Bushfire Safety
CONSULTING

Fire Management Plan

Tamala Park (Stages 9-11, 20 & 21))

Lot 9004 (#1700) Marmion Avenue
Tamala Park
City of Wanneroo

Prepared for : Satterley Property Group

August 29, 2013

Catalina Estate
Stages 9-11, 20 & 21
Lot 9004 (1700) Marmion Avenue
Tamala Park
City of Wanneroo

Front Cover Photo: Aerial photograph of development site

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Disclaimer

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Executive Summary

This Fire Management Plan has been prepared following the assessment of Lot 9004 (1700) Marmion Avenue, Tamala Park in the City of Wanneroo.

The development site has been assessed for vegetation class and bushfire hazard rating levels. **It has been determined that the proposed development will fall within the acceptable level of risk**. Areas of classified vegetation have been clearly identified surrounding the site, which require AS3959 construction standard compliance for all residential dwellings.

This Plan includes a table on page 25 showing responses to the Performance Criteria outlined in the Planning for Bushfire Protection Guidelines - Edition 2 (WAPC et al. 2010).

Currently, the site's bushfire hazard level is rated as predominantly extreme due to the remnant vegetation on site. There is also some moderate and low hazard areas. The development will see the removal of all vegetation apart from a 5.7 ha Biodiversity Conservation Area (BCA) proposed on the western portion of the site.

Three areas of Public Open Space (POS) will be provided and all will become fully landscaped parkland and reserves. The bushfire hazard south of the site on Urban deferred land will pose a threat to the development until it is removed. A perimeter Building Protection Zone will ensure the predicted radiant heat flux exposure levels remains below BAL-29.

Access and egress from the site will adequately service the development.

Reticulated water is available at the site and hydrants will be spaced according to Department of Fire and Emergency Services and Water Corporation Standards.

Both the City of Wanneroo and the Department of Fire and Emergency Services have a public education program to raise the community's awareness to its responsibilities regarding preparing homes for a bushfire attack and what to do if an event occurs.

If there is a bushfire within or near the site, implementing this Fire Management Plan will reduce the threat to residents, visitors and fire fighters.

1. Introduction

The subject land covers 16.5334 ha and will comprise 129 separate lots including 127 residential lots.

The site is generally bounded by Marmion Avenue to the west, Stage 1 of Catalina development to the north, a proposed primary school to the east and 'Urban Deferred' land (currently utilised as the Tamala Park Refuse Facility) to the south.

The site is located 30 kilometres north of the Perth CBD between the suburbs of Clarkson and Kinross and on the boundary between the City of Wanneroo and the City of Joondalup (Appendix A). The site is zoned Urban under the Metropolitan Region Scheme.

This Fire Management Plan (FMP) has been prepared on behalf of Satterley Property Group in consultation with CLE Town Planning and Design.

This FMP has been prepared to support the Local Structure Plan (LSP) process. It achieves this by providing responses to the performance criteria that fulfil the intent of the bushfire hazard management issues outlined in the Planning for Bushfire Protection Guidelines - Edition 2 (WAPC et al. 2010).

The proposed subdivision has evolved from the higher level Tamala Park Local Structure Plan (LSP) No. 79, dated March 2012. The LSP was endorsed by the WAPC in early 2012.

Community bushfire safety is a shared responsibility between governments, fire agencies, communities and individuals. When implemented, the planning and building controls outlined in this plan will reduce the risk to people and property. How people interpret the risk, prepare and maintain the property and buildings and what decisions and actions they take (i.e. evacuate early or stay and defend or other) greatly influence the outcome in a bushfire.

1.1 The Proposal

The proposed subdivision (Appendix B) provides a guide to future development of the site. Stages 9, 10 and 11 occur on land zoned 'Urban' and development of these sites will be progressed initially. Stages 20 and 21 occur on land zoned "Urban Deferred" and development of these sites will not occur until the land is rezoned "Urban".

The site will contain over 127 Residential lots and 1 Local Centre lot. Three Public Open Space (POS) areas totalling over 1.52 ha will accommodate the community's recreational needs and site drainage requirements (Appendix B). All POS areas will be landscaped and managed as parklands and reserves. The proposed subdivision fits within a larger LSP (Appendix C).

1.2 Objectives

The purpose of this FMP is to address bushfire management issues within the proposed development. If there is a bushfire within or near the site, implementing the FMP will reduce the threat to residents, property and emergency response personnel.

Achievable and measurable goals of this plan include ensuring:

- The development is located in an area where the bushfire hazard does not present an unreasonable level of risk to life and property;
- Vehicular access to the development is safe if there is a bushfire occurring;
- Water is available to the development so that life and property can be protected from bushfire;
- The development is sited to minimise the effects of a bushfire; and
- The development design will minimise the effects of a bushfire.

This document sets out the roles and responsibilities of the developer, residents and tenants, the City of Wanneroo, DFES and the Water Corporation. It is important that the measures and procedures outlined in this FMP are reviewed as necessary.

This FMP includes:

- A description of the site, the surrounding area, fire climate and bushfire history;
- A summary of research into the related effects of a bushfire;
- A bushfire hazard assessment;
- Means of addressing vehicular access;
- Siting of buildings to include building protection and hazard separation zones;
- Water supply; and
- Maps and plans of fire reduction measures.

2. Statutory and Policy Framework

Relevant key legislation, policy and guidelines include the following:

2.1 Bush Fires Act

The Act sets out provision to reduce the dangers resulting from bushfires; prevent, control and extinguish bushfires and for other purposes. The Act addresses various matters including prohibited burning times, enabling Local Government to require landowners and/or occupiers to plough or clear fire breaks, to control and extinguish bushfires and establish and maintain permanent fire fighters and volunteer bush fire brigades.

The Act also applies to land throughout Western Australia that is managed by the Department of Environment and Conservation (DEC). Sections 39 and 45 provide authorised CALM Act officers with powers to suppress fires in and near forests and Crown Land. Other sections provide for authorised CALM Act officers to enforce the provisions of the Bush Fires Act. The Bush Fires Act does not affect the provisions of the CALM Act and the Bush Fires Act does not generally bind the DEC.

The provisions of the Bush Fires Act can be enforced in addition to this FMP.

2.2 State Planning Policy No. 3.4 Natural Hazards and Disasters

The objectives of this policy are to:

- Include planning for natural disasters as a fundamental element when preparing all statutory and non-statutory planning documents, specifically town planning schemes and amendments, and local planning strategies, and;
- Use these planning instruments to minimise the adverse effects of natural disasters on communities, the economy and the environment.

The Policy determines those areas that are most vulnerable to bushfire and where development is appropriate and not appropriate. The provisions and requirements contained in Planning for Bush Fire Protection Guidelines - Edition 2 (WAPC et al. 2010) are used in this determination.

2.3 Planning for Bush Fire Protection Guidelines (2010)

DFES, the Western Australian Planning Commission (WAPC) and the Department of Planning (DEP) prepared these guidelines. The document is the foundation for fire risk management planning on private land in Western Australia.

The document addresses important fire risk management and planning issues and sets out performance criteria and acceptable solutions to minimise the risk of bushfires in new subdivisions and developments. It addresses management issues including location, design, the development site, vehicular access and water availability.

3. Building Survival in Bushfires

Buildings survive bushfires due to a number of factors. Some relate to the way a bushfire behaves at a site, others to the design and construction materials in the building and siting of surrounding elements. Infrastructure, utilities and human behaviour are also factors. Leonard (2009) identified the following factors:

- Terrain (slope);
- Vegetation - overall fuel load, steady state litter load, bark fuels, etc;
- Weather (temperature, relative humidity and wind speed);
- Distance of building from unmanaged vegetation;
- Individual elements surrounding the building that are either a shield or an additional fuel source;
- Proximity to surrounding infrastructure;
- Building design and maintenance;
- Human behaviour - ability to be present and capacity to fight the fire;
- Access to the building and how that influences human behaviour;
- Water supply for active and/or passive defence; and
- Power supply.

It is likely that buildings are lost because of their vulnerability to the mechanisms of bushfire attack. Buildings constructed to Australian Standard (AS 3959) are more likely to survive a bushfire compared to buildings with no construction standards however, building survival is not guaranteed.

4. Description of the Area

Tamala Park is located in the north-west corridor of the Perth Metropolitan Region in the City of Wanneroo. It is approximately 35 km north of the Perth CBD.

Development of the surrounding area from the 1990's resulted in rapid growth in 1991 aided further by the opening of the Clarkson Rail Station in 2004 and as a result new growth was added to the area, with major features being Ocean Keys Shopping Centre, Mindarie Marina and many established parks and schools.

Within the 170 ha Catalina Estate development launched in March 2012, overall around 2600 home sites will become available with plans for a shopping village, numerous parks, a primary school and community centre bordered by conservation park and ocean on one side and established communities on the other.

4.1 Description of the Subject Land

The site is part of Lot 9004 Marmion Avenue, Tamala Park, it is vegetated primarily in shrubland with patches of scrub and low woodland. A section of the site has been cleared as part of the earthworks program for Stage 1. The site has undulating slopes less than 5° and the BCA has high conservation values. The site is part of the much larger development area outlined in the LSP plan (Appendix C).

