

Appendix 7 Bushfire Management Plan and Bushfire Risk Management Plan



Bushfire Management Plan

Development of Caltex Service Station – Alkimos
Lot 768 (58), Montana Crescent, Alkimos

Prepared for
Caltex Australia Petroleum Pty Ltd

30 October 2018



DOCUMENT TRACKING

Item	Detail
Project Name	Bushfire Management Plan, Development of Caltex Service Station – Lot 768(58) Montana Crescent, Alkimos
Project Number	18PER-11319
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Approved by	Bruce Horkings (BPAD29962-L3)
Status	Draft
Version Number	V2
Last saved on	12 December 2018

This report should be cited as 'Eco Logical Australia 2018. *Bushfire Management Plan, Development of Caltex Service Station – Lot 768 (58), Montana Crescent, Alkimos.* Prepared for Caltex Australia Petroleum Pty Ltd.'

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Template 29/9/2015

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1 Introduction

1.1 Project overview

Eco Logical Australia (ELA) was commissioned by Caltex Australia Petroleum Pty Ltd. to prepare a Bushfire Management Plan (BMP) to support a development application (DA) being prepared for the development of a service station at Lot 768 (58) Montana Crescent, Alkimos (hereafter referred to as the subject site, **Figure 1**).

The proposed development will include construction of new retail store, canopies, fuel bowsers, underground fuel tanks, parking areas etc. as depicted in **Figure 1** and **Figure 2**.

The proposed development will result in an intensification of land use.

The subject site is within a designated bushfire prone area as per the *Western Australia State Map of Bush Fire Prone Areas* (DFES 2018), which triggers bushfire planning requirements under *State Planning Policy 3.7 Planning in Bushfire Prone Areas* (SPP 3.7; WAPC 2015) and reporting to accompany submission of the development application in accordance with the associated *Guidelines for Planning in Bushfire Prone Areas v 1.3* (the Guidelines; WAPC 2017).

This assessment has been prepared by ELA Senior Bushfire Consultant Daniel Panickar (FPAA BPAD Level 2 Certified Practitioner No. BPAD37802-L2) with quality assurance undertaken by Senior Bushfire Consultant, Bruce Horkings (FPAA BPAD Level 3 Certified Practitioner No. BPAD29962-L3).

1.2 Purpose and application of the plan

The primary purpose of this BMP is to act as a technical supporting document to inform planning assessment.

This BMP is also designed to provide guidance on how to plan for and manage the bushfire risk to the subject site through implementation of a range of bushfire management measures in accordance with the Guidelines.

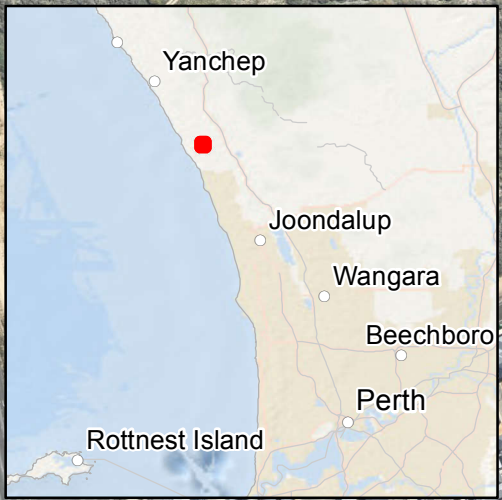
SPP 3.7 (Policy Measure 6.6) requires development applications for high-risk land uses (such as petrol stations) in areas between BAL-12.5 and BAL-29 to be accompanied by a risk management plan for any flammable on-site hazards. A Bushfire Risk Management Plan has been prepared by ELA for the proposed development (ELA 2018).

1.3 Environmental considerations

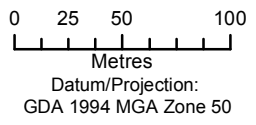
No vegetation clearing is proposed or required for this development.

All revegetation will be maintained as landscaping in a low-threat state.

