PROPERTY SUBDIVISION PROPOSAL

Stage 1 - Tamala Park (Catalina Estate)

Lot 9504 Marmion Avenue

Tamala Park

CITY OF WANNEROO

FIRE

MANAGEMENT PLAN

A Report for: Tamala Park Regional Council
173 Gildercliffe Street
Scarborough WA 6019

Prepared by

Bushfire Safety
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1. Introduction

The subject land comprises part of Lot 9504 Marmion Avenue, Tamala Park in the City of Wanneroo. Tamala Park is an unpopulated locality on the border between the City of Wanneroo and the City of Joondalup (Appendix A). The Catalina project site is divided into 3 large land lots, all of which are predominantly proposed for future residential development (Appendix B). Currently the land is mostly unoccupied bushland and unused except for occasional off-road driving and illegal rubbish dumping.

Stage 1 of the proposed subdivision is located on the northern boundary near the intersection of Marmion Avenue and Neerabup Road opposite the Ocean Views District Centre. Pursuant to the Local Structure Plan a Fire Management Plan is to be prepared and implemented to the satisfaction of Local Government and the Fire and Emergency Services Authority. This plan has been prepared to satisfy this requirement, it provides performance criteria and acceptable solutions that fulfill the intent of the bushfire hazard management issues outlined in the Planning for Bushfire Protection guidelines - edition 2.

Community bushfire safety is a shared responsibility between governments, fire agencies, communities and individuals. The planning and building controls outlined in this plan if fully implemented, will mitigate the risk of bushfire to people and property, it will not remove the risk. How people interpret the risk, prepare and maintain their property and buildings and what decisions and actions they take (ie. evacuate early or stay and defend) greatly influences the outcome of a bushfire. Individual land holders need to be self reliant, and not expect warnings or assistance from emergency services.

2. The Proposal

The proposal is to subdivide the subject land into 274 new lots to be zoned urban and public open space. Urban lot sizes range from 225m^2 up to 656m^2 in size. A copy of the subdivision plan is found in Appendix C.

3. Objectives

The purpose of this Fire Management Plan is to adequately address fire protection risks within the proposed subdivision and development. In particular, implementation of the Fire Management Plan will reduce the threat to residents and fire fighters in the event of a bush fire within or near the site. It achieves this by setting out minimum requirements to implement.

The Fire Management Plan also seeks to ensure that residents, landowners and relevant agencies are aware of their responsibilities.

Achievable and measurable goals of this plan include:

- Ensuring that the development of land use is located in an area where the bush fire hazard does not present an unreasonable level of risk to life and property.
- Ensuring vehicular access serving the development is safe in the event of a bushfire occurring.
- Ensuring water is available to the development to enable life and property to be defended from bushfire.
- Ensuring the siting of development minimises the level of bushfire impact.
- Ensuring that the design of the development minimises the level of bushfire impact.

This document forms the basis for a long term agreement between the developer and subsequent landowners of the proposed lots, the City of Wanneroo and other relevant agencies. Accordingly, it is important that the measures and procedures outlined in this Fire Management Plan are reviewed as necessary.

The Fire Management Plan includes:

- a description of the site, the surrounding area, fire climate and bushfire history;
- a summary of the factors affecting building survival in bushfires;
- a summary of research into bushfire related fatalities;
- a bush fire hazard assessment;
- addressing resident and fire services vehicular access;
- firebreak systems;
- building siting including building protection and hazard separation zones;
- water supply; and
- maps and plans of fire reduction measures.

4. Statutory and Policy Framework

The Western Australian Planning Commission has issued subdivision approval (WAPC Ref: 143766) for stage 1 of the development. A condition of subdivision is the preparation of a Fire Management Plan. Other relevant key legislation, policy and guidelines include the following.

4.1 Bush Fires Act

The purpose of the Act is to make better provision for diminishing the dangers resulting from bush fires, for the prevention, control and extinguishment of bush fires and for other purposes. The Act addresses various matters including prohibited burning times, enabling Local Government to require owners/occupiers of land to plough or clear firebreaks, the control and extinguishment of bush fires and the establishment and maintenance of Bush Fire Brigades.

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

The provisions of the Bush Fire Act can be enforced, in addition to this Fire Management Plan.

4.2 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 in the preparation of all statutory and non-statutory planning documents, specifically town planning schemes and amendments, and local planning strategies; and
- through the use of these planning instruments, to minimise the adverse impacts of natural disasters on communities, the economy and the environment.

The Policy incorporates by reference the provisions and requirements contained in Planning for Bush Fire Protection edition 2 (WAPC et.al. 2010) to determine those areas that are most vulnerable to bush fire and where development is appropriate and not appropriate.

4.3 Planning for Bush Fire Protection Guidelines (2010)

This policy document was prepared by the Fire and Emergency Services Authority of Western Australia (FESA), the Western Australian Planning Commission (WAPC) and the Department of Planning. The document forms 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 bush fire risk for new subdivisions and development. It addresses management issues including development location, vehicular access , water, design and siting of development.

5. Building Survival in Bushfires

The factors that affect building survival in a bushfire include :

- 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 - probability 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.

The likelihood of loss of a building is highly dependent on the vulnerability a building has to the mechanisms of bushfire attack (Leonard 2009). Buildings constructed to the Australian Standard (AS 3959) are not guaranteed to survive a bushfire event. This is substantially due to the degree of vegetation management, the unpredictable nature and behaviour of fire, and extreme weather conditions (Standards Australia 2009).

6. Bushfire Related Fatalities

The final report from the Victorian Bushfires Royal Commission (VBRC) into the Black Saturday bushfires handed down on July 31, 2010 provided the most comprehensive evidence ever assembled about the circumstances surrounding fatalities in an Australian bushfire. Where people died on Black Saturday contrasts strikingly with studies from previous bushfire fatalities (VBRC 2010). Historically about 32% of people have died in late evacuations (Risk Frontiers et al. 2008), however on Black Saturday the majority of people (113 out of 173) died inside or close to structures. The severity of the fire on Black Saturday was such that the only way to ensure ones safety was to leave early, well before any fire arrived. When the Fire Danger rating is “Catastrophic” most buildings are undefendable.

A significant amount of research on bushfires prior to the Victorian Bushfires on february 9, 2009 (Black Saturday) suggests that people are also likely to be killed by radiant heat or a vehicle accident when evacuating late from a bushfire. The research shows that well-prepared houses (and buildings) can be successfully defended from most bushfires and can provide safe refuge for people during the main passage of the fire front (McArthur and Cheney, 1967; Miller et al, 1984; Wilson and Ferguson, 1984; Lazarus and Elley, 1984; Leonard and McArthur, 1999; Leonard, 2003; Handmer and Tibbits, 2005; Blanchi and Leonard, 2008).

An investigation by Krusel and Petris (1999) which examined the civilian deaths in the Ash Wednesday bushfires in Victoria in 1983 identified that the majority of victims died during a late evacuation as the fire front arrived or because they were incapable of implementing a safe strategy due to inadequate warning, age or infirmity. Vulnerable people in the community are overly represented in bushfire fatality statistics, 44% of the people who died on Black Saturday were considered to be potentially vulnerable to bushfire because of age, ill health or a combination of both (VBRC 2010).

Bushfires generate enormous amounts of radiant heat. Most people die in bushfires from exposure to radiant heat. Protection from radiant heat is essential if caught in a bushfire. Wearing long sleeved natural fibre clothing, and having solid barriers between people and the fire (ie. source of radiant heat) provides the best protection. Bushfires also generate enormous amounts of smoke and wind, these factors combine with the fire usually causing many trees to come down. Emergency vehicles are also using the roads. These circumstances make driving on roads near bushfires extremely hazardous.

7. Description of the Area

Tamala Park is located in the north-west corridor of the Perth Metropolitian Region in the City of Wanneroo. It is approximately 35 kilometres north of the Perth Central Business District.

Development of the surrounding area dates primarily from the early 1990s. Rapid growth took place from 1991, a result of new dwellings being added to the area. Growth was aided by the extension of the railway line in 2004.

Major features of the area include Ocean Keys Shopping Centre, Anthony Waring Park, Richard Aldersea Park, Walyunga Park and a number of schools. (http://profile.id.com.au/Default.aspx?id=137&pg=101&gid=150&type=enum).

There has been substantial population growth in the City of Wanneroo in recent decades, which is directly related to the expansion of the northern and north-western suburbs of Perth, incorporating many of the southern parts of the City into the contiguous urban area of Perth.

7.1 Description of the Subject Land

Tamala Park is part of Lot 9504 Marmion Avenue, Tamala Park. The site has intact native vegetation of high conservation value in the western half bordering Marmion Avenue. Large areas of intact native vegetation (heath shrublands and acacia scrub) also extend to the south. More centrally and to the north and east large areas have degraded vegetation.

The Fire Management Plan focusses on the subject land (Appendix C). In summary this land:

- has undulating slopes of 1-3 degrees across the site.
- has predominantly shrub and scrub structured vegetation in the western section of the site and areas of degraded grasslands with some remnant heath.
- fronts the formed and sealed Marmion Avenue and Neerabup Road.
- is currently unused except for occasional four wheel driving and illegal rubbish dumping.
- has very high conservation values in the proposed biodiversity conservation area.

7.2 Fire Climate

Weather conditions significantly affect the behaviour of bushfires. Bushfires burn more aggressively when high temperatures combine with low humidity and strong winds. Virtually all house losses occur during severe, extreme or catastrophic (ie when the Fire Danger Indices are over 50) conditions (Blanchi et al. 2010). Statistics from the Bureau of Meteorology weather station at Swanbourne (27.5 kilometres south of Tamala Park) indicates the area experiences warm dry summers, cool wet winters (Figure 1), it is classified as a Mediterranean climate. Maximum and minimum temperatures vary from 30 degrees Celsius in January and February to 18 degrees Celsius in July. This combination of hot dry summers and cool wet winters (Figure 1) is classified as a Mediterranean climate.

The Bureau of Meteorology website (www.bom.gov.au/weather/wa/sevwx/perth/bushfires.shtml) 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% of extreme fire weather days (events) compared to less than 5% associated with southerly winds. About 15% of Perth events occurred in a westerly flow following the passage of a trough. This number increases inland from the west coast where the westerly or north-westerly winds can be strong and gusty while temperatures initially remain high with the trough change.

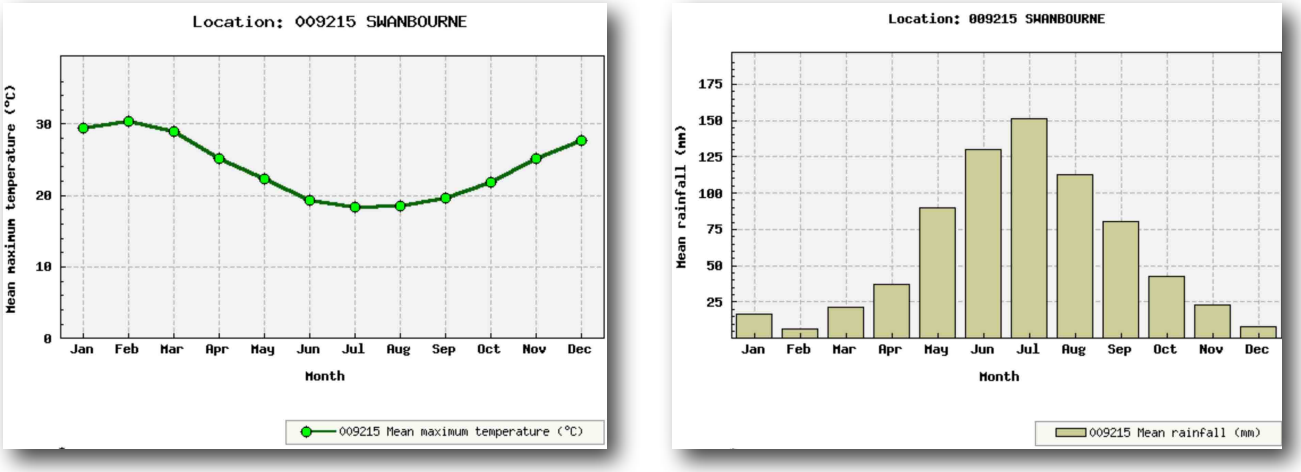

Figure 1 : Mean maximum recorded temperatures and mean rainfall for Swanbourne Bureau of Meteorology Station between 1993 and 2011.