4.2 Climate and Fire Weather

The behaviour of bushfires is significantly affected by weather conditions and they burn more aggressively when high temperatures combine with low humidity and strong winds. In Perth and surrounding coastal areas, the fire risk is greatest from summer through autumn when the moisture content in vegetation is low. Summer and autumn days with high temperatures, low humidity and strong winds are particularly conducive to the spread of fire. This threat is increased if thunderstorms develop, accompanied by lightning and little or no rain. Research indicates that virtually all house losses occur during severe, extreme or catastrophic conditions (i.e. when the Fire Danger Index is over 50) (Blanchi et al. 2010).

The Bureau of Meteorology website[1] states that extreme fire weather conditions in the Perth region typically occur with strong easterlies or north-easterly winds associated with a strong high to the south of the state and a trough offshore. Easterly winds represent about 60 per cent of extreme fire weather days (events) compared to less than 5 per cent associated with southerly winds. About 15 per cent of Perth events occurred in a westerly flow following the passage of a trough.

Very dangerous fire weather conditions often follow a sequence of hot days and easterly winds that culminate when the trough deepens near the coast and moves inland. Winds can change from easterly to northerly and then to westerly during this sequence of climatic events.

Data from the closest relevant weather station, Swanbourne Bureau of Meteorology weather station (27.5 kilometres south of the study site), indicate the area experiences warm dry summers and cool wet winters (Figure 1), and is classified as a Mediterranean climate. Mean maximum temperatures vary from 27 degrees Celsius in February to 17 degrees Celsius in July.

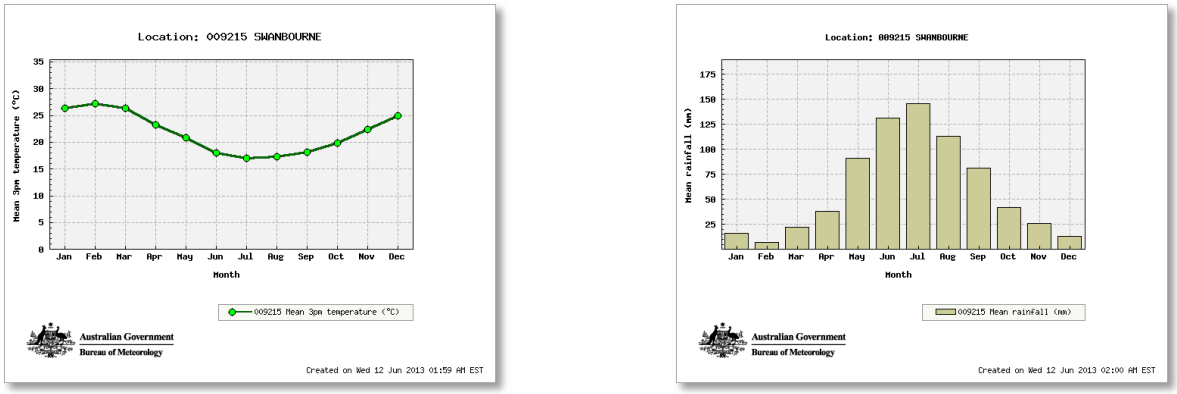

Figure 1: Mean maximum 3pm recorded temperatures 1993-2010 and mean rainfall for Swanbourne Bureau of Meteorology Station between 1993 and 2013

Data from the Swanbourne Bureau of Meteorology weather station indicate that the predominant winds in the summer months at 3pm near the study site are south-westerly (Figure 2). Easterly and south-easterly winds are very uncommon and wind strength, direction and frequency from the south-west is dominant and occurs 70 to 80% of the time.

[1] www.bom.gov.au/weather/wa/sevwx/perth/bushfires.shtml

The long term bushfire hazard is located east of the residential area and the predominant south east winds could potentially blow a bushfire in the BCA towards the residential area.

Although they occur infrequently, but slightly more regularly in February, east and north east winds are likely to be hot and dry and have the potential to drive large fire fronts on extreme fire weather days.

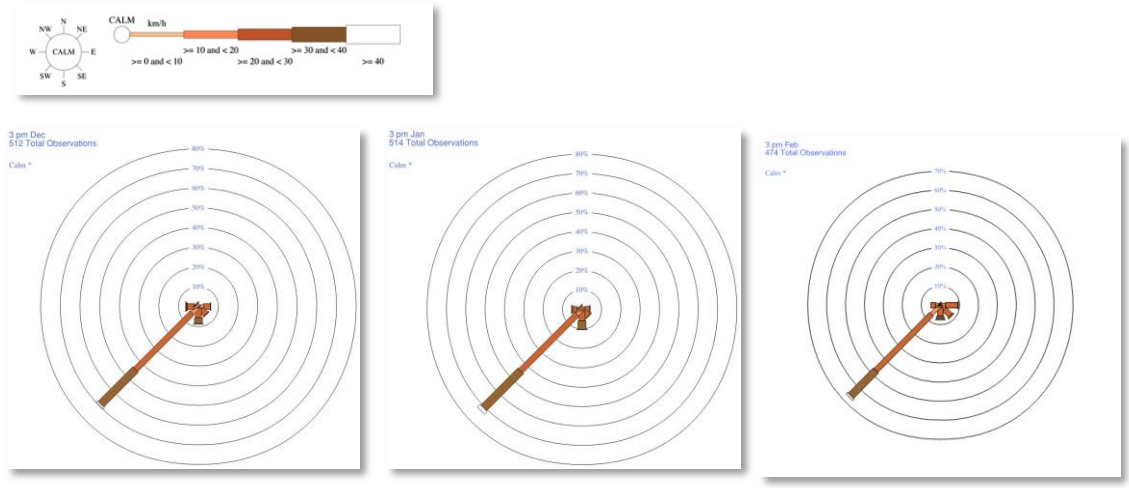

Figure 2: Rose of wind direction and wind speed in km/hr for December, January and February between 1993 and 2010 at the Swanbourne Meteorology Station

Interpreting Figure 2 - Wind speed vs Direction Plot

Wind roses summarize the occurrence of winds at a location, showing their strength, direction and frequency. The percentage of calm conditions is represented by the size of the centre circle - the bigger the circle, the higher is the frequency of calm conditions. Each branch of the rose represents wind coming from that direction, with north to the top of the diagram. Eight directions are used. The branches are divided into segments of different thickness and colour, which represent wind speed ranges in that direction. Speed ranges of 10 km/hr are used. The length of each segment within a branch is proportional to the frequency of winds blowing within corresponding range of speeds from that direction (BOM 2010).

4.3 Bushfire Fuels

The dominant bushfire fuels are is shrubland vegetation at the site, in smaller areas low woodland and scrub vegetation presents a more elevated fuel layer. Scrub fuel is common south of the site.

Post development, the bushfire fuels will be concentrated in the BCA west of the residential area and will temporarily be south and east of the site until removed.

4.4 Assets

When the site is fully developed Stages 9-11 will contain 127 residential dwellings. Stages 20 and 21 are expected to have a similar number of residential dwellings.

Assets under greatest threat from a bushfire will be those within 100 metres of the Biodiversity Conservation Area on the western interface. This hazard is permanent whereas hazard to the south is likely to be removed for urban development in the future.

Hazard to the east will be removed via vegetation slashing.

4.5 Access

The site has adequate access for urban development with Aviator Boulevard and Marmion Avenue, providing multiple access options for residents and emergency personnel. North of the site, the urban environment roadway available to residents on the northern perimeter of the site, , during the first staging and throughout all future developments.

A perimeter public roads system separates residents and visitors from bushfire hazard areas, as well as allowing access for fire appliances.

4.6 Water Supply

Reticulated water will be provided to the entire development. Fire hydrants will be spaced to Water Corporation and DFES standards and provide emergency services access to an adequate water supply.

4.7 Bushfire History

Fires have been common on the Swan Coastal Plain for thousands of years, the anthropological and historical evidence suggests that Aborigines regularly burnt this area (Abbott 2003).

Bushfires are common in the City of Wanneroo, in the 2009/10 financial year, the volunteer fire brigades attended to 132 fires (City of Wanneroo 2010). There is no comprehensive documentation on the past fire history (either planned or unplanned fires) of the Tamala Park Development Area over the period of European settlement

(Syrinx Environmental 2011). There is no evidence that further fires have occurred in the area beyond a few small patch fires observed in the fragmented Banksia sessilis heath located close to the northern boundary of the site along Neerabup Road.

Areas of native vegetation adjacent to residential estates are particularly susceptible to frequent bushfires due to the high risk of arson and great potential for accidental ignitions (Walker 1981, Burrows and Abbott 2003). The same conclusion can be reached for heath and scrub vegetation such as that found on site

Given that bushfires are common in the City of Wanneroo, this FMP plays a critical role in ensuring that the development of the land is appropriately mitigated from fire risk and threat.

5. Bushfire Hazard Assessment

Assessing bushfire hazards at a strategic level takes into account the predominant class of vegetation on the site and surrounding area for a minimum of 100 metres. The vegetation class map for the site and surrounding area for a minimum of 100 metres is shown in Appendix D. Fuel layers in a typical forest environment can be broken-down into five segments as shown in Figure 3. These defined fuel layers are used in the following descriptions regarding vegetation types, fuel structure and bushfire hazard levels.