Figure 1: Site Overview



- Legend**
- Subject site
 - 100m site assessment
 - 150m site assessment



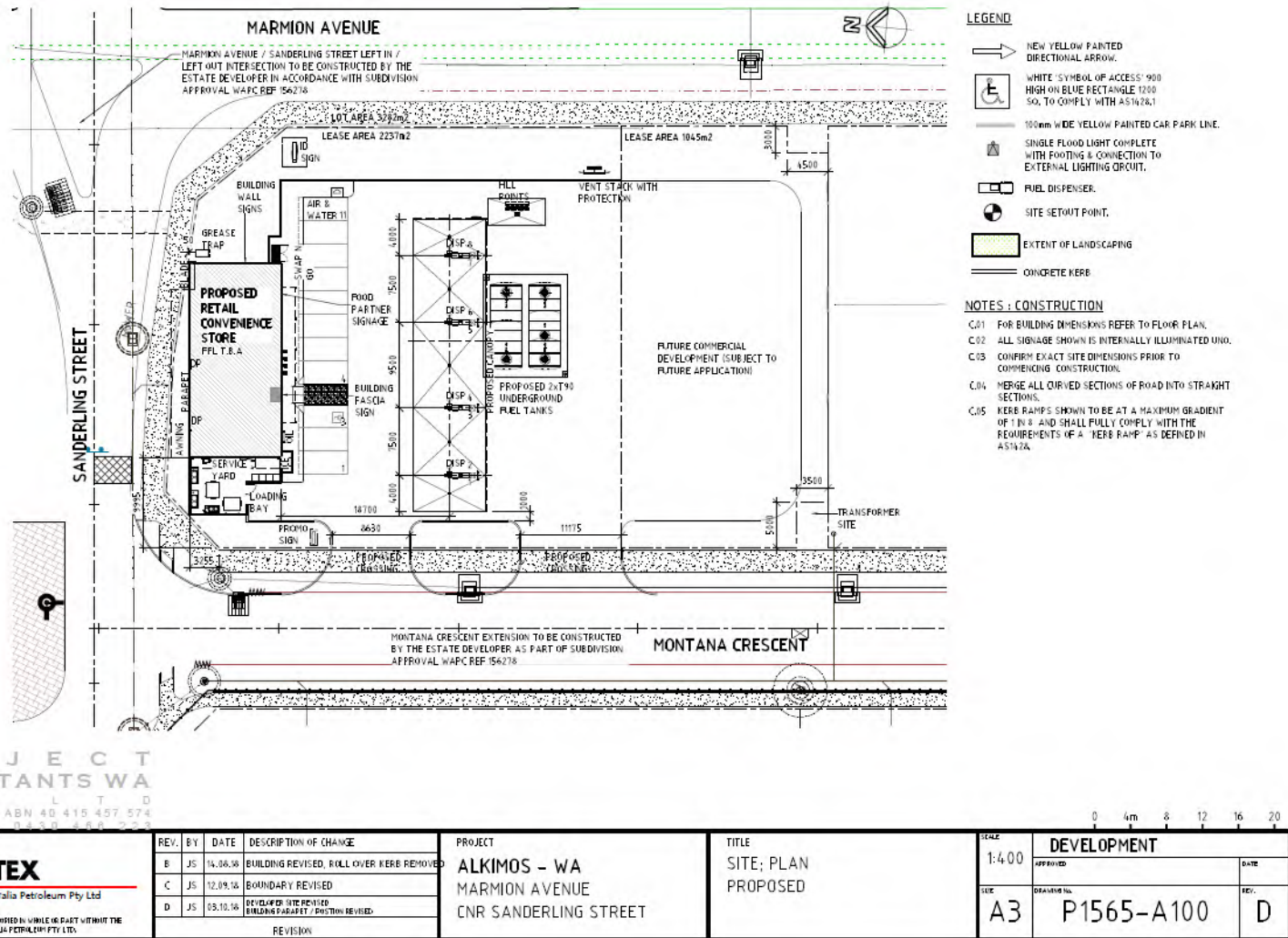


Figure 2: Proposed development

2 Bushfire assessment results

2.1 Bushfire assessment inputs

The following section is a consideration of spatial bushfire risk and has been used to inform the bushfire assessment in this report.

2.1.1 General

The subject site is located in the City of Wanneroo and is bound by Marmion Avenue to the east and residential/commercial development in all other directions.

Visual assessment of surrounding vegetation did not identify any recent fire scars and fire history was not able to be determined. Accumulation of vegetative matter over time, combined with the moderate to high risk of ignition associated with high levels of public access would potentially facilitate a bushfire occurrence in this area.

2.1.2 Fire Danger Index

A blanket rating of FDI 80 is adopted for Western Australian environments, as outlined in AS 3959–2009 and endorsed by Australasian Fire and Emergency Service Authorities Council (AFAC).

2.1.3 Vegetation classification

Vegetation within the subject site and surrounding 150 m (the assessment area) was assessed in accordance with the Guidelines and *AS 3959-2009 Construction of Buildings in Bushfire Prone Areas* (SA 2009) with regard given to the *Visual guide for bushfire risk assessment in Western Australia* (DoP 2016). Site inspection was undertaken on 27 September 2018.

The following vegetation classes and exclusions were identified within the assessment area as depicted in **Figure 3**:

- Class D scrub; and
- Exclusions as per clause 2.2.3.2 (e) and (f) (i.e. non-vegetated areas and low-threat vegetation).

Photographs relating to each vegetation type are included in **Appendix A**.

The Bushfire Attack Level (BAL) assessment addresses this topic further in **Section 2.2.2**.

