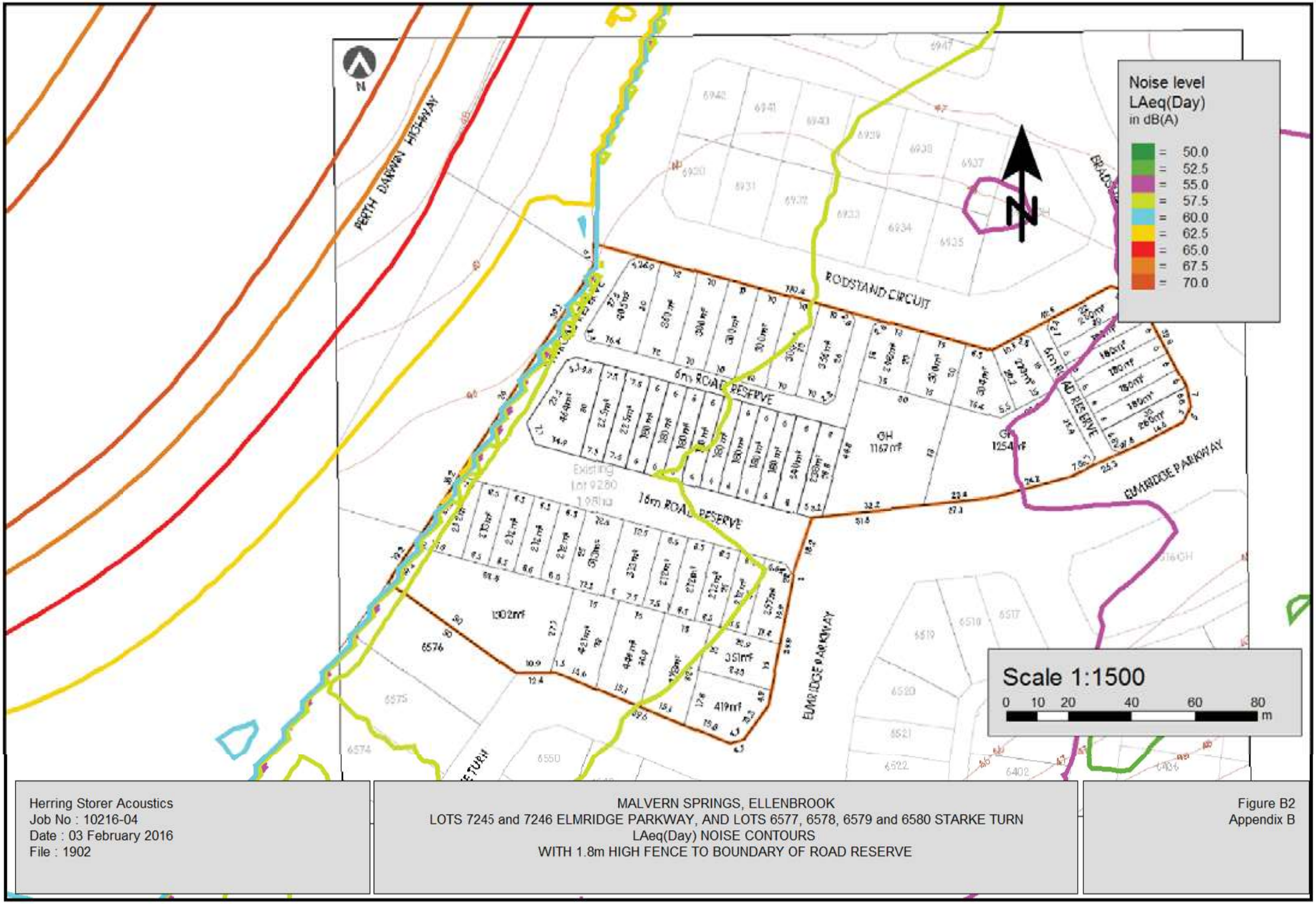
NOISE CONTOURS PLOT



Herring Storer Acoustics
Job No : 10216-04
Date : 03 February 2016
File : 1901

MALVERN SPRINGS, ELLENBROOK
LOTS 7245 and 7246 ELMRIDGE PARKWAY, AND LOTS 6577, 6578, 6579 and 6580 STARKE TURN
LAeq(Day) NOISE CONTOURS
NO NOISE MITIGATION