Figure 3: The five fuel layers in a forest environment that could be associated with fire behaviour (Gould et al. 2007)

5.1 Vegetation Type and Structure

The site assessment undertaken for this study identified 4 broad vegetation types on and surrounding the site as shown and mapped in Appendix D. The vegetation types identified include shrub land, scrub, low banksia woodland and unmanaged grassland.

Shrubland vegetation is the most common and widely distributed, it includes typical coastal open heath species and averages in height between 0.5 to 2 m. Grass tress were common throughout the site some of which exceeded 3 m in height *(Figure 4)*.

Where the shrubland vegetation bordered with scrub, the vegetation boundary was often not clearly defined. Scattered banksia trees and parrot bush intermixed with the shrubland vegetation and created clumps of more elevated fuels. Shrubland vegetation was classified on the dominant fuel layer present which was considered to be consistently the shrubland elevated fuel layer even though scattered banksia trees were often present (*Figure 5*).

Figures 4 and 5 – Classic open heath shrubland vegetation (left) and shrubland vegetation with scattered low banksia trees (right)

Scrub vegetation occurs in areas either dominated by acacia vegetation or parrot bush, the fuel layer obtains a height of 3-4 m, and large areas of scrub were found south of the site on the adjacent property and west of Marmion Avenue *(Figure 6)*. Banksia low woodland occurs in two distinct areas on the site and a larger area south of the site in the adjoining property. The low woodland includes banksia trees up to 8 m in height typically with a shrubland elevated fuel layer and surface and near surface leaf litter *(Figure 7)*. Banksia trees were scattered throughout areas not designated as banksia low woodland because total foliage cover was considered to be less than 10% in these vegetation types and were classified according to the understorey as AS3959 methodology.


Figures 6 & 7 Dryandra (parrot bush) scrub (left) and low banksia woodland (right)

A broad area of unmanaged grassland occurs the far eastern perimeter of the site extending into the adjoining lot which is proposed for development into a primary school and another small area of unmanaged grassland occurs in the north eastern part of the site and near the southern boundary *(Figure 8).*

Figures 8 Unmanaged low fuel grassland

5.2 Slope

The site is undulating and most of the site will be levelled for the development.

Effective slope underneath vegetation surrounding the site is flat, upslope and downslope in the BCA, however effective slope was at a maximum of 2° downslope for lots in the southern half of the site.

Effective slope under the scrub south of the site varies between zero and 5° downslope which would increase the intensity of a bushfire approaching through this vegetation from the south.

The land also slopes downslope east of the site, but does not increase long-term risk because future development stages will occur and the bushfire hazard will be removed.

The effective slope of vegetation surrounding the site is highlighted in Appendix E.

5.3 The Bushfire Hazard Assessment Levels

The vegetation class map (Appendix D) outlines the dominant vegetation types on the study site and in the surrounding area (for a minimum of 100 metres). Descriptions of the vegetation types, structure and fuel layers are outlined in Section 5.1 Vegetation Type and Structure.

The bushfire hazard assessment levels were determined using Appendix 1 of the Planning for Bushfire Protection Guidelines - Edition 2 (WAPC et al. 2010). The study site has bushfire hazard ratings of predominantly extreme, however there are also areas of moderate and low hazard.

The extreme hazard occurs where shrubland, scrub and woodland vegetation occurs.

Moderate hazard occurs in areas of grassland fuels on the eastern end of the site.

Low bushfire hazard areas occur where the vegetation has been cleared and there is no vegetation.

The current bushfire hazard rating map for the site is outlined in Appendix F.

5.3.1 Bushfire Hazard – Post Development

Management of bushfire hazard is essential during the staging of the development. The earthworks program will remove most of the bushfire hazard on the site during the staging process, and the three areas of public open space will be landscaped and managed as parkland and reserves.

Fuel loads within 100 metres of development stages within the site will be reduced to ensure an appropriate buffer exists around each stage as the entire site is developed.

Permanent extreme bushfire hazard will remain in the BCA and south of the site which will pose the greatest risk to the residential areas over the life of the development.

Extreme bushfire hazard west of Marmion Avenue are located in areas identified as

residential zones in the LSP. The bushfire hazard is likely to be reduced to low when is area is developed.

The site contains low hazard immediately to the north of the site and hazard located east will be removed as future stages of Tamala Park are completed.

Bushfire hazard post development is outlined in plan in Appendix G.

6. Fire Mitigation Strategies

This report adopts an acceptable solution and performance-based system of control for each bushfire hazard management issue. This approach is consistent with Appendix 2 of the Planning for Bushfire Protection Guidelines - Edition 2 (WAPC et al. 2010). The management issues are;

- Location of the development;
- Vehicular Access;
- Water;
- Siting of the development; and
- Design of the development.

Acceptable solutions are proposed for four out of the five management issues and each illustrates a means of satisfactorily meeting the corresponding performance criteria. A performance-based approach is proposed for the remaining management issue.

6.1 Element: Location of the Development

Intent
To ensure that development/intensification of land use is located in areas where bush fire hazard does not present an unreasonable level of risk to life and property.

Acceptable Solution
Bushfire hazard levels are rated as predominantly extreme on the development site due to the existing vegetation. There are similarly extreme bushfire hazard ratings for land immediately to the west and south. Land immediately to the east will be developed into a primary school and the bushfire hazard is expected to be reduced to low.

Permanent residual hazard will remain in shrubland and scrub vegetation immediately west and south of the site.

The maximum Bushfire Attack Level (BAL) for all dwellings in Stages 9 to 11 of the development is predicted to be BAL-12.5.

Stages 20 and 21 in the 'Urban Deferred' area, could be exposed to higher BAL ratings on the extreme southern perimeter of the site. However the maximum has been assessed at BAL- 29 which can be successfully mitigated by increasing building construction standards. Additional follow up assessment is required on this interface before the creation of titles in Stages 20 and 21.

Construction standards will be increased to align with the designated BAL rating to offset the requirement for a Hazard Separation Zone (HSZ). The site will be provided with an adequate water supply and has good perimeter vehicular access to fight fires.

6.2 Element: Vehicular Access

Intent
To ensure vehicular access serving a subdivision development is safe if a bushfire occurs.

Background
The proposed road network integrates with the existing roads under construction in Stage 1 of Tamala Park immediately north of the site .

The proposed road layout can be clearly seen in the proposed subdivision plan (Appendix B). There are four intersections with Aviator Boulevard which is the main road connecting with Marmion Avenue.

The site has a perimeter public road system ensuring dwellings are separated from bushfire hazard and fire appliances have access between bushfire hazard and residential dwellings

The proposed road network does include four-lane ways, 5 m in width. The lane ways provide rear access to lots and each lot is also serviced by a compliant public road.

This proposal complies with the performance criteria by applying the following acceptable solutions;

Acceptable Solution A2.1: Two Access Routes
The road network (Appendix B) outlines an interconnected loop road system including four intersections with Aviator Boulevard.

Development staging will first occur on the northern perimeter of the site and two access roads will be available for all residents at all times during the staging of development

Acceptable Solution A2.2: Public Roads
All proposed public roads within the site with the exception of the four 5 m wide laneways will comply with the minimum public road standards,.

The public road standards which will be achieved are;

- Minimum trafficable surface: 6 metres;
- Horizontal clearance: 6 metres;
- Vertical clearance: 4 metres;
- Maximum grades: 1 in 8;
- Maximum grades over <50 metres: 1 in 5;
- Maximum average grade: 1 in 7;
- Minimum weight capacity: 15 tonnes;
- Maximum crossfall: 1 in 33; and
- Minimum inner radius of curves: 12 metres.

6.3 Element: Water

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

Acceptable Solution: Reticulated Area
The development is located within an Emergency Services Levy (ESL) Category 1 area. This means it is located within the Perth Metropolitan Fire District and emergency response is provided by career Fire and Rescue Resources and the State Emergency Service (SES).

The area is provided with a reticulated water supply, together with fire hydrants that will meet the specifications of the Water Corporation Design Standard DS 63 and DFES. Residential dwellings (Class 1a) require fire hydrants to be sited within (or every) 200 metres in land zoned residential.

The developer is to provide detailed hydrant plans to the City of Wanneroo and the

DFES local fire station for monitoring. Local DFES staff are to conduct an initial inspection of hydrants as well as routine inspections. The Water Corporation is responsible for all hydrant repairs.

Fire services require ready access to an adequate water supply during fire emergencies.

6.4 Element: Siting of the Development

Intent
To ensure the siting of the development minimises the level of bushfire impact.

Background
The site will be extensively cleared and levelled to accommodate the development.

Three areas of Public Open Space (POS) will exist within the site.

There are two important bushfire setback issues addressed by this plan. The first issue revolves around the site having an adequate perimeter Building Protection Zone to manage risk from permanent bushfire hazard external to the site. The second strategy involves the management of risk at each individual stage of development. Each development stage is provided with acceptable setbacks from temporary hazards to reduce bushfire attack mechanisms impacting on completed dwellings.

Vegetation that does not trigger a BAL assessment according to the Australian standard (AS3959-2009) includes one or a combination of the following:

- Vegetation of any type more than 100 metres from the site;
- Single areas of vegetation less than 1 hectare in area and not within 100 metres of other areas of vegetation being classified;
- Multiple areas of vegetation less than 1 hectare in area and not within 20 metres of the site or each other;
- Strips of vegetation less than 20 metres wide(measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20 metres of the site or each other, or other areas of vegetation being classified;
- Non-vegetated areas, including waterways, roads, footpaths, buildings and rocky outcrops, and
- Low threat vegetation, including grassland managed in a minimal fuel condition, maintained lawns, golf courses, maintained public reserves and parkland, vineyards, orchards, cultivated gardens, commercial nurseries, nature strips and wind breaks.