2.1.4 Topography and slope under vegetation

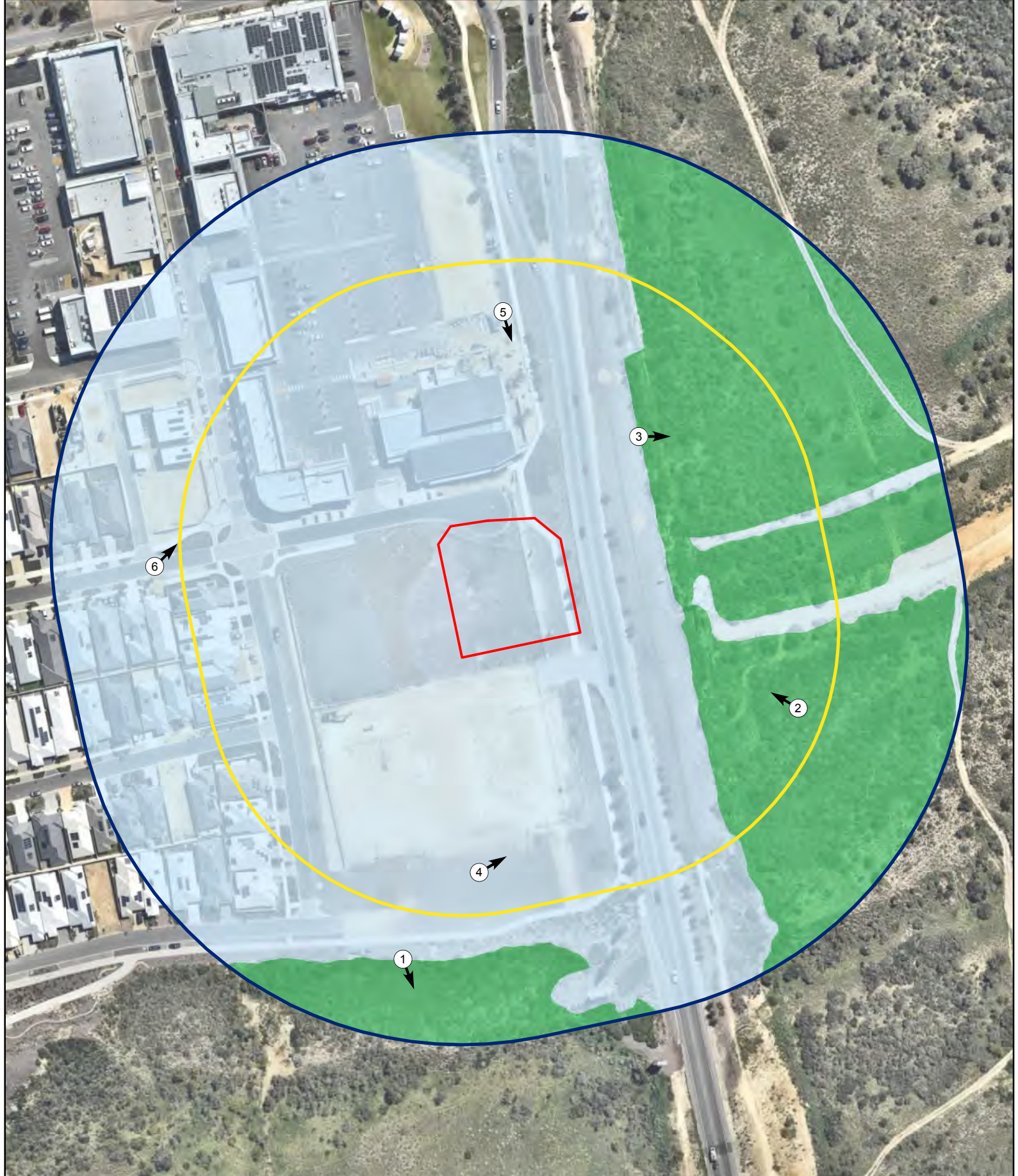
Effective slope under vegetation was assessed for a distance of 150 m from the subject site in accordance with the Guidelines and AS 3959-2009 and is depicted in **Figure 3**. Slope under all areas of classified vegetation within the assessment area was assessed as upslope/flat.

The BAL assessment addresses this topic further in **Section 2.2.2**.

2.1.5 Distance between proposed development areas and classified vegetation

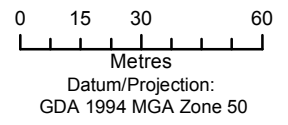
Separation distances between proposed development areas within the subject site and classified vegetation are discussed in the BAL assessment in **Section 2.2.2**.

Figure 3: Vegetation Classification



- Legend**
- Subject site
 - 100m site assessment
 - 150m assessment area
 - Photo location

- Vegetation classification**
- Class D scrub
 - Excluded as per clause 2.2.3.2 (e) and (f)



2.2 Bushfire assessment outputs

A BAL assessment has been undertaken in accordance with SPP 3.7, the Guidelines, AS 3959-2009 and the bushfire assessment inputs in **Section 2.1**.

2.2.1 Bushfire Attack Level (BAL) assessment

All land located within 100 m of the classified vegetation depicted in **Figure 3** is considered bushfire prone and is subject to a BAL assessment in accordance with AS 3959-2009.

A Method 1 BAL assessment (as outlined in AS 3959-2009) has been completed for the proposed development and incorporates the following factors:

- State adopted Fire Danger Index (FDI);
- Vegetation class;
- Slope under classified vegetation; and
- Distance between proposed development areas and the classified vegetation.

Based on the identified BAL, construction requirements for proposed buildings can then be assigned. The BAL rating gives an indication of the expected level of bushfire attack (i.e. radiant heat flux, flame contact and ember penetration) that may be received by proposed buildings and subsequently informs the standard of construction required to increase building survivability.

2.2.2 Method 1 BAL assessment

Table 1 and **Figure 4** display the Method 1 BAL assessment (in the form of BAL contours) undertaken for the proposed development in accordance with AS 3959-2009 methodology. The results show that all new structures (i.e. Canopy, Bowsers, Retail store etc.) within the subject site are located in areas subject to a BAL rating of BAL-12.5.

The Guidelines state;

The bushfire construction requirements of the Building Code of Australia only apply to certain types of residential buildings (being Class 1, 2 or 3 buildings and/or Class 10a buildings or decks associated with a Class 1, 2 or 3 building) in designated bushfire prone areas. As such, AS 3959 does not apply to all buildings. Only vulnerable or high-risk land uses that fall within the relevant classes of buildings as set out in the Building Code of Australia will be required to comply with the bushfire construction requirements of the Building Code of Australia. As such, the planning process focuses on the location and siting of vulnerable and high risk land uses rather than the application of bushfire construction requirements.