The site is 1.5 kilometers from the coast and it is influenced by land and sea breezes. These are created by the daily heating and cooling of the land surface adjacent to the ocean. The sea breeze occurs when the air over the land heats up and becomes more buoyant and rises, denser moist air over the ocean then flows inland. Sea breezes can strengthen prevailing wind, reduce it or even reverse it, depending on the strength and direction of the two airstreams (Cheney and Sullivan 2008).

The land breeze is the opposite and occurs when the land cools and air flows from the land towards the ocean to replace the rising warmer air. It is generally less turbulent than the sea breeze. The predominant winds in the summer months at 3pm at Swanbourne are south-westerlies (Figure 2). In terms of strength, the most common wind strength is between 20-30 km/hr and occurs approximately 50% of the time. Winds between 30 - 40 km/hr occur 20% of the time from the south-west.

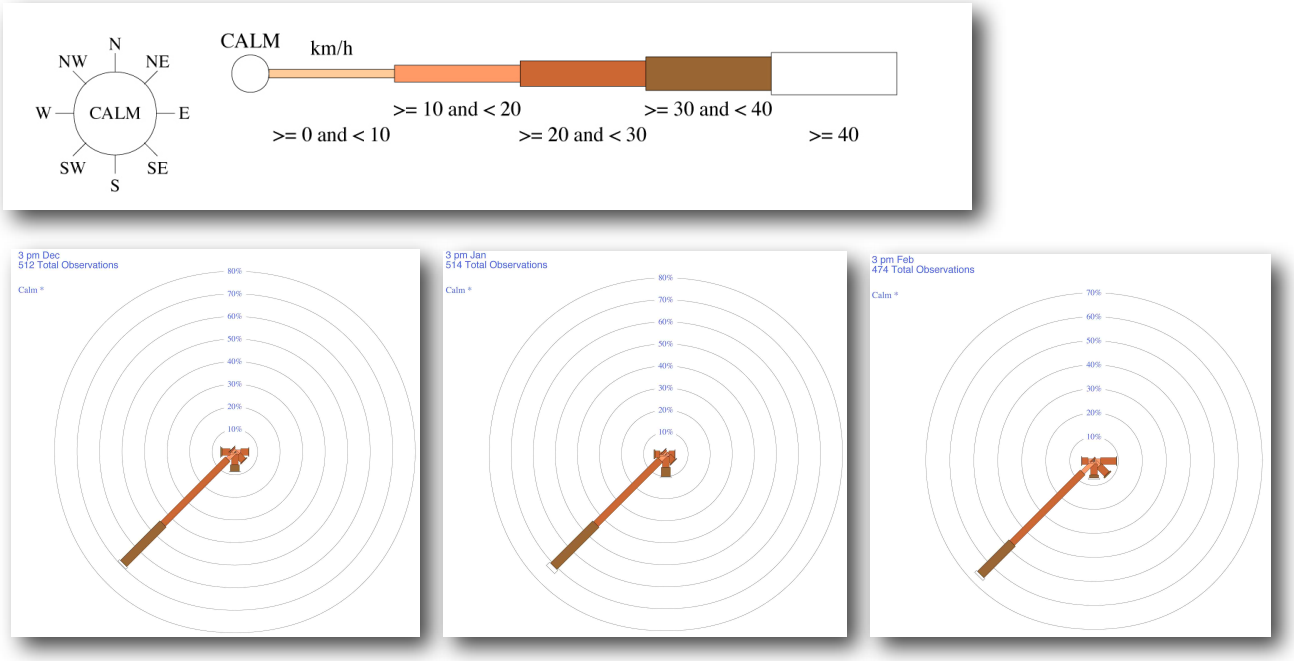

Figure 2: Rose of wind direction and wind speed in km/hr for December, January and February between 1993 - 2010 at Swanbourne Bureau of Meteorology Station.

Interpreting Figure 2 - Wind speed Vs Direction Plot

Wind roses summarise 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 10km/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).

7.3 Bushfire Fuels

The western half of the study site is dominated by remnant heath vegetation with species between 1 - 3 metres in height. In the west facing gully a taller scrub vegetation occurs with occasional mallee eucalypt trees. The eastern half of the study site has been significantly disturbed with large open areas of grassland and herbfields. Open heath also occurs in isolated areas.

West of Marmion Avenue and south of the study site intact scrub and heath vegetation occurs. The trend of highly disturbed and modified vegetation occurs east of the study site. Bushfire fuel loads are highest where vegetation remains intact, disturbed vegetation generally has a grass fuel load which would burn very differently to the heath and scrub vegetation.

7.4 Assets

The site when fully developed will contain 274 lots, 271 of which are residential. There will be three areas of public open space and a 6.298 hectare biodiversity conservation area. Assets most likely threatened will be the developed lots within 100 metres of remnant vegetation on the western, southern and eastern boundary. Residential lots on the western side of Marmion Avenue in Mindarie have smaller setback distances from the heath vegetation than the proposed development and will also be exposed to bushfire attack.

All development on the perimeter, bordering remnant vegetation is vulnerable. In extreme fire weather conditions, bushfires can impact deep into urban environments. Ember attack has been responsible for house losses over 500 metres from a bushfire front.

The high quality vegetation in the Biodiversity Conservation Area provides important habitat for Carnaby Black-Cockatoos. A level 2 flora, vegetation and graceful sun moth survey of the Tamala Park Development area by Syrinx Environmental in 2010 concluded that the most diverse vegetation communities in the best condition are located adjacent to Marmion Avenue (western end of the site). The Biodiversity Conservation Area will protect eight populations of Fabronia hampeana and the Sarcozona bicarinata population as well as the majority of vegetation communities on site.

A high intensity uncontrolled bushfire in surrounding vegetation could threaten properties, lives and the natural values of the area.

7.5 Access

The proposed subdivision will be well serviced with two major public road access points. All public roads within the site are sealed and provide appropriate access and egress. Bordering the northern boundary is Neerabup Road and Marmion Avenue is on the western side of the site.

7.6 Water Supply

Reticulated water will be provided to the entire development. Fire hydrants will be spaced to Water Corporation standards and provide fire agencies access to an adequate water supply for fire suppression purposes.

8. Fire Problem

8.1 Bushfire History

A recent study has concluded that bushfires may have been in the Australian Landscape for 50 million years longer than previously thought. The adaption of eucalypts that allows them to recover from bushfires has been traced back more than 60 million years (Crisp et. al. 2011), indicating fire has been in the Australian landscape since that time. Documented evidence exists of frequent fires in the south west of Western Australia for the past 2.5 million years (Hassel and Dodson 2003).

Bushfires are common in the City of Wanneroo, in the 2009/10 financial year, the volunteer fire brigades attended to132 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.

Forests and woodlands surrounded by urban areas 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.

8.2 Bushfire Hazard Assessment

The assessment of bushfire hazard at the strategic level takes into account the predominant vegetation class on the site and surrounding area for 100 metres minimum.

Vegetation type and class

The vegetation class map for the site and surrounding area for a minimum of 100 metres is found in Appendix D. The western portion of the site and southern boundary is dominated by relatively intact vegetation. The height, species composition and structure of this vegetation is predominantly open heath. There is a diversity of species including banksia, acacia, grevillea and xanthorrhoea. The average heights of the vegetation varies between 50cm up to 2.5 metres. The height of the foliage decreases the higher up the limestone ridges the vegetation grows. Some smaller areas of closed heath also occurs. In the west facing valley in the biodiversity conservation zone, closed scrub is dominant where a monoculture of multi stemmed acacia species exist. An open scrub vegetation layer occurs in one area with a distinct open heath understorey.

Centrally located near the southern boundary of the site is an open banksia woodland with an open heath understorey. The north-east half of the site is predominantly a disturbed grassland or herbfield with pockets of open heath, some of which is dominated by Xanthorrhoea sp. West of Marmion Avenue and south of the site is more intact heath and scrub vegetation.

North of Neerabup Road is the Ocean Keys District Centre and adjoining undeveloped light industrial areas. To the immediate east of the study site is degraded land dominated by introduced grasses and weeds.

Slope

The development site has undulating land ranging in elevation from 40 - 47 metres above sea level. Most slopes are in the range of 1 - 3 degrees. The highest areas are low limestone ridges, they are in the west of the site with the land then generally sloping down to the east.

The Bushfire Hazard Assessment Levels

The vegetation class map (Appendices D) outlines the dominant vegetation types on the study site and surrounding area for a minimum of 100 metres. The bushfire hazard assessment levels were determined using “Appendix 1” in Planning for Bushfire Protection (PBP) - guidelines (2010) . The study site and surrounding area has bushfire hazard ratings of low, moderate and extreme (Appendix E).

Existing areas of grassland and herbfields are all a moderate bushfire hazard. Grasses can grow quickly and then cure rapidly becoming available fuel for a bushfire earlier in the season compared to native vegetation. These areas appeared to be generally degraded and are exposed to weed invasion and thereby increasing fire hazard.

All scrub and shrub (heath) vegetation is classified as extreme bushfire hazard. The vegetation types vary in fuel loads and structure but each would provide sufficient fuels to easily carry a bushfire during the fire season.

The following representative photos provide a picture of fuel quantity and structure in the different vegetation units and these are related to bushfire hazard ratings as follows

Medium Bushfire Hazard Level

Figure 3 : Grassland and herbfields are highly degraded and are a moderate bushfire hazard.

Extreme Bushfire Hazard Levels

a) Open heath with a variety of species, heights and fuel structure.

b) Closed Scrub with consistent fuel structure.

c) Closed Heath with extensive foliage cover.

d) Open scrub with open heath understorey.

e) Open banksia woodland with open heath

f) Xanthorrhoea open scrub.

Figure 4(a-f) : Examples of Extreme Bushfire Hazard Vegetation

9. Fire Mitigation Strategies

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

1. Development Location
2. Vehicular Access
3. Water
4. Siting of development
5. Design of development

Acceptable solutions are provided for four out of the five management issues and each illustrates one example of satisfactorily meeting the corresponding performance criteria. A performance based approach is provided for one management issue.

9.1 Element : Development Location

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 moderate and extreme on the development site, the most vulnerable dwellings will be those located on the perimeter of the residential area adjacent to bushfire hazard. As vegetation is cleared and bulk earthworks occur on the development, the level of immediate risk will be significantly reduced.

External to the development site, significant extreme hazard exists to the south and east. However the subdivision design of external perimeter roads provides the required setback distance to ensure dwellings will not be required to be constructed to BAL-40 or BAL-FZ levels. Bulk earthworks are initially being implemented over stages 1-4 during the staged construction, this will provide a sufficient setback distance to ensure predicted radiant heat flux levels are maintained below 29 kW/m^2. Construction standards of dwellings will be increased to match the level of adjacent bushfire hazard risk consistent with the Australian Standard (AS3959-2009) and do not require to be constructed to BAL-40 or BAL-FZ levels. The construction stages 1-6 are outlined in Appendix F.

9.2 Element : Vehicular Access

Intent

To ensure that the vehicular access serving a subdivision development is safe in the event of a bush fire occurring.

Acceptable Solutions

The performance criteria is : The internal layout, design and construction of private vehicular access in the subdivision/ development allows emergency and other vehicles to move through it easily and safely at all times.