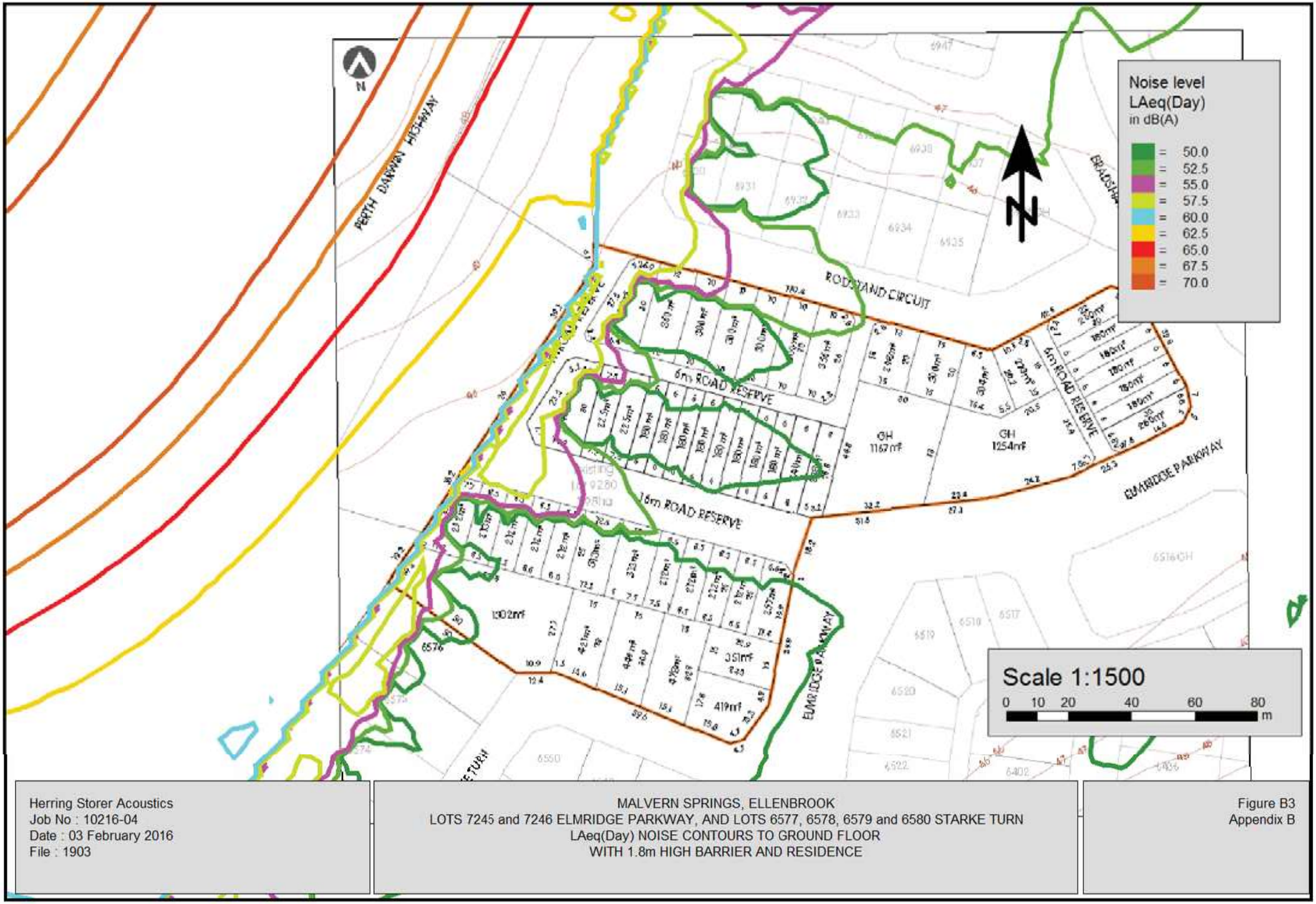
Figure B1
Appendix B



Herring Storer Acoustics
Job No : 10216-04
Date : 03 February 2016
File : 1902

MALVERN SPRINGS, ELLENBROOK
LOTS 7245 and 7246 ELMRIDGE PARKWAY, AND LOTS 6577, 6578, 6579 and 6580 STARKE TURN
LAeq(Day) NOISE CONTOURS
WITH 1.8m HIGH FENCE TO BOUNDARY OF ROAD RESERVE