As none of the proposed structures are a Class 1, 2 or 3 buildings and/or Class 10a buildings or decks associated with a Class 1, 2 or 3 building, construction to AS 3959-2009 is not required for this proposal. However, in consideration of section 5 of AS 3959-2009, it is recommended that the following elements are considered during construction for bushfire protection:

- Walls - constructed from non-combustible material to a minimum height of 400 mm;
- Joints, vents, weepholes – no gaps greater than 3 mm;
- Window assemblies - constructed from non-combustible material;
- Window glazing - Grade A safety glass minimum 4 mm thickness for windows less than 400 mm from the ground;
- Sliding doors – door frames to be constructed from metal and glazing to be Grade A safety glass complying with AS 1288;
- Roof – constructed from non-combustible material and all junctions/penetrations sealed to prevent gaps greater than 3 mm.

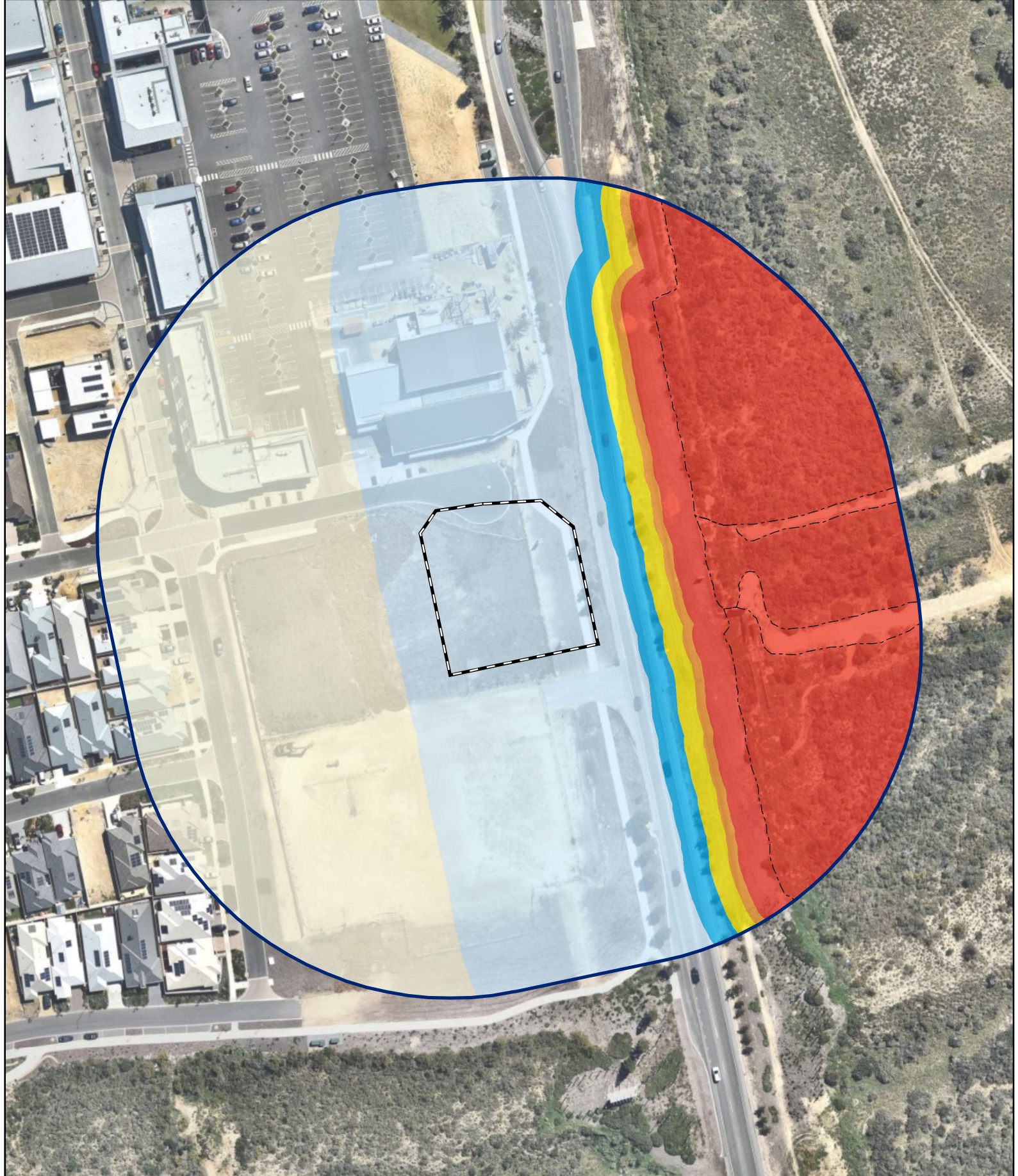
Table 1: Method 1 BAL calculation

Plot and vegetation classification	Effective slope under vegetation	Hazard separation distance (m)	BAL rating	Comment
Plot 1 Class D scrub	Upslope/flat	<10	BAL-FZ	No new structures proposed in this area
		10-<13	BAL-40	No new structures proposed in this area
		13-<19	BAL-29	No new structures proposed in this area
		19-<27	BAL-19	No new structures proposed in this area
		27-<100	BAL-12.5	New structures proposed in this area
Plot 2 Excluded – clause 2.2.3.2 (e) & (f)		N/A		

2.3 Identification of issues arising from the BAL assessment

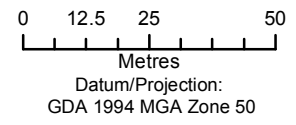
All new structures are located in areas subject to a BAL rating of BAL-12.5. Should there be any changes in development design or vegetation/hazard extent that requires a modified bushfire management response, then the above BAL ratings will need to be reassessed for the affected areas and documented in a brief addendum to this BMP.