Acceptable Solution: Building Protection Zone (BPZ)

One of the most important fire protection measures influencing the safety of people and property is to create a BPZ between buildings and bushfire hazard. The BPZ is a low fuel area immediately adjacent to a building. Non-flammable features such as irrigated landscapes, gardens, driveways, roads, and maintained parks and reserves can form parts of a BPZ.

World first research into land management and house losses during the Black Saturday Victorian bushfires concluded that the action of private landholders who managed fuel loads close to their houses was the single most important factor in determining house survival when compared with other land management practices such as broad scale fuel reduction burning remote from residential areas (Gibbons et al. 2012).

Creating a perimeter BPZ will ensure vegetation and fuels within close-proximity to dwellings are managed to reduce predicted levels of radiant heat flux and improve the survival of buildings. Creating a temporary BPZ during each stage of the development will ensure dwellings on the perimeter of each stage are not exposed to unnecessary risk from a temporary hazard.

The creation of the BPZ areas will ensure the predicted radiant heat flux exposure levels remains at or below a maximum of BAL – 12.5 on all exposed dwellings in Stages 9-11 of the development. It will also ensure the exposed dwellings on the south perimeter are not exposed to levels above BAL-29. Stages 21 and 22 will require further assessment at the time of development to address interface issues with Tamala Park Landholdings to further reduce the BAL ratings of exposed lots on the southern perimeter.

Managing vegetation in the BPZ has two main purposes - to reduce;

- Direct flame contact and radiant heat from igniting the building during the passage of a fire front; and
- Ember attack and provide a safer space for people to defend (if required) before, during and after a fire front passes.

The perimeter BPZ and the temporary staging BPZ must be established and maintained to the following standards:

- Perimeter BPZ Width: 20 metre minimum and as outlined in Appendix H and within the lot boundary (including road reserves) as identified in Appendix H;
- Temporary staging BPZ Width: 100 metres and within the overall perimeter of the development boundary and implemented as each stage occurs;
- Fuel load: reduced to and maintained at 2 tonnes per hectare;
- All tree crowns (or clumps of crowns) are a minimum of 10 metres apart;
- All trees to have lower branches pruned to a height of 2 metres;

- All tall shrubs or trees are not to be located within 2 metres of a building (including windows);
- No tree crowns or foliage is to be within 2 metres of any building. This includes existing trees and shrubs and new plantings;
- All fences and sheds are constructed of non-combustible materials (i.e. Colorbond, brick or limestone);
- All shrubs to contain no dead material within the plant;
- No tall shrubs are to be in clumps within 3 metres of the building; and
- No trees are to contain dead material in the crown or on the bole.

The perimeter BPZ will be required for Stages 9 and 10 of the development which includes an interface with the BCA.

Each development stage will require a 100 metre cleared zone surrounding the perimeter and located within the lot boundary. This will be achieved by the management of vegetation in this zone as stages are developed. It is the responsibility of the developer to establish the temporary staging and perimeter BPZ including fuel reduction in road reserves if necessary and landscaping in areas of POS.

A Hazard Separation Zone (HSZ) is an additional fuel managed zone to create further separation between dwellings and bushfire hazard. It can extend out to 100 metres from buildings. In the LSP, a HSZ is not required on the perimeter of the site because low threat areas adjoin the site on three sides. A HSZ does not fit within the design of the proposed development. The requirement for a HSZ in this area is offset by an increase in construction standards and compliance with AS3959-2009.

The following Bushfire Attack Level (BAL) assessment demonstrates that the proposed BPZ combined with increased dwelling construction standards will achieve acceptable levels of risk for the development.

By achieving this standard it will be possible to construct dwellings to an appropriate standard (i.e. BAL-29 or less) under the Australian Standard (AS 3959-2009: Construction of Buildings in Bushfire-Prone Areas).

6.4.1 Building Siting and Predicted Bushfire Attack Levels

The AS 3959-2009 standard comprises six categories of BAL and these categories are based on heat flux exposure thresholds.

The method for determining the BAL involves a site assessment of vegetation and local topography. The assumed Fire Danger Index (FDI) for Western Australia is 80.

The BAL identifies the appropriate construction standard that applies as a minimum standard in Construction of Buildings in Bushfire-Prone Areas (AS 3959-2009).

Methodology and Assumptions

The following indicative BAL assessment for five example dwelling locations on the perimeter of the site (see Appendix H & Table 1) was determined using the methodology in Appendix A of AS 3959-2009. This methodology is also outlined in the Planning for Bush Fire Protection Guidelines.

The criteria to determine the BAL is outlined as follows:

Designated FDI : 80
Flame Temperature: 1090
Slope : Flat (See Table 1)
Vegetation Class : Scrub and shrub land
Setback distances : 20m, 22m, 27m, 29m, & 32 m setback (See Table 1)

Indicative dwelling BAL assessment	Setback Distance (m)	Classified Vegetation	Effective Slope (degrees)	BAL Rating
Dwelling 1	29m	Shrubland	Flat	BAL-12.5
Dwelling 2	32m	Scrub	Flat	BAL-12.5
Dwelling 3	27m	Shrubland	Flat	BAL-12.5
Dwelling 4	22m	Scrub	Downslope 2	BAL-19
Dwelling 5	20m	Scrub	Downslope 5	BAL-29

Table 1: Bushfire Attack Level (BAL) Assessment for indicative exposed dwellings as identified in Appendix H

All dwellings located on the western interface perimeter with the BCA are exposed to a predicted radiant heat flux of BAL-12.5. A dwelling located on the south interface could be exposed to BAL-29, however Stages 20 and 21 in the 'Urban Deferred' area will be developed after the land zoning has changed to 'Urban'. An additional assessment of the BAL ratings are required before the creation of titles for Stages 20 and 21 to re-assess the exposure of dwellings on the southern interface.

A Bushfire Attack Level of BAL-12.5 means the risk is considered to be low. It is expected that the construction elements will be exposed to a radiant heat flux not

greater than 12.5kW/m^2. There is a risk of ember attack and burning debris ignited by wind borne embers and a likelihood of exposure to radiant heat (Standards Australia 2009). The recommended construction Sections are 3 and 5 in AS 3959-2009.

A Bushfire Attack Level of BAL-19 means the risk is considered to be moderate. It is expected that the construction elements will be exposed to a radiant heat flux not greater than 19kW/m^2. There is a risk of ember attack and burning debris ignited by wind borne embers and a likelihood of exposure to radiant heat (Standards Australia 2009). The recommended construction Sections are 3 and 6 in AS 3959-2009.

This indicative assessment demonstrates that all proposed dwellings will fall within the acceptable level of risk (i.e. BAL-29 and lower). The lots identified in Stages 9-11 (Appendix I) are confirmed BAL ratings and will provide certainty to builders to new dwellings within 100 metres of identified classified vegetation require a BAL assessment at building licence application stage to confirm the BAL rating.

The BAL ratings for development Stages 9 - 11 have been determined and these lots do not require re-assessment. The BAL ratings for all lots within 100m of classified vegetation are rated as BAL-12.5 (Appendix I).

The BAL ratings for Stages 20 and 21 are only indicative at this stage. Lot setbacks need to be established as well as lot design. All future lots within 100 m of the scrub vegetation are exposed in the 'Urban Deferred' land south of the site. Any dwellings constructed within 22m of the scrub vegetation are exposed to BAL-29. Dwellings constructed between 22-31 metres are exposed to BAL-19 and dwellings located between 31-100 m are exposed to BAL12.5. This is represented in Appendix J.

Prior to the creation of titles on Stages 20 and 21, a completed BAL assessment needs to be undertaken to formally assess BAL ratings as circumstances regarding vegetation is likely to change once the design of the development is confirmed.

Lots within 100m of the eastern perimeter are not exposed to predicted bushfire attack mechanisms that warrant increased construction standards because vegetation will be managed within 100m of this interface.

6.4.2 Landscaping Considerations

Landscaping can both assist in the survival of the building and be a determining factor in its destruction. Landscaping can protect buildings by forming a barrier or deflector for wind borne debris and radiant heat. It can also bring the fire directly to the building, so a degree of care needs to be exercised when selecting and locating landscaping.

All plants will burn under the right conditions and plants do not attain a 'fire resistance level' that meets requirements of the Building Code of Australia. Placing plants too close to a building, under timber decks or next to windows will provide a direct threat to the building. Having a clearance around the building will achieve the desired effect of creating a break between the vegetation and the building. A pathway around buildings may be one way to achieve this requirement. Landscaping can then be established at a suitable distance from the building.

The POS strip on the road batter adjacent to the Building Code of Australia interface requires special consideration with its landscaping. The DFES document titled "Plant Guide within the Building Protection Zone" provides a useful list of species and spacing requirements to achieve compliance with vegetation within a building protection zone in the Swan Coastal Plain. It provides guidance for selecting species for revegetation of streetscapes, POS areas and residential gardens and can be downloaded at

http://www.dfes.wa.gov.au/safetyinformation/fire/bushfire/BushfireProtectionPlanningPublications/FESA%20Plant%20Guide-BP%20Zone-Final-w.pdf.