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

Acceptable Solution : Two access routes

Stage 1 of the development will incorporate the public road access onto Nerrabup Road and prior to the clearance of any titles, the access way onto Marmion Avenue will be constructed to Emergency Access Way standards. During Stage 2 of the development, this Emergency Access Way will be upgraded to public road standard. The subdivision will have two public access ways available for residents and emergency services at all times (Appendix G).

Acceptable Solution : Public Roads

A substantial number of public roads will be developed for the public to access their residences and drive throughout the subdivision (Appendix G). All main access and collector public roads will comply with the following minimum standards :

- 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
- Curves minimum inner radius : 12 metres

Every lot has access to a 6 metre wide public road except for 2 five metre wide laneways that each access 6 lots. These laneways are 70 metres each in length and located centrally in the subdivision. Where 8 or less lots are being serviced, a public road with a minimum of 4 metres for a maximum distance of 90 metres may be provided (WAPC 2010).

The subdivision design does include a number of additional 5 metre wide laneways that run behind single lots providing additional access to the rear.

Acceptable Solution : Emergency Access Ways

A temporary emergency access way will be provided to link the subdivision to Marmion Avenue until this is fully developed into a public road during the construction of stage 2.

The temporary emergency access way must meet the following minimum standards :

- 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
- Curves minimum inner radius : 12 metres
- Signposted

Acceptable Solution : Fire Service Access Routes

There is a requirement for a temporary fire service access route on the eastern side of stage 5 of the development. This will provide emergency services access along the eastern perimeter of the subdivision (Appendix G). This will link in with existing public roads and allow fire service access around the perimeter of the entire subdivision. When further development occurs east of the existing site, the temporary fire service access route will not be required. This is the only fire service access route required and it will meet the following standards :

- Surface : all weather
- Dead End : not permitted
- Minimum trafficable surface : 6 metres
- Horizontal clearance : 6 metres
- Vertical clearance : 4 metres
- Maximum grades : 1 in 7
- Maximum grades over < 50 metres : 1 in 4
- Maximum average grade : 1 in 5
- Minimum weight capacity : 15 tonnes
- Maximum crossfall : 1 in 33
- Curves minimum inner radius : 12 metres
- Turn around areas located every 500 metres (standards in Appendix H)
- Temporary erosion control measures and maintenance arrangements until development occurs to the east.
- Accesses the public road network every 500 metres.
- Allows for two way traffic
- Signposted

Acceptable Solutions : Gates

The temporary fire service access way requires gates to restrict traffic at all intersections with public roads. The standard of gates is :

- Minimum width : 3.6 metres
- Design and Construction : to be approved by the City of Wanneroo
- May be locked, but only with a common key made available to emergency services and local government.
- Signposted

Acceptable Solutions : Signs

Acceptable Solutions : Signs

Signs must be erected where the fire service access route adjoins the public road and must meet the following requirements:

- Minimum height above ground : 0.9 metres
- Design and construction : to be approved by the relevant local government
- Lettering height : 100 millimetres
- To display the following wording : “Fire Service Access - No Public Access”

9.3 Element : Water

Intent

To ensure that water is available to the development to enable life and property to be defended from bush fire.

Acceptable Solution

The development is provided with a reticulated water supply, together with fire hydrants, in accordance with the specifications of the Water Corporation and FESA. The ‘Water Corporation’s No. 63 Water Reticulation Standard‘ is deemed to be the baseline criteria for developments and should be applied.

Fire services require ready access to an adequate water supply during fire emergencies. Water supplies have to be easily accessible and located at regular intervals. Fire hydrant location and identification markings are found in Appendix M.

9.4 Element : Siting of Development

Intent

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

Performance Solution

The largest residential lot is 656m^2 in size, hence lots sizes do not allow for a complete 20 metre building protection zone to be located within individual lot boundaries. In these circumstances the entire lot must be managed to building protection zone standards. All residential lots where adjacent to one another will provide an overlapping building protection zone that covers most of the development. This will help stop radiant heat and flames from a bushfire front pushing deep into the middle of the development. The stage 1 of the development (Appendix C) will have further residential development bordering it immediately to the east and south as detailed in the Tamala Park Local Structure Plan and outlined in diagrams in Appendix A & B. These adjoining areas are zoned urban.

The type and management of vegetation in areas of public open space throughout the development must be managed to building protection zone standards. This is to ensure that dwellings facing the Biodiversity Conservation Area have sufficient setback distance to achieve a bushfire attack level of BAL-12.5. It also ensures dwellings located adjacent to areas of public open space should not come under bushfire attack due to high fuel loads in those spaces. Bushfires cannot burn in areas designed and maintained to building protection zone standards.

Construction standards of homes must be compliant with the Australian Standard AS3959. This requires an assessment on all homes within 100 metres of the Biodiversity Conservation Area. On the north side of the development which borders Neerabup road there is no classified vegetation within 100 metres (Appendix D). Dwellings on the eastern and southern perimeter of the development will have public roads or a fire service access route between them and development and setback distances (ie building protection and hazard separation zones) maintained during construction stages and until bordering residential development occurs to minimise the hazard. The zone of homes that require AS3959 assessment is outlined in Appendix I.

9.4.1 Dwelling locations and predicted Bushfire Attack Level

The Australian Standard 'Construction of buildings in bushfire-prone areas (AS 3959-2009)' has six categories of Bushfire Attack Level, namely BAL-LOW, BAL-12.5, BAL19, BAL-29, BAL-40 and BAL-FZ. 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 Bushfire Attack Level (BAL) examples were determined using the methodology in Appendix A in the Australian Standard (AS 3959-2009) Construction of Buildings in Bushfire-prone Areas. The Appendix A methodology is also outlined in Planning for Bush Fire Protection. Six representative sites were chosen around the perimeter of the development (Appendix J). The sites were selected to provide BAL examples of the most exposed dwellings. It can be concluded from these examples that all other dwellings are exposed to a predicted radiant heat flux will be BAL-12.5 or less (Appendix J).

The criteria to determine the BAL is outlined in Appendix J and is as follows:

Designated Fire Danger Index	:	80
Flame Temperature	:	1090 K
Slope	:	Various (See Table 1)
Vegetation Type	:	Open and closed heath and scrub
Vegetation Classification	:	Scrub and Shrubland vegetation
Building setback distance	:	Various (See Table 1)

LOT Number	Vegetation Class.	Setback Distance (minimum)	Effective Slope under vegetation	Maximum BAL
128	Scrub	Setback on lot 6m Road reserve - 18m POS = 7 m Total = 31 metres	Downslope 3 degrees	BAL-12.5
127	Shrubland	Setback on lot 6m Road reserve - 18m POS = 6 m Total = 30 metres	Downslope 3 degrees	BAL-12.5

Table 1 : Bushfire Attack Level (BAL) Assessments for the two most exposed proposed dwellings

The assessment of the two most exposed dwellings to bushfire hazard (vegetation type and slope) results in both proposed dwellings being exposed to BAL-12.5 or ember attack (Table 1).

Vegetation clearing and bulk earthworks will initially be carried out over stages 1-4 of the development (Appendix K). This will immediately exceed Building Protection Zone (BPZ) standards for much of the development over a large area. It will ensure during construction stages that dwellings on the eastern perimeter are separated from vegetation. In addition to the bulk earthworks a 100 metre cleared buffer will be installed on the southern and eastern boundary of the development. This setback distance between dwellings and vegetation immediately ensures the Bushfire Attack Level is BAL-LOW for all dwellings.

The building protection zone around the perimeter of the subdivision will include the public road reserves. On the western perimeter it also includes the public open space (and drainage) reserve which will provide a minimum 30 metre setback between vegetation and proposed dwellings.

A building protection zone of 100 metres and temporary fire service access route must be constructed along the eastern boundary to have an adequate setback distance between dwellings and the vegetation. Where public roads exist the additional clearing required varies depending on the width of the road reserve. A 12 metre road reserve borders the northern perimeter of the subdivision. Revegetation within the Neerabup Road reserve must also comply with building protection standards.

A summary of maximum BAL ratings on the perimeter of the development is outlined in Table 2. The minimum vegetation management zones surrounding the development are outlined in Appendix L.

Side of Development	Minimum Setback Distance	Highest vegetation class and average maximum slope	Maximum BAL Rating
North	100 metres +	Road reserves and light industrial	BAL-LOW
East	100 metres +	Shrubland and 2 degrees upslope	BAL-LOW
South	100 metres +	Scrub and Shrubland	BAL-LOW
West	30 metres (Shrubland) 31 metres (Scrub)	Shrubland & Scrub	both BAL-12.5

Table 2 : BAL assessment summary for the four separate sides of the development.

The building protection zones (BPZ) will meet the following standards :

- Width: to all lot boundaries on all lots. Houses on the perimeter of the development will have a building protection zone that includes road reserves and public open space. Additional vegetation clearance is required on the eastern and southern perimeter to ensure there is no vegetation within 100 metres of dwellings. Vegetation clearing to BPZ standards is required in this 100 metre zone on the eastern ands southern boundary (Dimensions outlined in Appendix L) as well as during all construction stages.
- Location: within the boundaries of the lot on which the building is located or overlapping with the BPZ on adjoining lots.
- Fuel load: reduced to and maintained at 2 tonnes per hectare.
- All tree 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 with non combustible materials.
- All shrubs to contain no dead material within the plant.
- No tall shrubs are to be in clumps within 3 metres of the building.
- No trees are to contain dead material in the crown or on the bole.

By achieving these standards, it will be possible to construct buildings to the appropriate construction standard (ie. BAL-12.5) under the Australian Standard (AS 3959-2009) Construction of buildings in bushfire-prone areas. A site specific assessment however is required to accurately determine the BAL once plans for dwellings are available and vegetation has been removed and areas of public open space landscaped.

Because construction standards will apply for all buildings under AS 3959-2009, the requirement for a hazard separation zone (HSZ) to minimum width of 80 metres from all buildings and their building protection zones can be removed. The lot sizes will also not allow a HSZ of any size to fit within the lot boundaries.

9.4.2 Landscaping considerations

Bushfires can impact deep into urban environments. Landscaping can both assist in the survival of the building and be a determining measure in its destruction. Landscaping can protect homes by forming a barrier or deflector for windborne debris and radiant heat. It can also bring the fire directly to the building and therefore a degree of care in the selection and location of landscaping needs to be exercised.

All plants will burn under the right conditions and plants do not achieve a “fire resistance level” in accordance with the BCA (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 breaking the vegetation from the building. A pathway around the building may be one way of achieving this requirement. The landscaping can then be provided further out from the building.

Bark chips and combustible mulch near a building is not favoured and is a particular problem when the windows have low sill heights. The flames can have a direct connection with the glass which was identified as a major issue during the Canberra bushfires of 2003 where over 500 homes were destroyed.

Work from Ramsay and Rudolf (2006) has identified fourteen (14) major plant attributes that assists people in determining suitable plant species for gardens surrounding homes (ie. building protection zones). A brief discussion on each follows :

a) Moisture content of leaves

The presence of water in fuel retards combustion, enhances smoke formation and has a slight cooling effect as heat is used to evaporate water. The rate of combustion is significantly reduced by increased moisture content.

Most Australian trees and shrubs have low moisture contents of between 80% and 150% of oven-dried weight. By comparison, exotic deciduous trees have a high water content of between 250% and 400% of oven-dried weight. Introduced evergreen hardwoods and conifers fall between these two extremes. The introduced species will most likely be lost in the fire but their higher moister content means they are less likely to contribute to the fire.

b) Volatile oil content of leaves

Oils are readily volatile. They promote flaming in the early stages and encourage combustion particularly when leaves are green.

c) Mineral content of leaves

The higher the level of total minerals present in leaves the lower the flammability.

d) Leaf fineness

A narrow leaf has a greater area to volume ratio than a broad leaf and will therefore be more easily ignited and burn more intensely.

e) Density of Foliage

Dense foliage will tend to filter out wind-blown embers, block radiation and flame and reduce or deflect wind forces. Combustion is increased when fuel is scattered and ample supplies of oxygen can reach the flame zone.

f) Continuity of Plant form

A broken form of plant is one, which has large spaces between separate branches or concentrations of foliage. The greater the separation between branches and/or concentrations of foliage, the less likely is the spread of fire by radiation and flame.

g) Height of lowest foliage

The characteristic of some trees and shrubs to have foliage near the ground makes it easier for the transfer of heat and flame from the ground level up into the foliage. This characteristic of plants can be modified by pruning lower branches, but this reduces the ability for the plant to act as a wind break.

h) Size of plant.