Figure 4: Bushfire Attack Level (BAL) Contours



- Legend**
- Subject site
 - 100m site assessment
 - 150m site assessment
 - Bushfire hazard interface

- Bushfire attack level (BAL)**
- BAL - FZ
 - BAL - 40
 - BAL - 29
 - BAL - 19
 - BAL - 12.5
 - BAL - LOW



Datum/Projection:
GDA 1994 MGA Zone 50

3 Assessment against the Bushfire Protection Criteria

3.1 Compliance

The proposed development is required to comply with policy measures 6.2, 6.5 and 6.6 of SPP 3.7 and the Guidelines.

In response to the above requirements of SPP 3.7 and the Guidelines, bushfire management measures have been devised for the proposed development in accordance with Guideline acceptable solutions where possible to meet compliance with bushfire protection criteria.

Table 2 outlines the Acceptable Solutions (AS) that are relevant to the proposal and summarises how the intent of each Bushfire Protection criteria has been achieved. No Performance Solutions (PS) have been used for this proposal. These management measures are depicted in **Figure 5**.

Table 2: Summary of solutions used to achieve bushfire performance criteria

Bushfire Performance Criteria	AS	PS	N/A	Comment
Element 1: Location A1.1 Development location	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The entire subject site is situated in areas subject to a BAL rating of BAL-12.5. The proposed development is considered to be compliant with A1.1.
Element 2: Siting and design of development A2.1 Asset Protection Zone (APZ)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	APZs will be implemented between the proposed assets and classified vegetation in the form of car parking areas, landscaping beds (maintained as low-threat vegetation), and other cleared areas (refer to Figure 5). The proposed development is considered to be compliant with A2.1.
Element 3: Vehicular access A3.1 Two access routes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Two access routes to/from the subject site are available (refer to Figure 5). The proposed development is considered to be compliant with A3.1.
Element 3: Vehicular access A3.2 Public road	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No public roads proposed as part of the development.
Element 3: Vehicular access A3.3 Cul-de-sac	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No cul-de-sacs proposed as part of the development.
Element 3: Vehicular access A3.4 Battle-axe	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No battle-axe lots proposed as part of the development.
Element 3: Vehicular access A3.5 Private Driveway longer than 50 m	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No private driveways longer than 50 m proposed as part of the development.
Element 3: Vehicular access A3.6 Emergency Access way	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No emergency access ways proposed as part of the development.

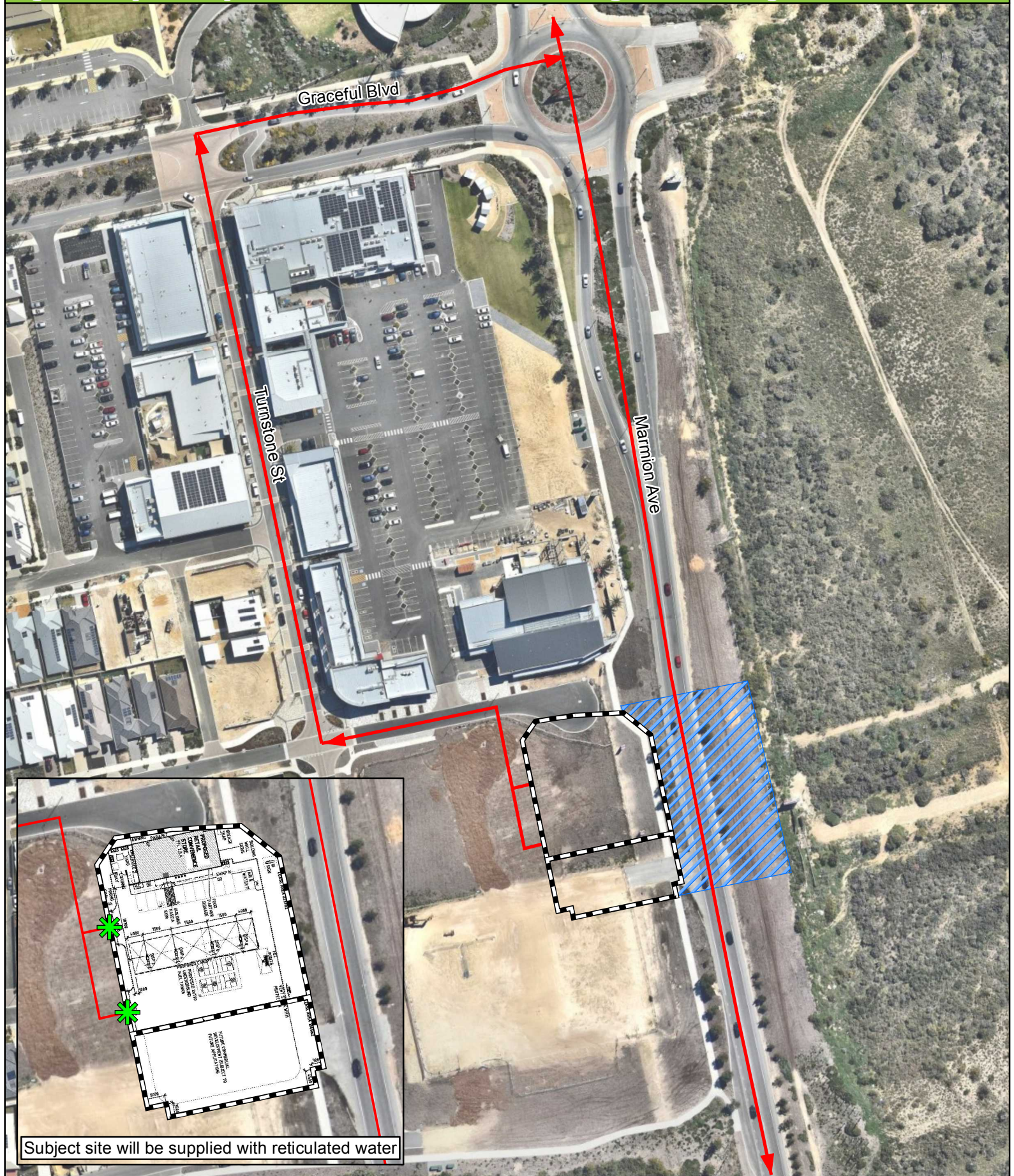
Bushfire Performance Criteria	AS	PS	N/A	Comment
Element 3: Vehicular access A3.7 Fire-service access routes	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No fire service access routes proposed as part of the development.
Element 3: Vehicular access A3.8 Firebreak width	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No firebreaks proposed or required as part of the development.
Element 4: Water A4.1 Reticulated areas	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The subject site has a reticulated water supply which will be extended to all relevant areas of development. The proposed development is considered to be compliant with A4.1.