Figure B2
Appendix B



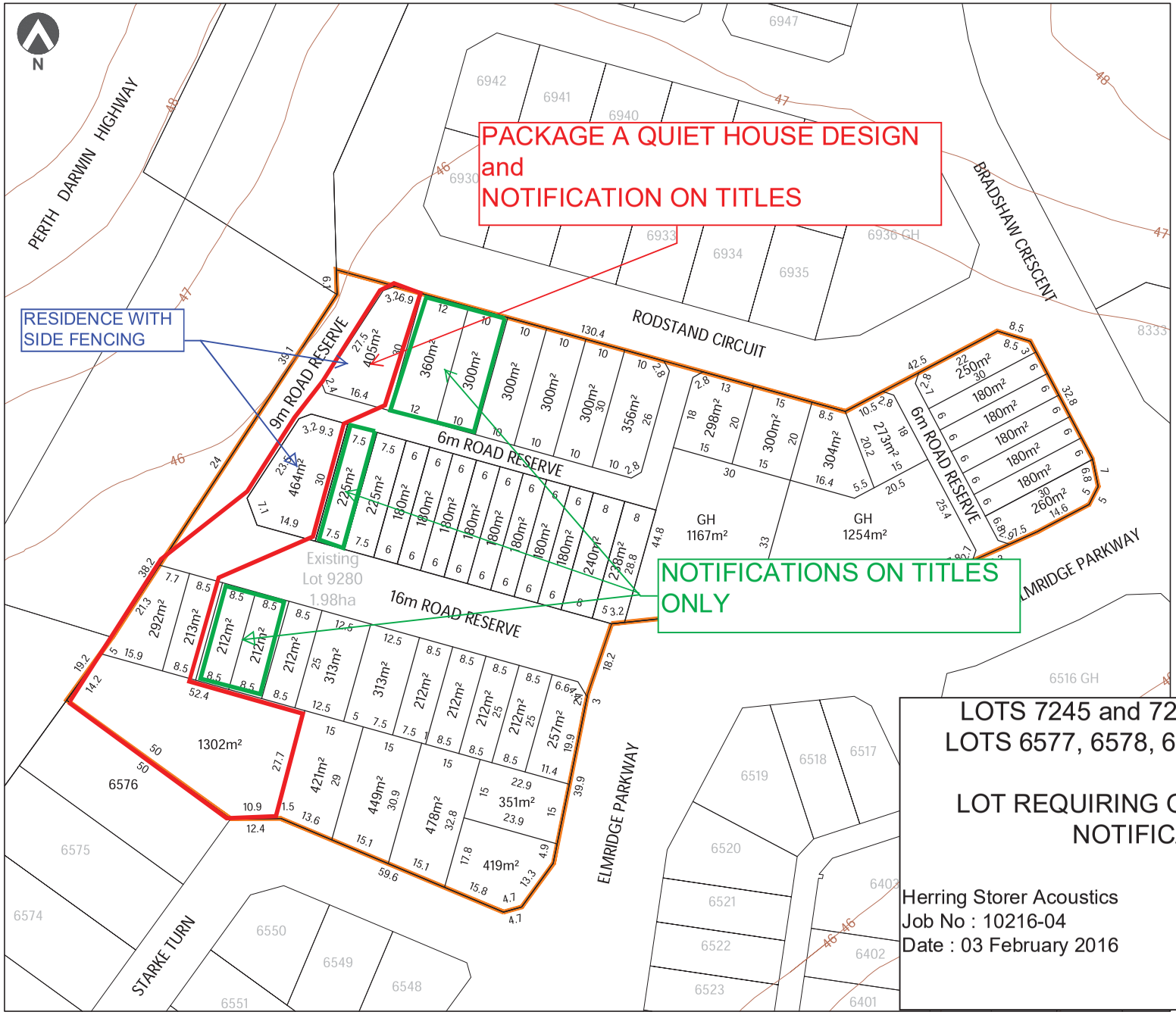
Herring Storer Acoustics
Job No : 10216-04
Date : 03 February 2016
File : 1903

MALVERN SPRINGS, ELLENBROOK
LOTS 7245 and 7246 ELMRIDGE PARKWAY, AND LOTS 6577, 6578, 6579 and 6580 STARKE TURN
LAeq(Day) NOISE CONTOURS TO GROUND FLOOR
WITH 1.8m HIGH BARRIER AND RESIDENCE