Species from this list must be used in the POS landscaping zone adjacent to the BCA to create a suitable low fuel environment.

6.5 Design of the Development

Performance Criteria
The design of the development is appropriate to the level of bushfire hazard that applies to the site.

Acceptable Solution
All on-site development is to comply with the performance criteria or acceptable solutions 1 to 4 in the "Planning for Bushfire Protection" Guidelines. The buildings are to comply with AS 3959-2009: Construction of Buildings in Bushfire-Prone Areas if required. The City of Wanneroo has the responsibility of ensuring dwellings meet this standard.

The predicted highest BAL level for the dwelling is BAL-12.5 in Stages 9-11. BAL ratings will be re-assessed for stages 20 & 21 after the 'Urban Deferred; zone is lifted. All exposed dwellings (i.e. dwellings within 100 metres of classified vegetation) will have risk mitigated by compliance with the Australian Standard AS3959-2009.

6.6 Public Education and Community Awareness

Community bushfire safety is a shared responsibility between individuals, the community, government and fire agencies. DFES has an extensive Community Bushfire Education Program including a range of publications, a website and Bushfire Ready Groups. The 30 page booklet 'Prepare, Act, Survive' provides excellent advice on preparing for and surviving the bushfire season. Other downloadable brochures include 'Fire Danger Ratings and what they mean for you' and 'Bushfire Warnings and what you should do'.

Information available on the City of Wanneroo website regarding fire, keeping your home safe from fire and total fire bans, as well as volunteer bush fire brigade information is available on their website:
http://www.wanneroo.wa.gov.au/Residents/Our_Place_-_Community_Safety/Fire

6.7 Community Fire Refuges and Fire Safer Areas

There are no designated Community Fire Refuges in the City of Wanneroo, however, at the time of an emergency, the relevant authorities can select an evacuation centre and DFES, the City and Police will provide this information to residents.

A predetermined centre cannot be nominated because there are no purpose built structures (such as bunkers) designed to withstand the impacts of a bushfire. This means the location of an evacuation centre is not determined until the position of the fire and the characteristics of a specific event are considered by authorities. There would be nothing more dangerous than sending residents to a centre which is in the direct path of a fire.

The safest place to be during a bushfire is away from it. Where to go is an important element when people are relocating during a time of emergency (NSW Rural Fire Service 2004). The preferred option for residents is to designate a destination that is not in a bushfire-prone area and will be safe to travel to before a bushfire attack.

Those who find themselves threatened by a bushfire, need options (VBRC 2009). This may be because their plan to leave is no longer possible because they cannot reach a place away from the fire front, or their plan to defend their property fails. Residents may also be caught away from their home when a bushfire threatens.

The concept of a "Neighbourhood Safer Place" and Neighbourhood Safer Precincts" has arisen from recommendations by the Victorian Bushfire Royal Commission into the Black Saturday bushfires.

There are many areas within the City of Wanneroo including landscaped open spaces and urban areas that are not bushfire-prone, but they have not been declared. Obviously a non-bushfire-prone area can provide a safe location for people during a bushfire, but there is no official criteria in Western Australia to determine these areas.

As there is no specific criteria to guide this process, DFES's general advice is when residents household bushfire survival plans have failed, go to a safer place such as a local open space or building where people may go to seek shelter from a bushfire (FESA 2010).

7. Conclusion

This Plan provides acceptable solutions and responses to the performance criteria that fulfil the intent of the bushfire hazard management issues outlined in Planning for Bushfire Protection Guidelines - Edition 2 (WAPC et al. 2010). However, community bushfire safety is a shared responsibility between governments, fire agencies, communities and individuals.

The BAL ratings are final for Stages 9-11 as identified in Appendix I and the BAL ratings will be re-assessed at the time of development to address interface issues on the southern perimeter.

The planning and building controls outlined in this plan will reduce the risk of bushfire to people and property. It will not remove all risk. How people interpret the risk, prepare and maintain their properties and buildings and the decisions and actions they take (i.e. evacuate early or stay and defend or other) greatly influence their personal safety. Residents need to be self-reliant and not expect warnings or assistance from emergency services.

7.1 Compliance Checklist

Performance Criteria and Acceptable Solutions

Element	Question	Answer
1: Location	Does the proposal comply with the performance criteria by applying acceptable solution A1.1?	Yes
2: Vehicular access	Does the proposal comply with the performance criteria by applying acceptable solution A2.1?	Yes
	Does the proposal comply with the performance criteria by applying acceptable solution A2.2?	No - However the proposal does satisfactorily comply with performance criterion P2 because the 5m wide laneways each have a compliant public road interface with dwellings.
	Does the proposal comply with the performance criteria by applying acceptable solution A2.3?	Not Applicable
	Does the proposal comply with the performance criteria by applying acceptable solution A2.4?	Not Applicable

Element	Question	Answer
2: Vehicular access	Does the proposal comply with the performance criteria by applying acceptable solution A2.5?	Not Applicable
	Does the proposal comply with the performance criteria by applying acceptable solution A2.6?	Not Applicable
	Does the proposal comply with the performance criteria by applying acceptable solution A2.7?	Not Applicable
	Does the proposal comply with the performance criteria by applying acceptable solution A2.8?	Not Applicable
	Does the proposal comply with the performance criteria by applying acceptable solution A2.9?	Not Applicable
	Does the proposal comply with the performance criteria by applying acceptable solution A2.10?	Not Applicable
3: Water	Does the proposal comply with the performance criteria by applying acceptable solution A3.1?	Yes
	Does the proposal comply with the performance criteria by applying acceptable solution A3.2?	Not Applicable.
	Does the proposal comply with the performance criteria by applying acceptable solution A3.3?	Not Applicable

Element	Question	Answer
4: Siting of the Development	Does the proposal comply with the performance criteria by applying acceptable solution A4.1?	Yes - Construction standards are increased to align with site bushfire attack level if required.
	Does the proposal comply with the performance criteria by applying acceptable solution A4.2?	Not Applicable
	Does the proposal comply with the performance criteria by applying acceptable solution A4.3?	Yes
	Does the proposal comply with the performance criteria by applying acceptable solution A4.4?	No - However the proposal does satisfactorily comply with performance criterion P4 because building construction standards are to be increased to comply with AS 3959-2009 to offset the reduced Hazard Separation Zone if required. Construction standards will achieve a maximum of BAL-29.
	Does the proposal comply with the performance criteria by applying acceptable solution A4.5?	Not Applicable - Shielding not applicable.

Element	Question	Answer
5: Design of the Development	Does the proposal comply with the performance criteria by applying acceptable solution A5.1?	No - However the proposal does comply with the performance criterion P5 because building construction standards will be increased to comply with AS 3959-2009 to offset the reduced HSZ. BAL-29 is not exceeded.
	Does the proposal comply with the performance criteria by applying acceptable solution A5.2?	Yes - The proposal complies as the development will meet the performance criteria because of compliance with AS 3959 and BAL-29 is not exceeded.

Applicant Declaration

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

Rohan Carboon

28/8/13

8. Implementing the Fire Management Plan

8.1 Developer's Responsibilities

To maintain a reduced level of risk from bushfire, the developer's responsibilities are to:

- Install the public roads and turn around areas to standards outlined in Element 6.2 Vehicular Access
- Lodge a Section 70A Notification on each Certificate of Title exposed to AS 3959 construction standards, proposed by this development. The notification shall alert purchasers and successors in title, to these exposed lots, of the responsibilities of the Fire Management Plan and bushfire building construction requirements;
- Comply with the City of Wanneroo Fire Control Notice as published, on all vacant land;
- Landscape all POS areas to have minimal bushfire hazard and ensure the POS strip adjacent to the BCA is landscaped with species from the DFES approved list;
- Establish and maintain the perimeter Building Protection Zones to standards;
- Ensure 100 metres of vegetation is managed from the perimeter of each construction stage within the overall development site to ensure temporary hazard does not threaten any subdivision stage;
- Further assess stages 20 and 21 for exposure to AS3959 construction standards at the time of development to reduce BAL ratings for perimeter dwellings;
- Install reticulated water supply and hydrants to Water Corporation, DFES and City of Wanneroo standards;
- Provide detailed hydrant plans is to the City of Wanneroo and DFES local fire station for monitoring.
- Supply a copy of this Fire Management Plan and The Homeowners Bush Fire Survival Manual, Prepare, Act, Survive (or similar suitable documentation) and the City of Wanneroo's Fire Control Notice to each lot owner subject to AS 3959 construction standards.

8.2 Property Owners' / Occupiers Responsibilities

The owners/occupiers of the site, as created by this proposal, are to maintain a reduced level of risk from bushfire, and will be responsible for undertaking, complying and implementing measures to protect their own assets (and people under their care) from the threat and risk of bushfire. Site owners and occupiers' will be responsible for:

- Ensuring that all lots comply with City of Wanneroo's Fire Control Notice;
- Maintain each property in good order to minimise bushfire fuels;

- Ensure that where hydrants are located, they are not obstructed and remain visible at all times;
- As part of the building license application if final BAL ratings have not been provided for Stages 20 and 21, the property owner or the City of Wanneroo shall have the proposed buildings re-assessed for Bushfire Attack Level (at the time of construction) with results to be submitted to the City of Wanneroo;
- Ensuring construction of dwellings complies with AS 3959 if required; and
- If dwellings are subject to additional construction in the future such as renovations, AS3959 compliance is required.