3.2 Additional management strategies

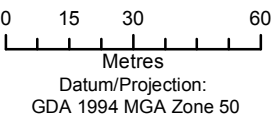
A BRMP has been prepared for the proposed development in accordance with Policy measure 6.6 of SPP 3.7 (ELA 2018). This plan details how high-risk components of the proposed development will be managed to reduce bushfire risk.

All landscaping areas within the subject site will be maintained in accordance with *Standards for Asset Protection Zones (Appendix B)*.

Figure 5: Spatial representation of the bushfire management strategies



- Legend**
- Access point *(Refer to inset)
 - Subject site
 - Access / egress route
 - Indicative APZ



4 Implementation and enforcement

Implementation of the BMP applies to Caltex Australia Petroleum Pty Ltd. and the City of Wanneroo to ensure bushfire management measures are adopted and implemented on an ongoing basis. A summary of the bushfire management measures described in **Section 3**, as well as a works program, is provided in **Table 3**. These measures will be implemented to ensure the ongoing protection of life and property assets is achieved. Timing and responsibilities are also defined to assist with implementation of each measure.

Table 3: Proposed works program

No.	Bushfire management measure	Responsibility
Prior to occupancy		
1	Ensure all new structures are located outside of areas subject to BAL-FZ and BAL-40 as per the design in Figure 4 .	Caltex Australia Petroleum Pty Ltd.
2	Undertake and maintain landscaping in accordance with Appendix B .	Caltex Australia Petroleum Pty Ltd.
3	Extend reticulated water supply to appropriate areas	Caltex Australia Petroleum Pty Ltd.
Ongoing management		
4	Comply with Bushfire Risk Management Plan	Caltex Australia Petroleum Pty Ltd.
5	Compliance with fire break order	Caltex Australia Petroleum Pty Ltd. and the City of Wanneroo

5 Conclusion

In the author's professional opinion, the bushfire protection requirements listed in this assessment provide an adequate standard of bushfire protection for the proposed development consistent with the aim and objectives of SPP 3.7 and associated guidelines and is recommended for approval.



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References

Department of Fire and Emergency Services (DFES). 2018. *Map of Bush Fire Prone Areas*, [Online], Government of Western Australia, available from:

<http://www.dfes.wa.gov.au/regulationandcompliance/bushfireproneareas/Pages/default.aspx>

Department of Planning (DoP). 2016. *Visual guide for bushfire risk assessment in Western Australia*. DoP, Perth.

Eco Logical Australia (ELA). 2018. *Bushfire Risk Management Plan: Development of Caltex Service Station – Lot 768 (58) Montana Crescent, Alkimos*. Report prepared for Caltex Petroleum Pty. Ltd. Perth.

Standards Australia (SA). 2009. *Construction of buildings in bushfire-prone areas, AS 3959-2009*. SAI Global, Sydney.



Western Australian Planning Commission (WAPC). 2015. *State Planning Policy 3.7 Planning in Bushfire Prone Areas*. WAPC, Perth.

Western Australian Planning Commission (WAPC). 2017. *Guidelines for Planning in Bushfire Prone Areas Version 1.3 (including appendices)*. WAPC, Perth.