The protection provided by a plant depends on how its shape relates to the shape of the building or opening its designed to protect. Generally a tall-narrow tree is not as good a barrier as a wide spreading tree, even though both may be large in volume. The greater the volume of a plant, the larger the amount of embers, radiation and flame it can produce, provided other attributes favour their production.

i) Dead foliage on plants

Dead leaves and twigs still attached or suspended in a plant increase embers, radiation and flame. Many deciduous trees, eucalypts and other natives shed the dead lower limbs naturally. Conifers, however are less self-pruning than natives.

j) Bark texture.

Loose flaky, stringy, papery or ribbon-like bark provides a path for fire to spread up into foliage which contributes to flame generation, radiation and ember attack.

k) Quantity of ground fuel available in fire season.

In most forest or grassland fuel types, the rate of spread of ground fire increases directly proportional to the quantity of fine fuel available. Only fuel which is present during a fire season needs to be considered. The aim is to maintain levels less than 2 tonnes per hectare in the Building Protection Zone. Many Australian natives species drop fuel throughout the year and the process is accelerated in the summer when under heat and drought conditions.

l) Particle size of ground fuel

The finer the fuel the greater the spread of ignition and the rate of spread of fire. Coarse material is not readily ignited unless fine fuels are present.

m) Compactability of ground fuel

The placement of individual pieces of fuel in relation to one another influences heat transfer and thus the rate of spread.

n) Mineral content of ground fuel

The greater the mineral content the lower the flammability of leaves in ground litter. Once the leaves become ground fuel the moisture and volatile oils dry out sufficiently to be not relevant.

Ramsay and Rudolph (2006) summarises the effects of plant attributes in table 3 and some useful diagrams are outlined in Figure 5 concerning vegetation management techniques to maintain low fuel hazards.

Plant attribute	Degree of attribute	Performance characteristic		
		Flammability	Provision of ground fuel	Barrier forming ability
Moisture content of leaves	High Low	Decrease Increase	*	Negligible
Volatile oil content of leaves	High Low	Increase Decrease	*	Negligible
Mineral content of leaves	High Low	Decrease Increase	*	Negligible
Leaf fineness	Broad Narrow	Decrease Increase	*	Increase Decrease
Density of foliage	Closely spaced Sparse	Increase Decrease	*	Increase Decrease
Continuity of plant form	Connected Broken	Increase Decrease	*	Increase Decrease
Height of lowest foliage above ground	High Low	Decrease Increase	*	Decrease Increase
Size of plant (Volume)	Large Small	Increase Decrease	*	Increase Decrease
Size of plant (Spread)	Wide Narrow	Increase Decrease	*	Increase Decrease
Dead Foliage on plant	Heavy Light	Increase Decrease	*	Negligible
Bark texture	Loose Tight	Increase Decrease	*	Negligible
Quantity of ground fuel available in fire season	Heavy Light	Increase Decrease	Increase Decrease	Negligible
Fineness of ground fuel	Fine Coarse	Increase Decrease	Increase Decrease	Negligible
Compactability of ground fuel	Packed close Packed loose	Decrease Increase	Decrease Increase	Negligible
Mineral content of ground fuel	High Low	Decrease Increase	Decrease Increase	Negligible

Table 3: Plant attributes that effect the performance of plants in bushfires.

To provide an overall assessment for a particular species, its a matter of assessing as many positives as possible. This way of presenting the information allows the general public to assess any species without the need to be a Botanist. The scheme provides an important basis for decisions to be made with regard to managing vegetation on a site.

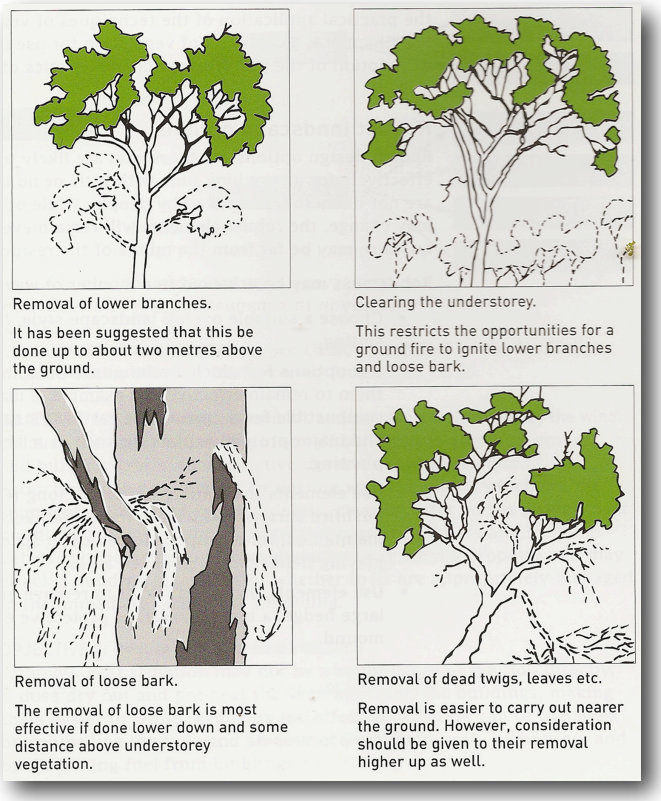

Figure 5: Vegetation management techniques to create and maintain low fuel hazards (Ramsay & Rudolf 2006)

9.5 Design of Development

Performance Criteria

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

Acceptable Solution 5

All development on-site will comply with the performance criteria or acceptable solutions 1 - 4 in the "Planning for Bushfire Protection guidelines. All buildings to be developed must comply with AS 3959-2009 Construction of buildings in bushfire-prone areas. The predicted highest BAL level for all proposed dwellings is BAL-19.

9.6 Public Eduction and Community Awareness

Community Bushfire Safety is a shared responsibility between individuals, the community, government and fire agencies. The Fire and Emergency Services Authority of Western Australia (FESA) have an extensive Community Bushfire Education Program including a range of publications, a website and Bushfire Ready Groups. The Prepare, Act, Survive 30 page booklet 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'.

The City of Wanneroo, their website and local bushfire brigades provide bushfire safety advise to residents. The website provides links to the downloadable brochure Protect Your home and Property from Bushfires. (found at: http://www.wanneroo.wa.gov.au/Residents/Fire_Services) and also provides details on how to become a volunteer at your local Bush Fire brigade. Research into the devastating bushfires on the Eyre Peninsula in South Australia confirmed residents were much more likely to make good decisions if they were current or past members of the local bushfire brigade. Invaluable experience can be gained by being a member of the local bushfire brigade.

Professional consultants also offer bushfire safety advise and relevant services to residents and the University of Western Australia is currently running (in spring 2011) a full day workshop for residents to assist them to develop their household Bushfire Survival Plans. This program may run annually.

9.7 Community Fire Refuges and Fire Safer Areas

There are no designated Community Fire Refuges in the City of Wanneroo. However, the selection of an evacuation centre can be made at the time of the emergency by the relevant authorities, this is then advised to residents by FESA, the Shire and Police.

A predetermined centre cannot be nominated because there are no purpose built structures (such as bunkers) designed to withstand the impacts of a bushfire. Therefore 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. This obviously requires evacuating to a destination away from the fire that is not in a bushfire prone area. Where to go is an important element in people 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 that will be safe to travel to before a bushfire impacts.

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 large areas within the City of Wanneroo 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. There is no official criteria in Western Australia yet to determine these areas. In the absence of criteria to guide this process the following general advice from FESA will assist residents to determine where to go as a last resort when their their household bushfire survival plans have failed: As a last resort, a safer place is a local open space or building where people may go to seek shelter from a bushfire (FESA 2010). Larger urban areas or urban parks or shopping centres more than 300 metres from native vegetation could provide a safe place to shelter from life threatening radiant heat.

10. Conclusion

This plan provides acceptable solutions that fulfill 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 planning and building controls outlined in this plan will reduce the risk of bushfire to people and property, it will not remove the risk. How people interpret the risk, prepare and maintain their property and buildings and what decisions and actions they take (ie. evacuate early or stay and defend or other) greatly influences their personal safety during a bushfire. Individual land holders need to be self reliant, and not expect warnings or assistance from emergency services.

10.1 Compliance checklist for performance criteria and acceptable solutions

Element 1: Location

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

Element 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 there are only two short laneways (70m each in length) that service 6 lots each. The proposed dwellings on the two short laneways are beyond 100 metres from any native vegetation hence do not need to comply with AS3959 (ie they do not warrant any bushfire construction standards). All other 5 metre wide laneways provide additional access to lots that also front standard compliant public roads. These additional laneways provide access to the rear of lots that would not normally be provided.

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

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

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

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

Does the proposal comply with the performance criteria by applying acceptable solution A2.7 ?
YES - The temporary Fire Service Access route will comply on the eastern perimeter of development until further development to the east occurs.

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

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

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

Element 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 ?
N/A

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

N/A

Element 4: Siting of Development

Does the proposal comply with the performance criteria by applying acceptable solution A4.1 ?
No - However the proposal does satisfactorily comply with performance criterion P1 because the Hazard Separation Zone is not necessary and the building construction standards (under AS3959) will be increased to BAL-12.5 to exposed dwellings that are a minimum of 30 metres from the hazard. The building protection zone is a minimum of 30 metres in width and an 18 metre wide public road reserve is incorporated for residents and emergency vehicles. Construction standards required are a maximum of BAL-12.5. Three sides of the development are sited over 100 metres from bushfire hazard meaning increased construction standards are not required.

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

YES

Does the proposal comply with the performance criteria by applying acceptable solution A4.3 ?
NO - Lots sizes are to small for BPZ to be contained within the lot boundaries however the proposal does satisfactorily comply with performance criterion P4. Building Protection Zones (BPZ) will overlap with neighbouring BPZ zones on adjoining properties. The BPZ is also a minimum of 30 metres wide on the western perimeter and is 100 metres wide east and south of the development. There is low threat vegetation north of the devlopment. Construction standards will be increased to the appropriate BAL assessment for exposed dwellings.

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 the Hazard Separation Zone is removed and the building construction standards will be increased to the exposed dwellings to comply with AS3959-2009 to offset the reduced Hazard Separation Zone. Construction standards will achieve a maximum of BAL-12.5. Three sides of the development are sited over 100 metres from bushfire hazard meaning increased construction standards are not required.

Does the proposal comply with the performance criteria by applying acceptable solution A4.5 ?
N/A - Shielding not applicable.

Element 5: Design of Development

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

11. Implementation of Fire Management Plan

11.1 Developers Responsibilities

To maintain a reduced level of risk from bushfire, the developers responsibilities are to:

- Landscape the public open space areas to building protection zone standards and consider the criteria in 9.4.2 Landscaping Considerations.
- Establish and maintain a minimum 100 metre setback distance between dwellings and the bushfire hazard north, east and south of the development during all construction stages by vegetation clearing to Building Protection Zone standards.
- Prior to house occupation establish two access routes into and out of the subdivision.
- Construct public roads, emergency access ways, fire service access routes, gates and signs to minimum standards set out in Section 9.2.
- Install reticulated water supply and hydrants to Water Corporation, FESA and City of Wanneroo standards.
- All internal roads are to comply with the design requirements of this plan and the City of Wanneroo.
- All purchasers/new property owners are to be advised of the location of any hydrant that is positioned on their Lot or verge and the requirement for the hydrant to remain unobstructed at all times;
- Developer is to notify any landscaping contractor's, under direction of the developer, of relevant hydrant locations and the requirement to ensure the hydrant is not obstructed, covered over or damaged;
- The developer is required to lodge a Section 70A Notification on each Certificate of Title exposed to AS3959 construction standards, proposed by this subdivision. The notification shall alert purchasers and successors in title to these exposed lots the responsibilities of the Fire Management Plan and bush fire building construction requirements;
- All vacant land is to comply with the City of Wanneroo Fire Control Notice as published,
- 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 Fire Break Notice to each lot owner subject to AS3959 construction standards.