8.3 City of Wanneroo's Responsibilities

The responsibility for compliance with the law rests with individual property owners and occupiers and the following conditions are not intended to unnecessarily transfer some of the responsibilities to the City of Wanneroo.

The City of Wanneroo shall be responsible for:

- Providing fire prevention and preparedness advice to landowners upon request;
- Monitoring bush fuel loads in road reserve sites and liaising with relevant stakeholders to maintain fuel loads at safe levels;
- Maintaining public roads to appropriate standards and ensuring compliance with the City of Wanneroo Fire Control Notice;
- Review the Fire Management Plan as necessary;
- Ensuring dwellings are constructed to AS 3959 where applicable; and
- Endorsing a section 70A notification on the new Certificate of Title for all lots within 100m of "classified vegetation" affected by this Fire Management Plan that states "the Lots are subject to a Fire Management Plan"

8.4 Department of Fire and Emergency Services Responsibilities

- Conduct an initial inspection of hydrants and conduct routine inspections.

8.5 Water Corporation Responsibilities

- Repair water hydrants as needed.

9. References

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Appendix A: Site Location

Lot 9004 (1700) Marmion Avenue
Tamala Park
City of Wanneroo

N

Bushfire Safety CONSULTING

All road carriageway detail depicted on this Plan including pavements, road treatments, medians and parking are for illustrative purposes only and are subject to final engineering design and any relevant approvals. The detail reflects the intent of the road network standards preferred for this subdivision.

All dimensions and areas depicted on this Plan are subject to pre-cal and final survey and will vary from the figures shown.

WAPC 143766

WAPC 146745

AVIATOR BOULEVARD

MARMION AVENUE

Public Open Space 8153m²

Local Centre 4010m²

Public Open Space 2123m²

POS 4938m²

Biodiversity Conservation Area 5.7352ha

Balance of Lot 9004 1.0826ha

1.1002ha

4269m²

2091m²

3427m²

3818m²

Reserve

Laneway

6m Laneway

5m Laneway

20m Reserve

16m Reserve

15m Reserve

18m Reserve

20.25m Reserve

POS

NEERABUP ROAD

MARMION AVENUE

9004

Lot 9004 (330.3413ha)

Subject Area (16.5334ha)

Balance Lot (313.8079ha)

MRS Urban Deferred Boundary

Yield -	Residential	- 127 lots
	Local Centre	- 1 lot
	Balance	- 1 lot
Total -		- 129 lots

Appendix B

PROPOSED SUBDIVISION

Lot 9004 (1700) Marmion Avenue, Tamala Park
City of Wanneroo

plan no: 2228-157P-01

scale: 1:2000 @ A3, 1:1000 @ A1

date: 17.05.2013

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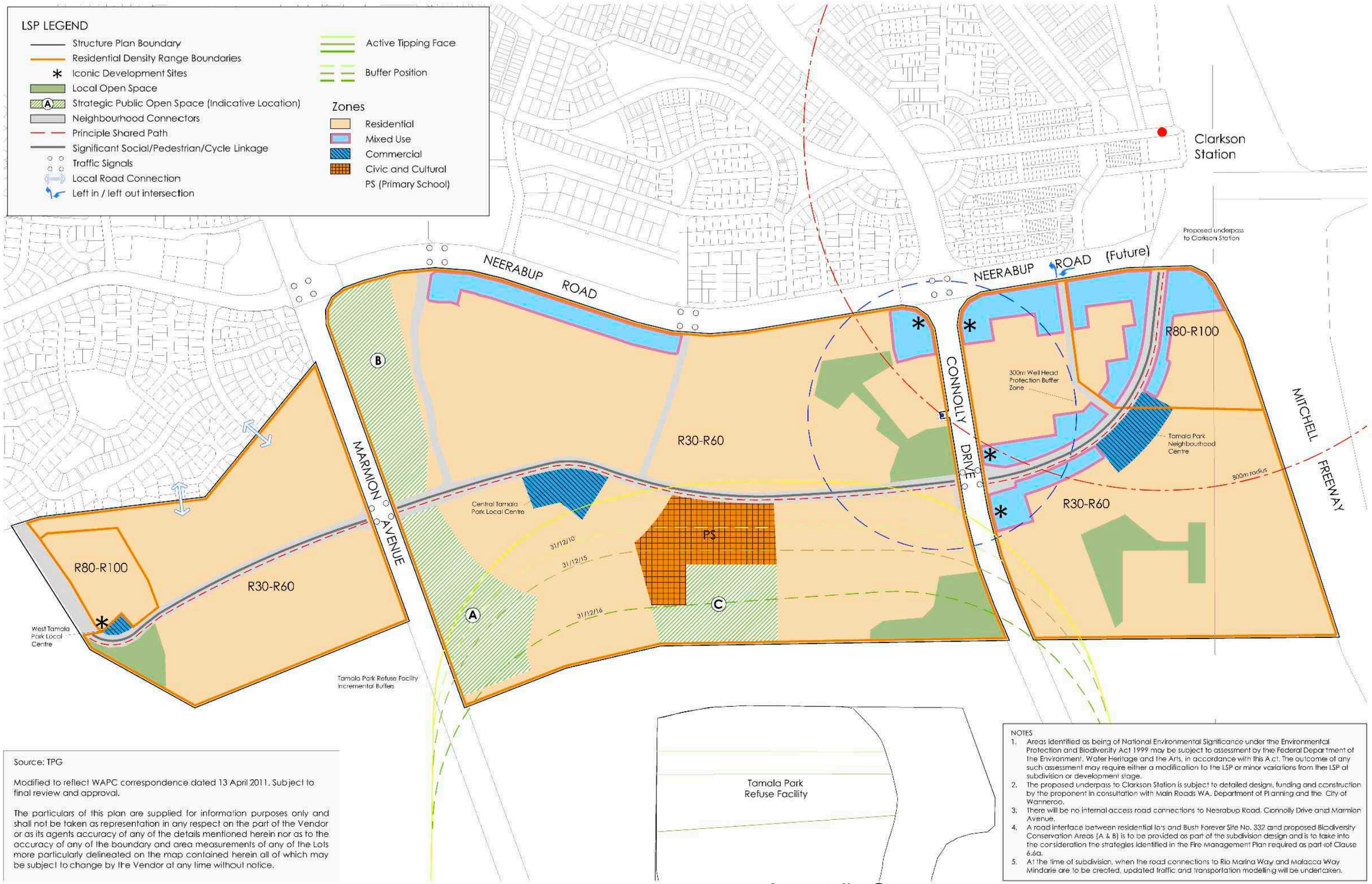


Source: TPG

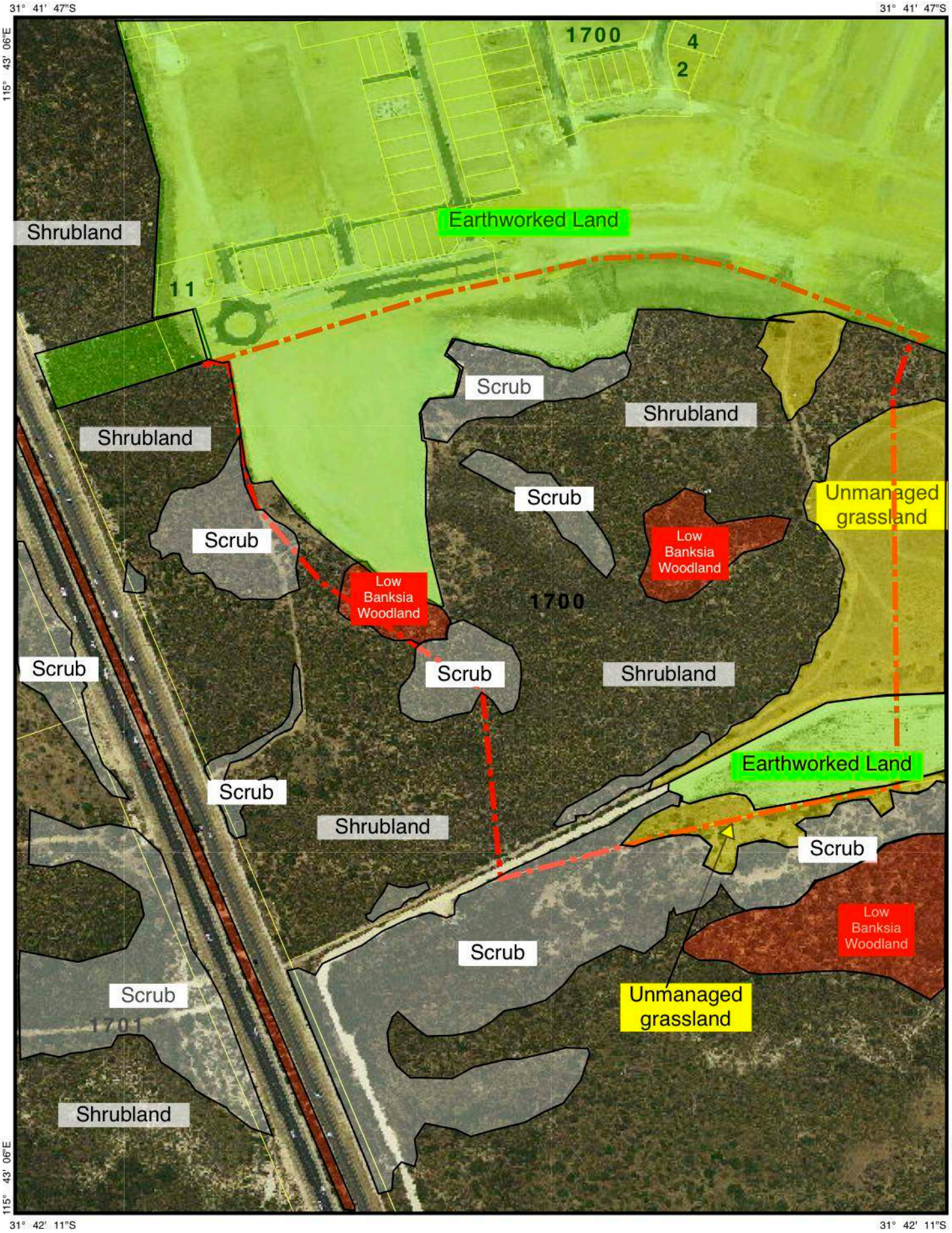
Modified to reflect WAPC correspondence dated 13 April 2011. Subject to final review and approval.