Appendix A Plates

Plot	Photo ID	Photo and vegetation class
1	1	 <p data-bbox="491 405 1402 481">E 90 SE 120 150 S 180 SW 210 240 175°S (T) 31°37'21"S, 115°41'16"E ±16.4ft ▲ 142ft</p> <p data-bbox="1171 1032 1394 1061">17 Sep 2018, 14:14</p> <p data-bbox="491 1099 644 1128">Class D Scrub</p>
1	2	 <p data-bbox="491 1140 1402 1216">SW 210 240 W 270 NW 300 330 N 0 306°NW (T) 31°37'19"S, 115°41'22"E ±16.4ft ▲ 141ft</p> <p data-bbox="1171 1771 1394 1800">17 Sep 2018, 14:36</p> <p data-bbox="491 1834 644 1863">Class D Scrub</p>

Plot	Photo ID	Photo and vegetation class
1	3	 <p>Class D Scrub</p>
2	4	 <p>Excluded – clause 2.2.3.2 (e) & (f)</p>

Plot	Photo ID	Photo and vegetation class
2	5	<div data-bbox="491 253 1406 936"> <p style="text-align: center;">North Elevation</p> <p style="text-align: center;">☉ 163°S (T) ● 31°37'11"S, 115°41'18"E ±32.8ft ▲ 164ft</p>  <p style="text-align: right;">17 Sep 2018, 14:51</p> </div> <p>Excluded – clause 2.2.3.2 (e) & (f)</p>
2	6	<div data-bbox="491 987 1406 1671"> <p style="text-align: center;">NW N NE E SE</p> <p style="text-align: center;">330 0 30 60 90 120</p> <p style="text-align: center;">☉ 57°NE (T) ● 31°37'17"S, 115°41'13"E ±16.4ft ▲ 148ft</p>  <p style="text-align: right;">17 Sep 2018, 15:10</p> </div> <p>Excluded – clause 2.2.3.2 (e) & (f)</p>

Appendix B Standards for Asset Protection Zones

The following standards have been extracted from the *Guidelines for Planning in Bushfire Prone Areas v 1.3* (WAPC 2017).

Every habitable building is to be surrounded by, and every proposed lot can achieve, an APZ depicted on submitted plans, which meets the following requirements:

a. Width: Measured from any external wall or supporting post or column of the proposed building, and of sufficient size to ensure the potential radiant heat impact of a fire does not exceed 29kW/m^2 (BAL-29) in all circumstances.

b. Location: the APZ should be contained solely within the boundaries of the lot on which a building is situated, except in instances where the neighbouring lot or lots will be managed in a low-fuel state on an ongoing basis, in perpetuity (see explanatory notes).

c. Management: the APZ is managed in accordance with the requirements of 'Standards for Asset Protection Zones' (below):

- Fences: within the APZ are constructed from non-combustible materials (e.g. iron, brick, limestone, metal post and wire). It is recommended that solid or slatted non-combustible perimeter fences are used
- Objects: within 10 metres of a building, combustible objects must not be located close to the vulnerable parts of the building i.e. windows and doors
- Fine Fuel load: combustible dead vegetation matter less than 6 millimetres in thickness reduced to and maintained at an average of two tonnes per hectare
- Trees (> 5 metres in height): trunks at maturity should be a minimum distance of 6 metres from all elevations of the building, branches at maturity should not touch or overhang the building, lower branches should be removed to a height of 2 metres above the ground and or surface vegetation, canopy cover should be less than 15% with tree canopies at maturity well spread to at least 5 metres apart as to not form a continuous canopy (**Figure 6**).

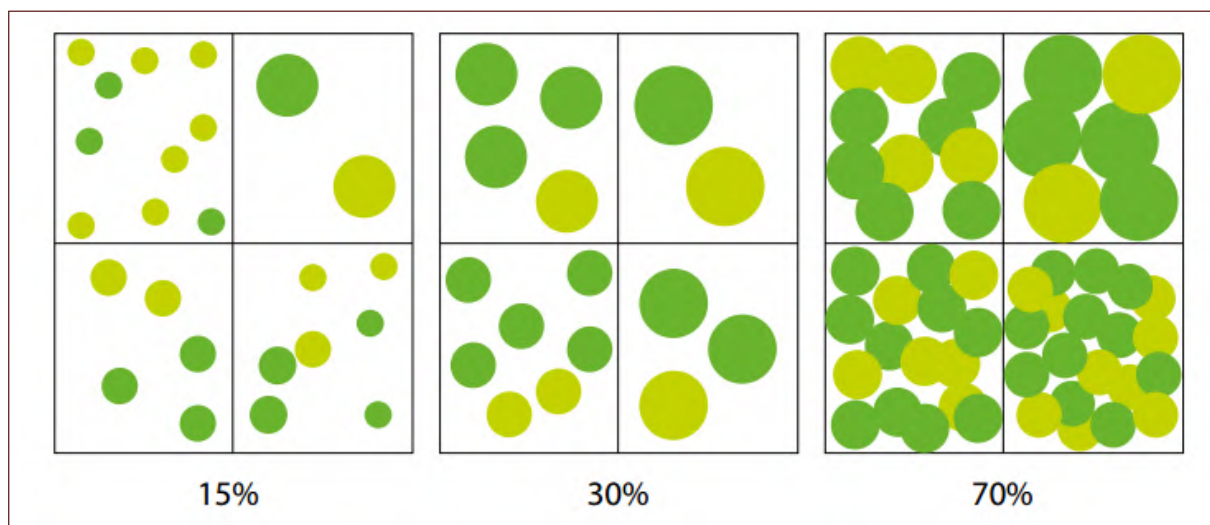


Figure 6: Illustrated tree canopy cover projection (WAPC 2017)

- **Shrubs (0.5 metres to 5 metres in height):** should not be located under trees or within 3 metres of buildings, should not be planted in clumps greater than 5m² in area, clumps of shrubs should be separated from each other and any exposed window or door by at least 10 metres. Shrubs greater than 5 metres in height are to be treated as trees
- **Ground covers (<0.5 metres in height):** can be planted under trees but must be properly maintained to remove dead plant material and any parts within 2 metres of a structure, but 3 metres from windows or doors if greater than 100 millimetres in height. Ground covers greater than 0.5 metres in height are to be treated as shrubs
- **Grass:** should be managed to maintain a height of 100 millimetres or less.