11.2 Property Owners Responsibilities

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

- Maintain the property in good order to minimize potential bushfire fuels to mitigate the risk of fire on the property;
- Comply with the City of Wanneroo annual Firebreak notice.
- Ensure that vacant Lots comply with the City of Wanneroo Fire Control Notice;
- Ensure construction of dwellings is in accordance with AS 3959.
- Establish and Maintain Building Protection Zones at the Property owner/occupiers own cost.
- As part of the building license application, the property owner or the City of Wanneroo (at the property owners expense) shall have the proposed dwelling reassessed for Bushfire Attack Level (at the time of construction) with results to be submitted as part of the Building License application.

11.3 City of Wanneroo 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:

- Provide fire prevention and preparedness advice to landowners upon request.
- Monitor bush fuel loads in all areas of public open space, the biodiversity conservation area, road reserve sites and liaise with relevant stakeholders to maintain at safe levels.
- Maintain public roads to appropriate standards.
- Ensure compliance with the City of Wanneroo fire control notice.
- Maintain and ensure the temporary fire services access gate is unobstructed and should it be locked, a City of Wanneroo Emergency Services lock must be incorporated.
- Ensure dwellings are constructed to AS 3959 where applicable.
- Endorse a section 70A notification on each title affected by this Fire Management Plan.

11.4 Fire and Emergency Services Authority (FESA) Responsibilities

- Maintain district fire fighting capabilities for structural and bush fires.