The particulars of this plan are supplied for information purposes only and shall not be taken as representation in any respect on the part of the Vendor or as its agents accuracy of any of the details mentioned herein nor as to the accuracy of any of the boundary and area measurements of any of the Lots more particularly delineated on the map contained herein all of which may be subject to change by the Vendor at any time without notice.

NOTES

1. Areas identified as being of National Environmental Significance under the Environmental Protection and Biodiversity Act 1999 may be subject to assessment by the Federal Department of the Environment, Water Heritage and the Arts, in accordance with this A.ct. The outcome of any such assessment may require either a modification to the LSP or minor variations from the LSP at subdivision or development stage.
2. The proposed underpass to Clarkson Station is subject to detailed design, funding and construction by the proponent in consultation with Main Roads WA, Department of Planning and the City of Wanneroo.
3. There will be no internal access road connections to Neerabup Road, Connolly Drive and Marmion Avenue.
4. A road interface between residential lots and Bush Forever Site No. 332 and proposed Biodiversity Conservation Areas (A & B) is to be provided as part of the subdivision design and is to take into the consideration the strategies identified in the Fire Management Plan required as part of Clause 6.6a.
5. At the time of subdivision, when the road connections to Rio Marina Way and Malacca Way Mindarie are to be created, updated traffic and transportation modelling will be undertaken.

Appendix C: PROPOSED TAMALA PARK LOCAL STRUCTURE PLAN MAP



Appendix D: Vegetation Class

Lot 9004 (1700) Marmion Avenue
Tamala Park
City of Wanneroo

Site Boundary

N

Bushfire Safety CONSULTING

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WAPC 143766

WAPC 146745

Public Open Space 8823m²

Local Centre 4162m²

Flat site contours

POS

Flat or upslope

Flat or upslope

Biodiversity Conservation Area 5.7352ha

POS 4938m²

Public Open Space 2123m²

Balance of Lot 9004 1.0826ha

1.1002ha

Downslope 4 degrees

Downslope 2 degrees

Downslope 2 degrees

Downslope 0-5 degrees

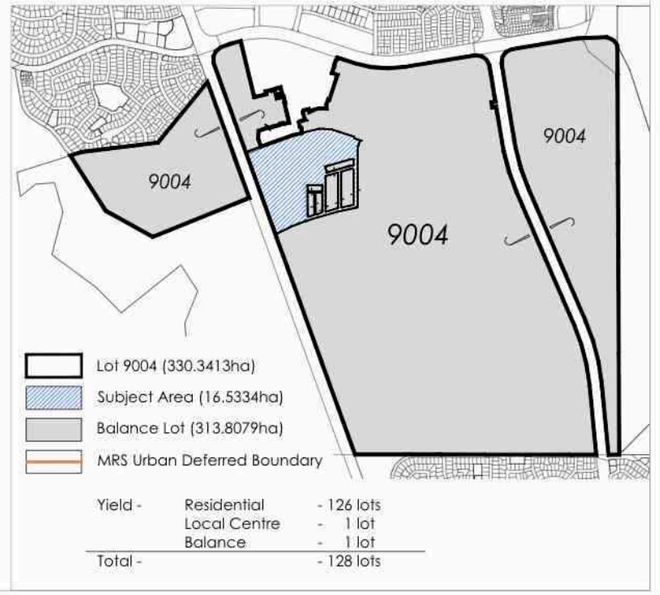
Reserve

Laneway

16m Reserve

20m Reserve

18m Reserve



Yield -	Residential	- 126 lots
	Local Centre	- 1 lot
	Balance	- 1 lot
Total -		- 128 lots

Appendix E: Topography & Effective Slope

plan no: 2228-157M-01
scale: 1:2000 @ A3, 1:1000 @ A1
date: 02.05.2013

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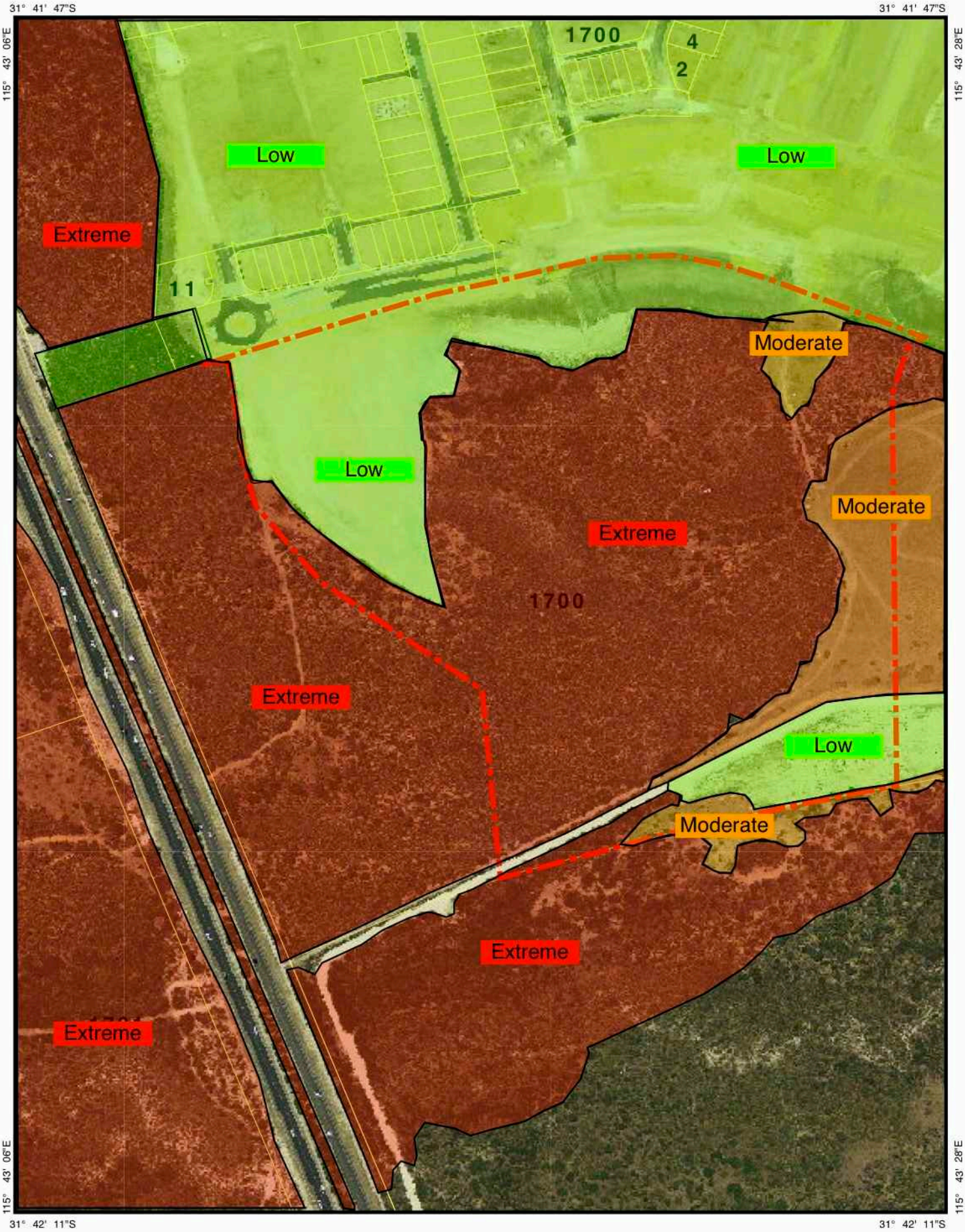