Figure B3
Appendix B

APPENDIX C

LOTS REQUIRING QUIET HOUSE DESIGN
AND / OR NOTIFICATIONSON TITLES



LOCATION PLAN SCALE 1:5000

LEGEND

- SUBJECT LAND
- EXISTING LOT BOUNDARY
- PROPOSED LOT BOUNDARY
- CONTOURS

LOTS 7245 and 7246 ELMRIDGE PARKWAY & LOTS 6577, 6578, 6579 and 6580 STARKE TURN

LOT REQUIRING QUIET HOUSE DESIGN AND NOTIFICATION ON TITLES

Herring Storer Acoustics
Job No : 10216-04
Date : 03 February 2016

Figure C1
Appendix C

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planning design place

ellenbrook

CADASTRAL INFORMATION
SOURCE: WHELANS
YYMMDD: 130913
DWG REF:
PROJECTION: PCG84

SIZE A3
1:1000 0 metres 10 20 30 40 50

REV	DESCRIPTION	YYMMDD	DRAWN	APPR'D
A	SUBDIVISION PLAN	150923	RF	EJ

SUBDIVISION PLAN
Lot 9280 The Broadway, Ellenbrook
Malvern Springs, Ellenbrook

REF NO.	DRAW NO.	REV.
EJV VL6	RD1 301	A

APPENDIX D

DEEMED TO SATISFY
QUIET HOUSE REQUIREMENTS

Area	Orientation to road or rail corridor	Package A L_{Aeq},Day up to 60dB L_{Aeq},Night up to 55dB	Package B L_{Aeq},Day up to 63dB L_{Aeq},Night up to 58dB	Package C L_{Aeq},Day up to 65dB L_{Aeq},Night up to 60dB
Bedrooms	Facing	• Walls to R_w+C_{tr} 45dB • Windows and external door systems: Minimum R_w+C_{tr} 28dB (Table 6.4), total glazing area up to 40% of room floor area. [if R_w+C_{tr} 31dB: 60%] [if R_w+C_{tr} 34dB: 80%] • Roof and ceiling to R_w+C_{tr} 35dB (1 layer 10mm plasterboard) • Mechanical ventilation as per Section 6.3.1	• Walls to R_w+C_{tr} 50dB • Windows and external door systems: Minimum R_w+C_{tr} 31dB (Table 6.4), total glazing area up to 40% of room floor area. [if R_w+C_{tr} 34dB: 60%] • Roof and ceiling to R_w+C_{tr} 35dB (1 layer 10mm plasterboard) • Mechanical ventilation as per Section 6.3.1	• Walls to R_w+C_{tr} 50dB • Windows and external door systems: Minimum R_w+C_{tr} 34dB (Table 6.4), total glazing area limited to 40% of room floor area [if 20% of floor area or less, R_w+C_{tr} 31dB] • Roof and ceiling to R_w+C_{tr} 40dB (2 layers 10mm plasterboard) • Mechanical ventilation as per Section 6.3.1
	Side-on	•As above, except glazing Rw+Ctr values for each package may be 3dB less, or max % area increased by 20%		
	Opposite	• No requirements • As per Package A 'Side On' • As per Package A 'Facing'	• No requirements • As per Package A 'Side On' • As per Package A 'Facing'	• No requirements • As per Package A 'Side On' • As per Package A 'Facing'
Indoor living and work Areas	Facing	• Walls to Rw+Ctr 45dB • Windows and external door systems: Minimum Rw+Ctr 25dB (Table 6.4), total glazing area limited to 40% of room floor area. [if Rw+Ctr 28dB: 60%] [if Rw+Ctr 31dB: 80%] • External doors other than glass doors to Rw+Ctr 26dB (Table 6.4) • Mechanical ventilation as per Section 6.3.1	• Walls to Rw+Ctr 50dB • Windows and external door systems: Minimum Rw+Ctr 28dB (Table 6.4), total glazing area up to 40% of room floor area. [if Rw+Ctr 31dB: 60%] [if Rw+Ctr 34dB: 80%] • External doors other than glass doors to Rw+Ctr 26dB (Table 6.4) • Mechanical ventilation as per Section 6.3.1	• Walls to R_w+C_{tr} 50dB • Windows and external door systems: Minimum R_w+C_{tr} 31dB (Table 6.4), total glazing area up to 40% of room floor area. [if R_w+C_{tr} 34dB: 60%] • External doors other than glass doors to R_w+C_{tr} 30dB (Table 6.4) • Mechanical ventilation as per Section 6.3.1
	Side-on	• As above, except the glazing R_w+C_{tr} values for each package may be 3dB less, or max % area increased by 20%		
	Opposite	• No requirements	• As per Package A 'Side On'	• As per Package A 'Facing'
Other indoor areas	Any	• No requirements	• No requirements	• No requirements
Outdoor living areas	Any (Section 6.2.3)	• As per Package C, and/or • At least one ground level outdoor living area screened using a solid continuous fence or other structure of minimum 2 metres height above ground level	• As per Package C, and/or • At least one ground level outdoor living area screened using a solid continuous fence or other structure of minimum 2.4 metres height above ground level	• At least one outdoor living area located on the opposite side of the building from the transport corridor

Notes :

1 Alternative constructions are acceptable, provided they are assessed and approved by a suitably qualified acoustical consultant.

2 It is understood that the lots as noted on Figure C1 in appendix C will have side fences. These fences are likely to mitigate noise and reduce the "Quiet House" design requirements. Hence it is suggested that for these lots, individual assessment undertaken.