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Appendices

Appendix A: Site Location

Site Location

Tamala Park - Catalina Estate

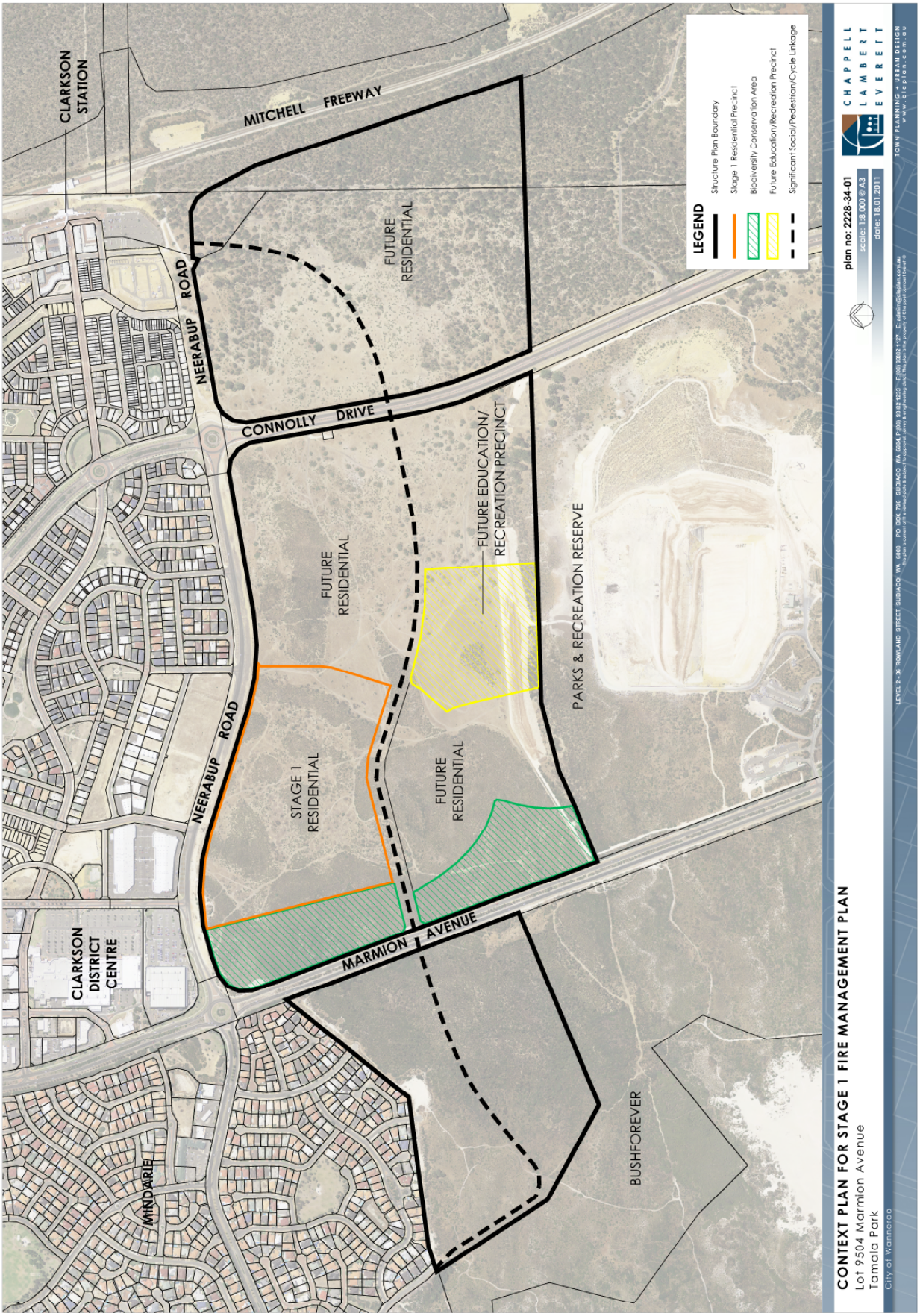
Lot 9504 Marmion Avenue
Tamala Park

0m 1 km

N

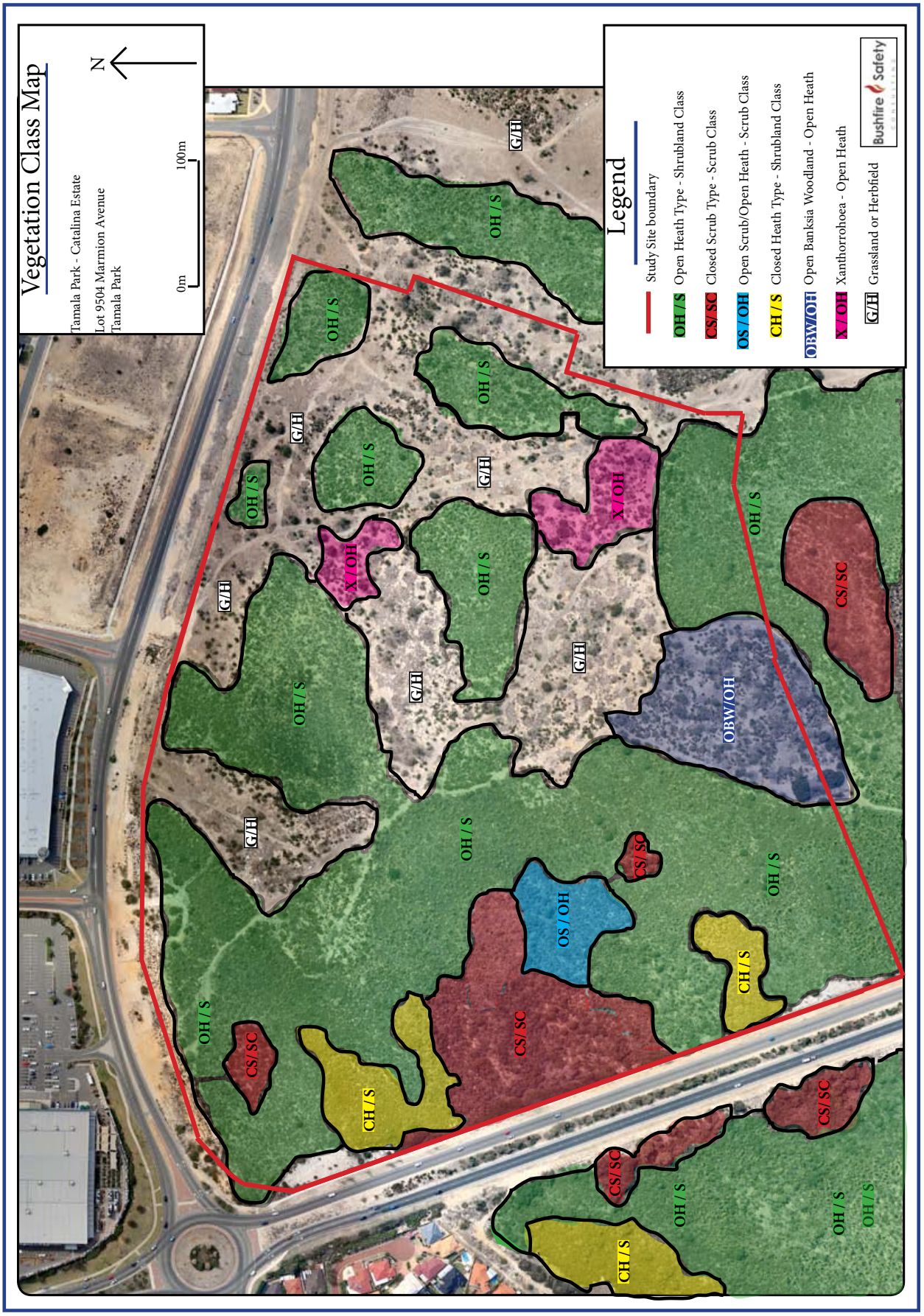
Bushfire Safety CONSULTING

Appendix B: Context Plan

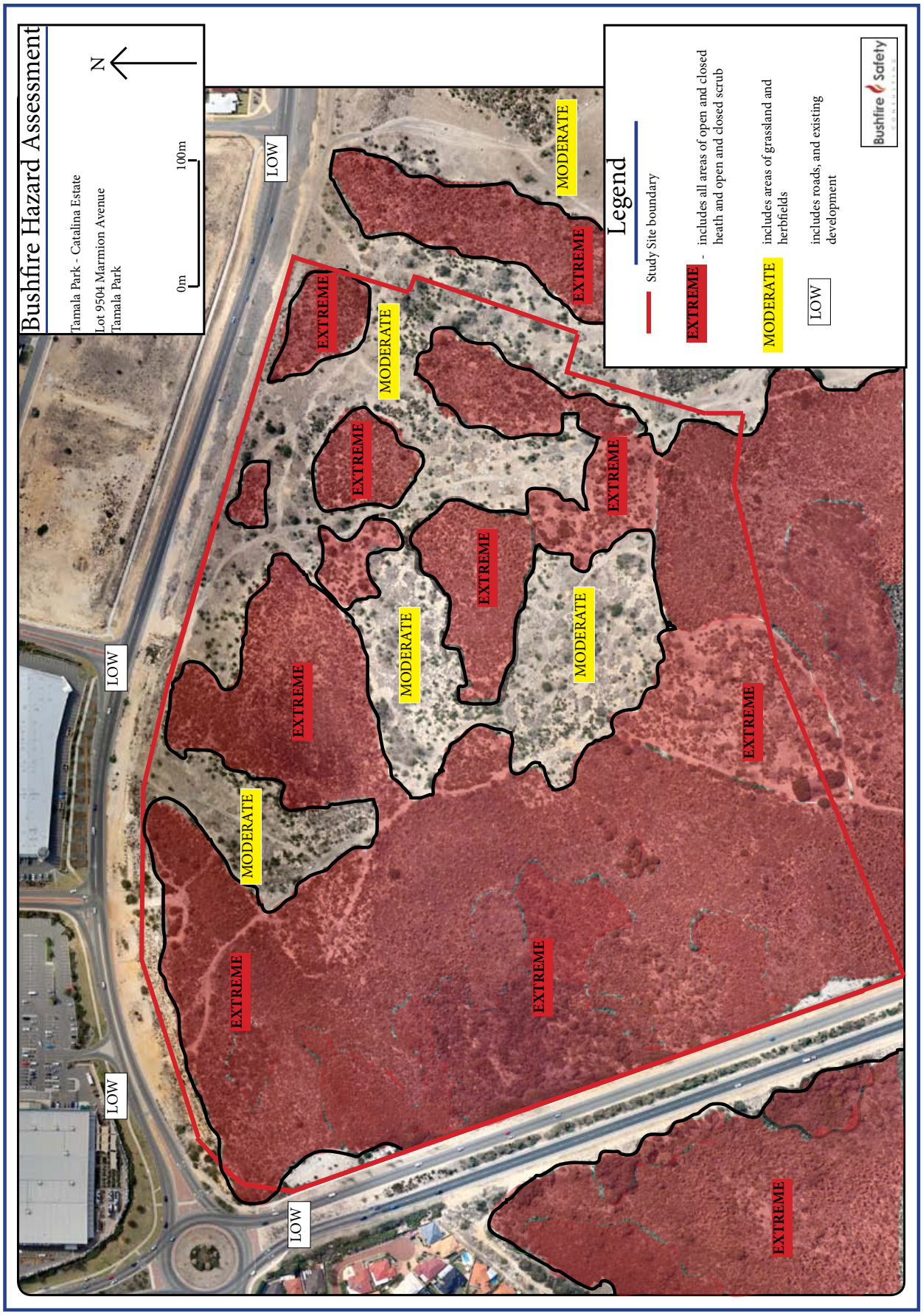


Appendix C: Subdivision Plan

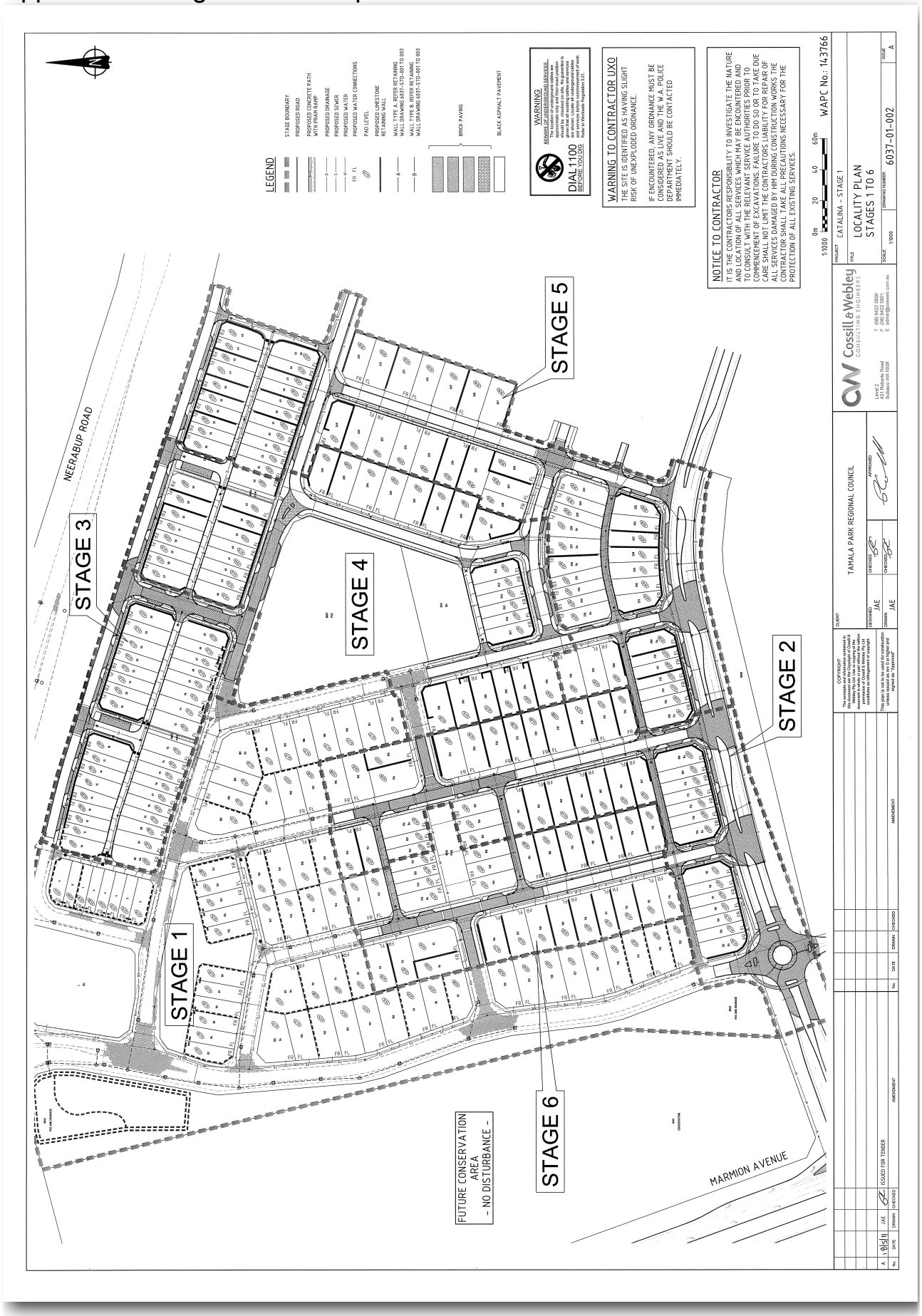
Appendix D: Vegetation Classes Map



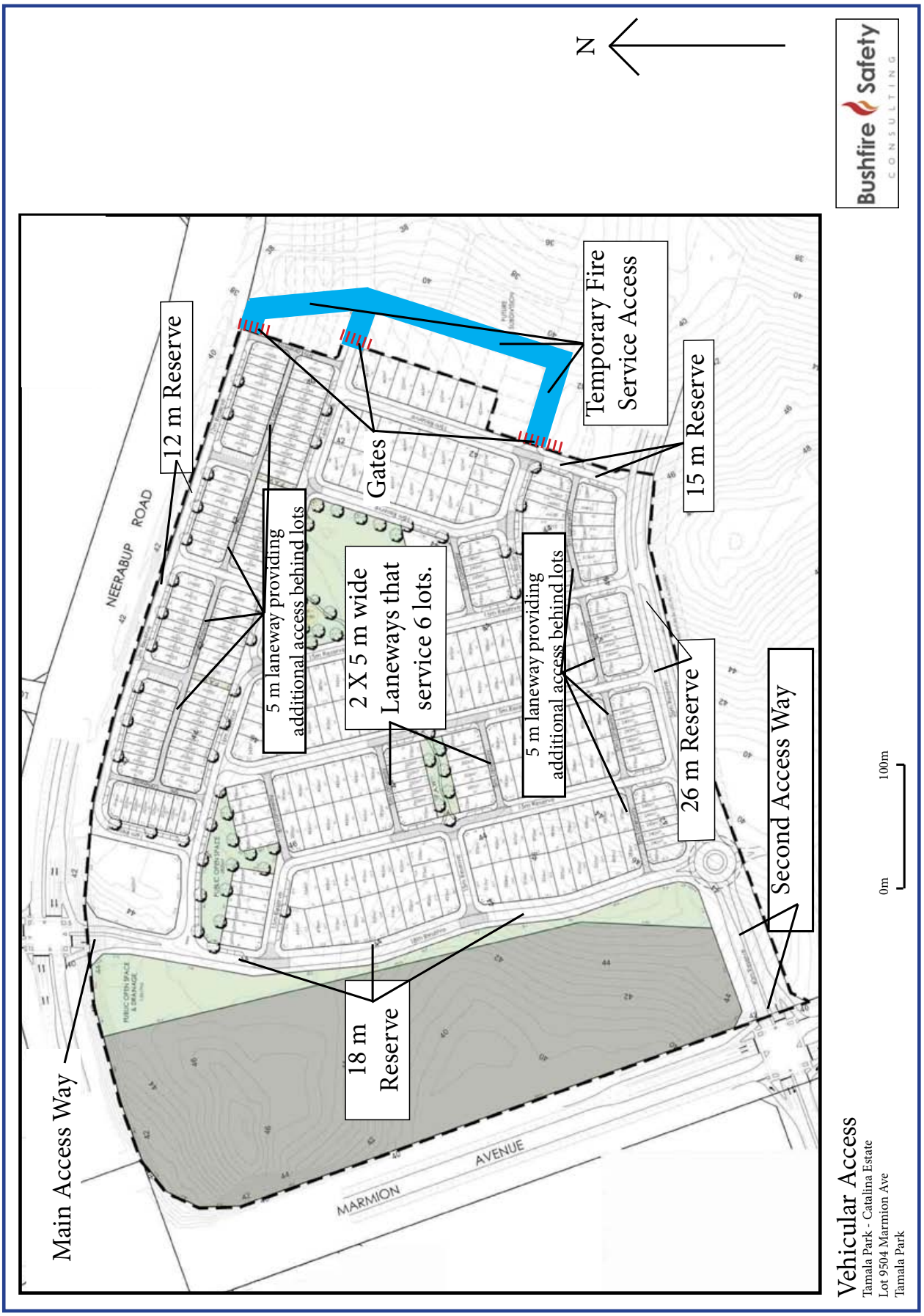
Appendix E: Hazard Assessment Level Map



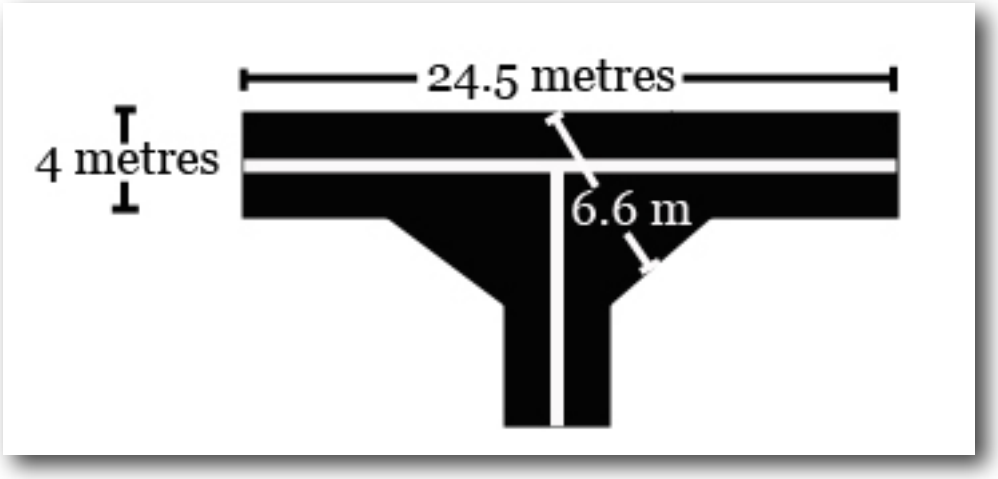
Appendix F: Stages of Development

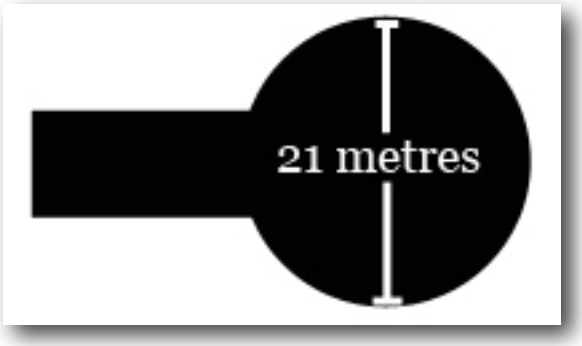


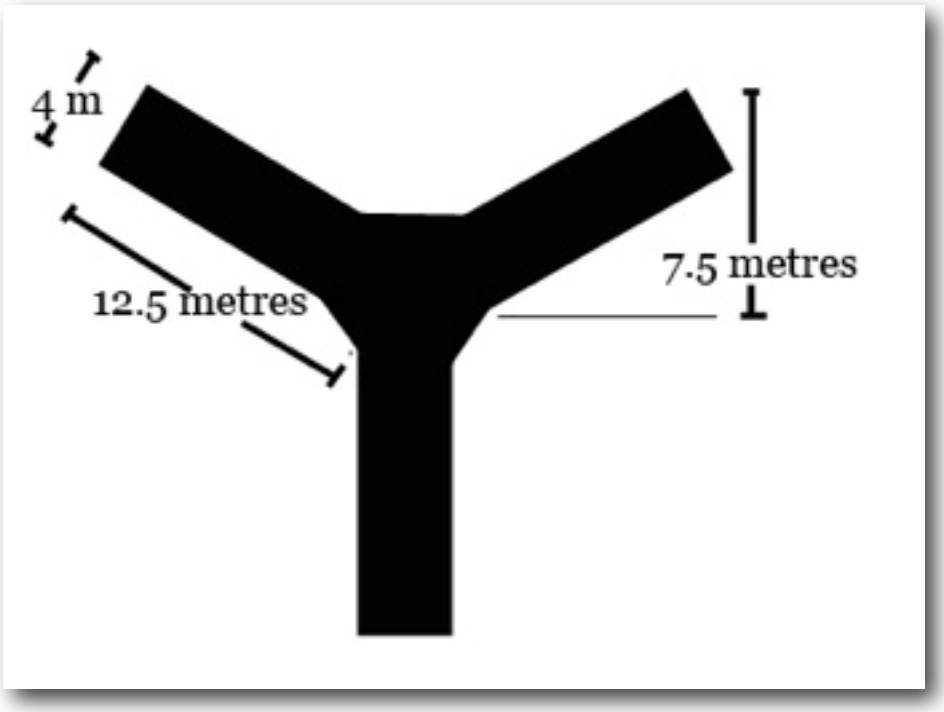