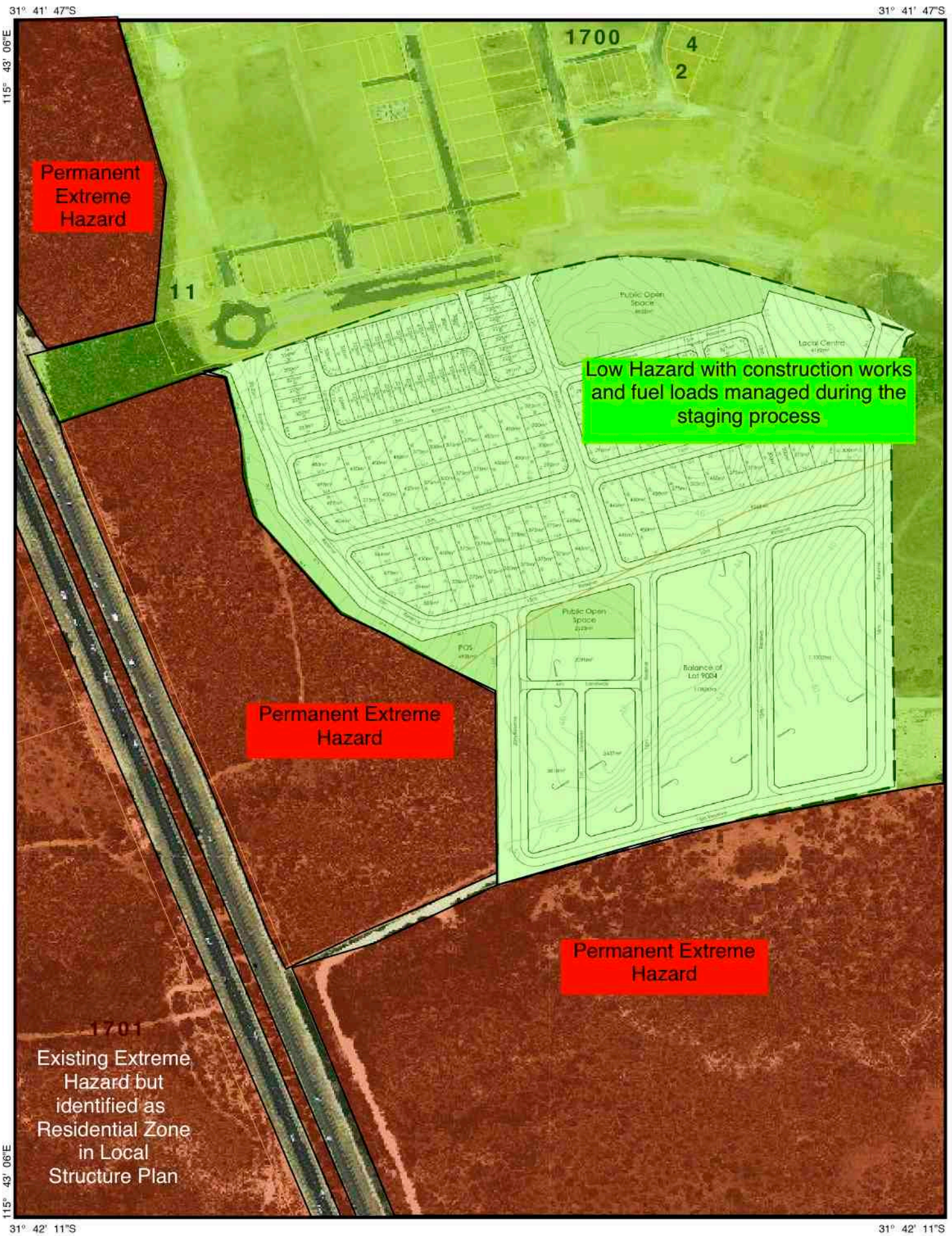
Appendix F: Bushfire Hazard Rating

Lot 9004 (1700) Marmion Avenue
Tamala Park
City of Wanneroo

Site Boundary

N

Bushfire Safety CONSULTING



Appendix G: Bushfire Hazard - Post Development

Lot 9004 (1700) Marmion Avenue
Tamala Park
City of Wanneroo

N

Bushfire Safety CONSULTING

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WAPC 143766

WAPC 146745

AVIATOR BOULEVARD

R60 lots have 1.5 m minimum dwelling setback

R30 lots have 2 m minimum dwelling setback

R30 lots have 2 m minimum dwelling setback

Lots will have 4 m minimum dwelling setback to achieve 20 m total

Public Open Space 8153m²

Local Centre 4010m²

Public Open Space 2123m²

POS

POS 4938m²

Biodiversity Conservation Area 5.7352ha

MARMION AVENUE

Reserve

Laneway

6m Laneway

20m Reserve

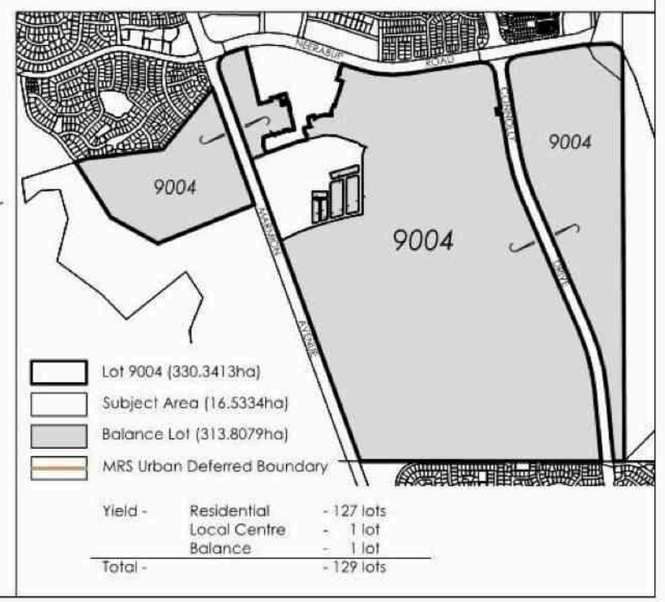
16m Reserve

18m Reserve

Balance Lot

1.1002ha

4268m²



Yield -	Residential	- 127 lots
	Local Centre	- 1 lot
	Balance	- 1 lot
Total -		- 129 lots

Appendix H: Building Protection Zone

plan no: 2228-157P-01
scale: 1:2000 @ A3, 1:1000 @ A1
date: 17.05.2013

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All dimensions and areas depicted on this Plan are subject to pre-cal and final survey and will vary from the figures shown.

WAPC 143766

WAPC 146745

AVIATOR BOULEVARD

Stage 9

Stage 11

Stage 10

Stages 20 & 21

BAL-12.5

Public Open Space 8153m²

Local Centre 4010m²

Public Open Space 2123m²

POS 4938m²

Biodiversity Conservation Area 5.7352ha

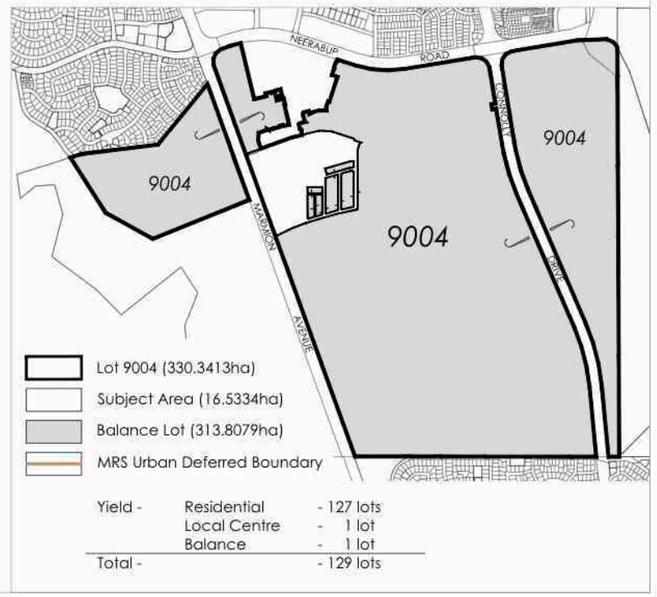
MARMION AVENUE

Reserve

Laneway

16m Reserve

20m Reserve



Yield -	Residential	- 127 lots
	Local Centre	- 1 lot
	Balance	- 1 lot
Total -		- 129 lots

Appendix I: BAL Ratings - Stages 9 - 11

plan no: 2228-157P-01
scale: 1:2000 @ A3, 1:1000 @ A1
date: 17.05.2013

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All dimensions and areas depicted on this Plan are subject to pre-cal and final survey and will vary from the figures shown.

WAPC 143766

WAPC 146745

AVIATOR BOULEVARD

Stage 9

Stage 11

Stage 10

Stages 20 & 21

Public Open Space 8153m²

Local Centre 4010m²

Public Open Space 2123m²

POS 4938m²

POS

Biodiversity Conservation Area 5.7352ha

Balance of Lot 9004 1.0826ha

MARMION AVENUE

BAL-12.5

BAL-19

BAL-29

NEERABUP ROAD

9004

Lot 9004 (330.3413ha)

Subject Area (16.5334ha)

Balance Lot (313.8079ha)

MRS Urban Deferred Boundary

Yield -	Residential	- 127 lots
	Local Centre	- 1 lot
	Balance	- 1 lot
Total -		- 129 lots

Appendix J: Indicative BAL Rating Zones - Stages 21 & 22

plan no: 2228-157P-01
scale: 1:2000 @ A3, 1:1000 @ A1
date: 17.05.2013

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