Appendix G : Vehicular Access



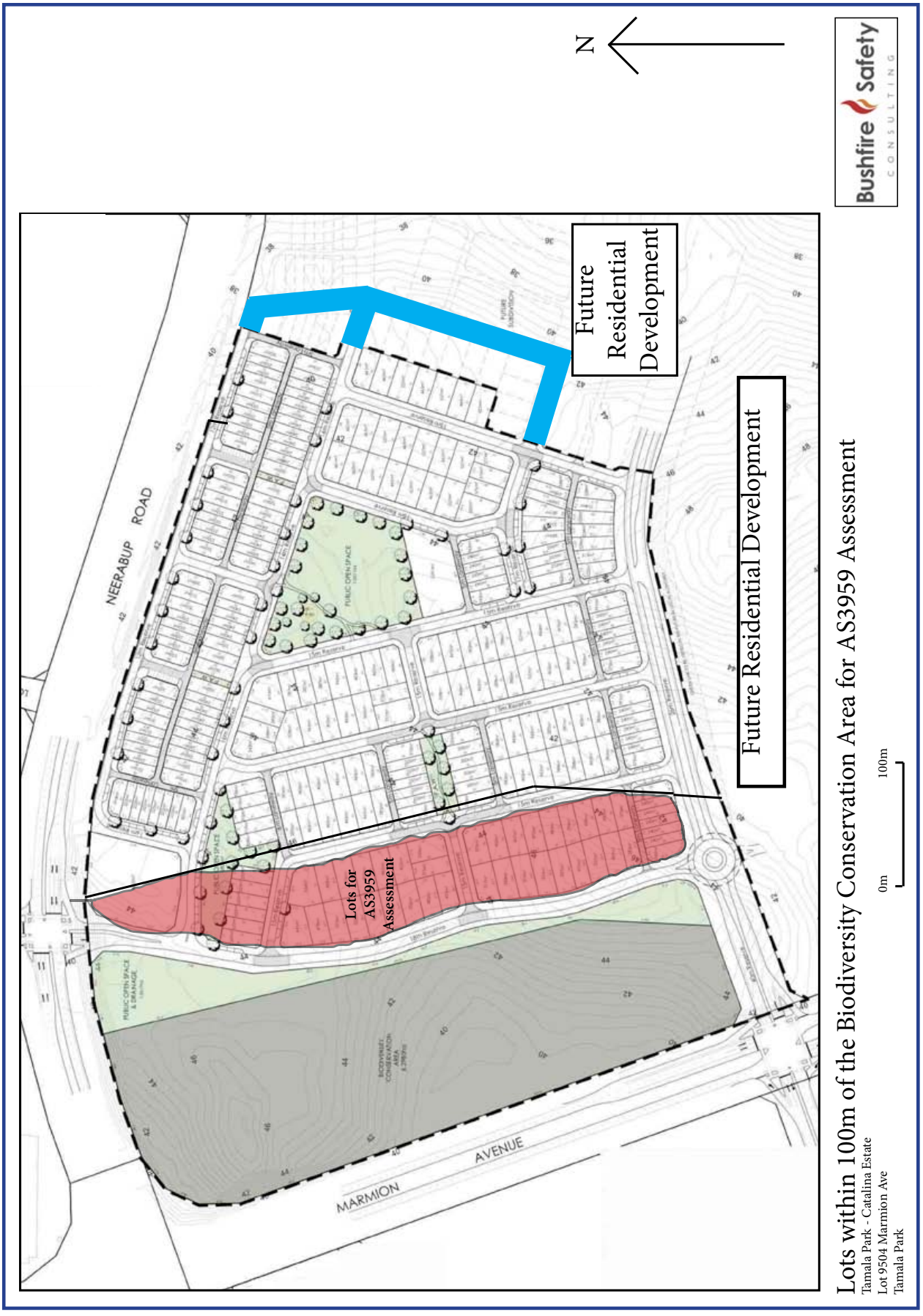
Appendix H : Turn Around Standards



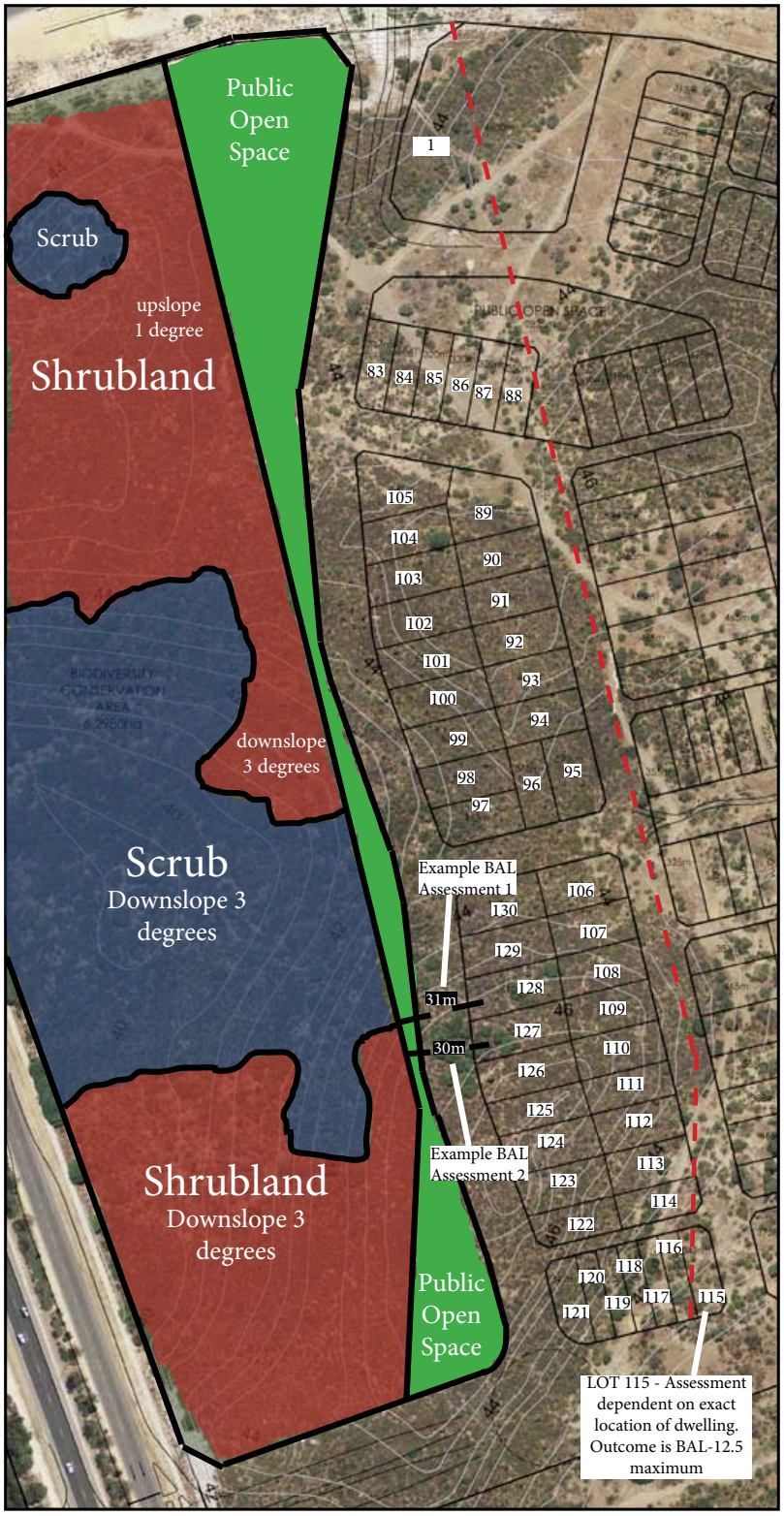




Appendix I : Bushfire Construction Standard Zone (AS3959)



Appendix J: Bushfire Attack Level Assessment Outcomes



Bushfire Attack Level Assessment Outcomes

for all lots within 100m of the Biodiversity Conservation Reserve

Tamala Park - Catalina Estate
Lot 9504 Marmion Ave
Tamala Park

LEGEND

- 100 m zone boundary where AS3959 applies
- SCRUB (includes open and closed scrub vegetation)
- SHRUBLAND (includes open and closed heath vegetation)
- Public Open Space (to be established and managed to Building Protection Standards)

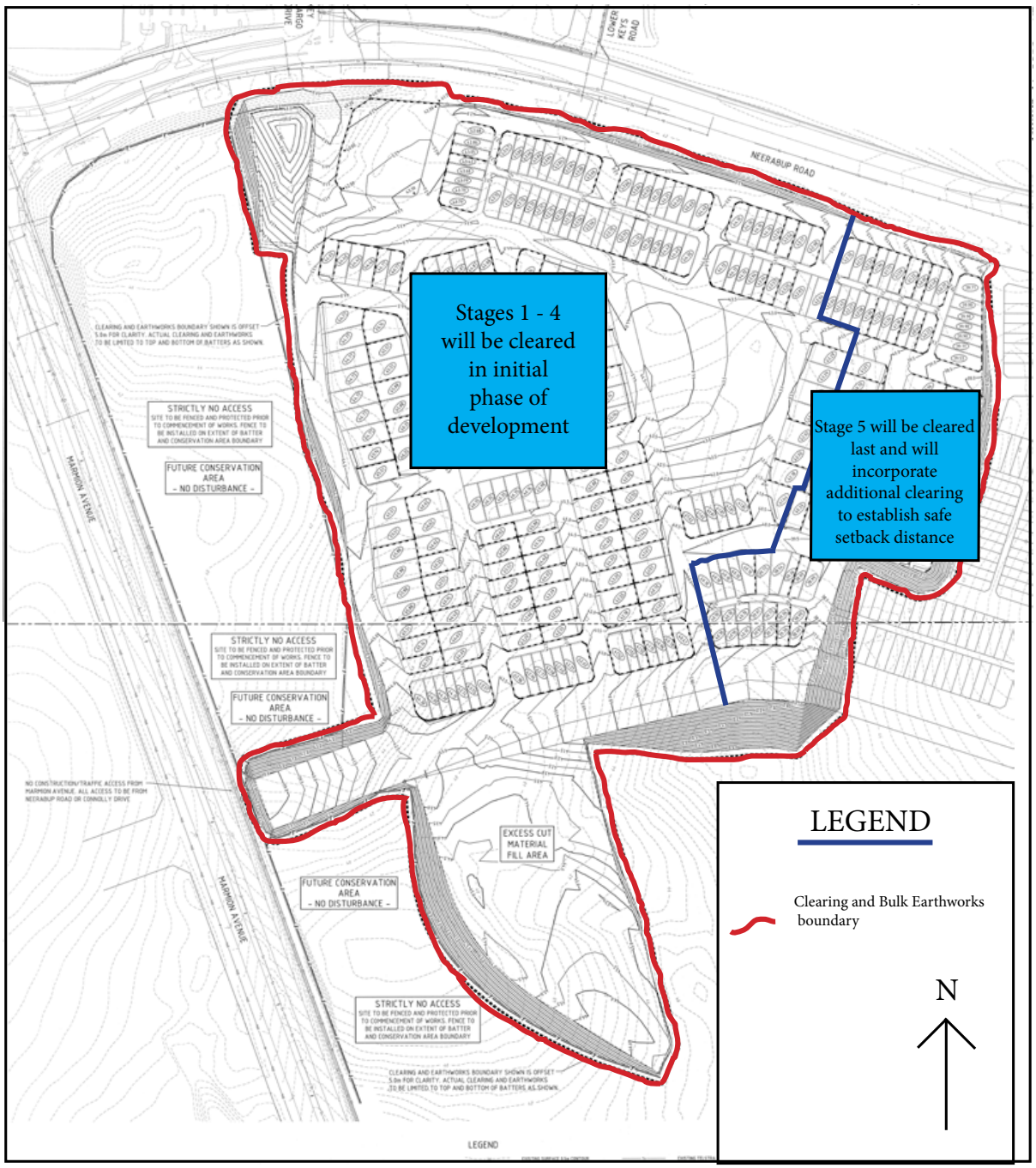
A 6 metre setback from the front of lots means all dwellings within 100 metres of the Biodiversity Conservation Area are exposed to a Bushfire Attack Level of BAL-12.5.

Construction Section in AS3959-2009 is Sections 3 and 5.

N

Bushfire Safety CONSULTING

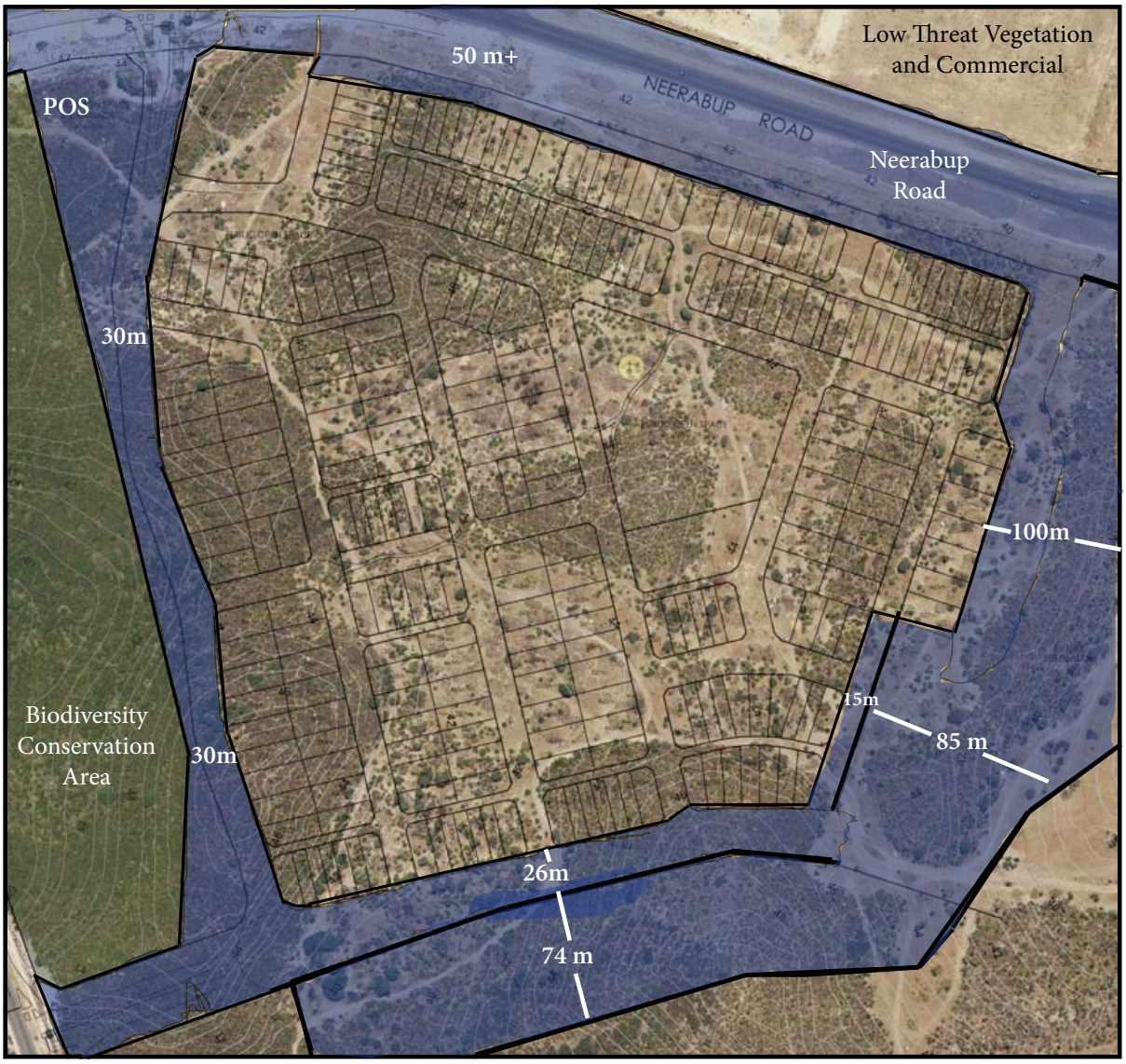
Appendix K : Bulk Earthworks and Clearing Plan



Bulk Earthworks and Clearing Plan

Tamala Park - Catalina Estate
Lot 9504 Marmion Avenue
Tamala Park

Appendix L : Vegetation Management Zone



Vegetation Management Zone surrounding the development- minimum requirements

Tamala Park - Catalina Estate
Lot 9504 Marmion Ave
Tamala Park

0m 100m

N

LEGEND

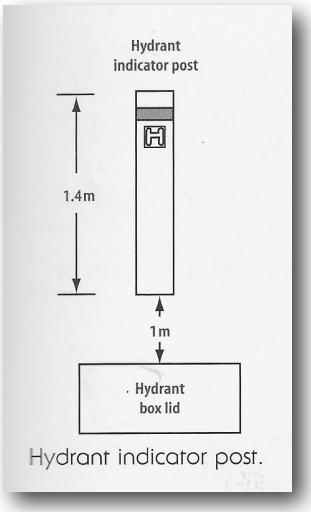
Building Protection Zone (BPZ) surrounding the perimeter of the development. There will be no classified vegetation within 100 metres of the development to the north, east and south

Bushfire Safety CONSULTING

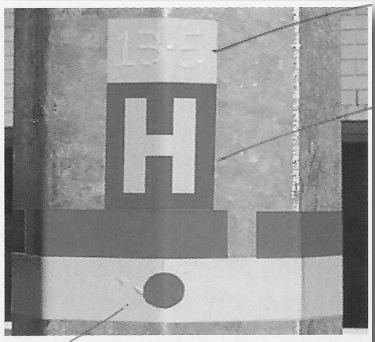
Appendix M : Fire hydrant location and identification markings (FESA 2007).

Ball hydrant indicating

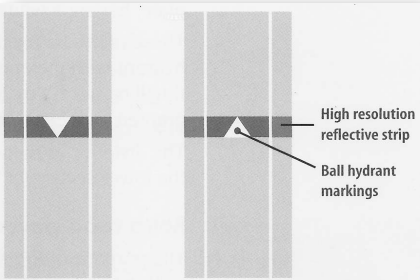
To enable visual identification of ball hydrants from hydrant indications fixed to street poles, a red reflectorised disc will be fixed to the band of aluminium lattice. It will be placed in the centre of the white aluminium lattice directly in line with the centre of the H plate.



Hydrant indicator post.



Ball hydrant indicating on a steel pole. Hydrant is on the other side of the road, 13.5 metres away.



The arrow is facing the hydrant on the same side of the street.

The arrow is facing the hydrant on the opposite side of the street.

The term 'hydrant indicating' means the fixing of hydrant indicating materials and painting, so that hydrants can be quickly located and identified day and night.

FESA provides markers to indicate the location of hydrants. These markers are designed to be seen easily, day or night. The materials used and method of application vary according to the location and conditions.

Procedures for fixing indicators on street poles

All poles are to have a band of aluminium lattice (white outside) fixed horizontally on the pole between 1.5m and 1.8m from the ground. When in position, this acts as a guide for reflective delineators.

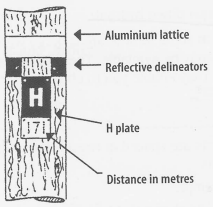
Indicating poles on same side of road or street as hydrant

Poles situated between road junctions to have two metal backed reflective delineators fixed immediately below and in line with the lower edge of the aluminium lattice. They are positioned horizontally on the poles and at right angles to the street or road so as to reflect the headlights of the appliance approaching from either direction.

The reflecting 'H' plate is fixed to the pole with galvanised clouts, facing directly to the hydrant. The red section is above the 'H' plate and immediately below and in line with the lower edge of the reflective delineators.

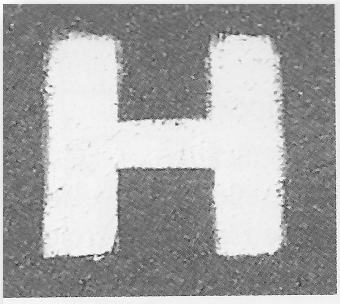
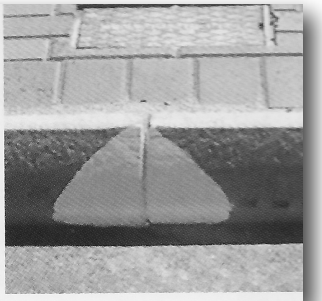
The distance in metres from the indicators to the centre of the hydrant is measured and punched on the unpainted part of the 'H' direction plate.

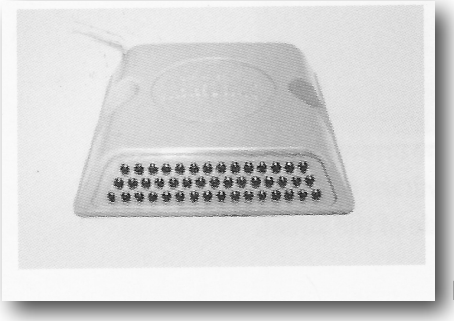
The distance is to be measured to the nearest one-tenth of a metre.



Indicates that the hydrant is on the same side of the street as the pole.

Indicates that the hydrant is on the opposite side of the street to the pole.



Road markings


Retro Road pavement marking