Additional notes

The Asset Protection Zone (APZ) is an area surrounding a building that is managed to reduce the bushfire hazard to an acceptable level. Hazard separation in the form of using subdivision design elements or excluded and low threat vegetation adjacent to the lot may be used to reduce the dimensions of the APZ within the lot.

The APZ should be contained solely within the boundaries of the lot on which the building is situated, except in instances where the neighbouring lot or lots will be managed in a low-fuel state on an ongoing basis, in perpetuity. The APZ may include public roads, waterways, footpaths, buildings, rocky outcrops, golf courses, maintained parkland as well as cultivated gardens in an urban context, but does not include grassland or vegetation on a neighbouring rural lot, farmland, wetland reserves and unmanaged public reserves.

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Lot 768 (58) Montana Crescent, Alkimos

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30 October 2018



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1 Introduction

1.1 Project overview

Eco Logical Australia (ELA) was commissioned by Caltex Australia Petroleum Pty Ltd. to prepare a Bushfire Risk Management Plan (BRMP) to support a development application (DA) being prepared for the development of a service station located at Lot 768 (58) Montana Crescent, Alkimos (hereafter referred to as the subject site, **Appendix A, Figure 2**).

The proposed development will include construction of new retail store, canopies, fuel bowsers, underground fuel tanks, parking areas etc. as depicted in **Appendix A, Figure 3**.

The proposed development will result in an intensification of land use.

The entirety of the subject site is within a designated bushfire prone area as per the *Western Australia State Map of Bush Fire Prone Areas* (DFES 2018), which triggers bushfire planning requirements under *State Planning Policy 3.7 Planning in Bushfire Prone Areas* (SPP 3.7; WAPC 2015) and reporting to accompany submission of the development application in accordance with the associated *Guidelines for Planning in Bushfire Prone Areas v 1.3* (the Guidelines; WAPC 2017).

This assessment has been prepared by ELA Senior Bushfire Consultant, Daniel Panickar (FPAA BPAD Certified Practitioner No. BPAD37802-L2.) with quality assurance undertaken by Senior Bushfire Consultant, Bruce Horkings (FPAA BPAD Level 3 Certified Practitioner No. BPAD29962-L3).

1.2 Purpose and application of the plan

The primary purpose of this BRMP is to act as a technical supporting document to inform planning assessment in conjunction with the corresponding Bushfire Management Plan (BMP).

SPP 3.7 (Policy Measure 6.6) requires development applications for high-risk land uses (such as petrol stations) in areas between BAL-12.5 and BAL-29 to be accompanied by a risk management plan for any flammable on-site hazards. The Bushfire Risk Management Plan (BRMP) prepared by ELA for the subject site (ELA 2018) identifies all new proposed structures within the subject site as being located within areas subject to a BAL rating of BAL-12.5.

The Building Code of Australia bushfire construction requirements only apply to residential buildings and associated structures. The Guidelines therefore require the planning process to focus on location and siting of high-risk land uses rather than application of bushfire construction requirements.

Under the *Dangerous Goods Safety (Storage and Handling of Non-Explosives) Regulations 2007* (the Regulations), the operator will also be required to complete a separate risk assessment that addresses risks other than bushfire for the proposed development. The Regulations also require operators to prepare an emergency plan for petrol stations. An emergency management plan will be developed for the subject site, which will set guidelines for the management of an emergency, disaster or major incident at the site. The emergency plan for the fuel station will reflect the site layout and bushfire risk post-construction.

2 Potential bushfire scenarios

The BMP (ELA 2018) identifies and classifies the existing bushfire hazards within 150 m of the subject site, based on existing vegetation and slope and separation distance to the vegetation.

Based on this information, ELA has assessed potential bushfire scenarios that could affect the subject site. The potential bushfire scenarios have been used to inform a bushfire risk assessment (refer to **Section 4**) and assist in development of appropriate bushfire mitigation responses (refer to **Section 5**). The following bushfire scenarios were assessed:

1. Bushfire approaching the subject site from the south; and
2. Bushfire approaching the subject site from the east.

A description of each potential bushfire scenario is provided in the following subsections and November to February wind roses for Gingin Aero (Station No. 9178, approximately 24.5 km from the subject site) used to identify potential directions of bushfire attack are provided in **Appendix B, Figure 4** to **Figure 11** (BoM 2018).

Bushfire scenarios have been selected based on the location of classified vegetation from the subject site and direction of prevailing winds during the bushfire season.

2.1 Scenario 1: Bushfire approaching the subject site from the south-west

A bushfire approaching the subject site from the south is possible, however vegetation is located greater than 100 m from proposed built assets and will be cleared for residential development in the near future and thus, represents a temporary hazard. A fire approaching from this direction would likely be spread by south-westerly winds in the afternoon that are common throughout the bushfire season (BoM 2018). It is likely however, that a change in wind direction in the morning (from the east) would alter the direction of fire spread, away from the subject site (BoM 2018).

2.2 Scenario 2: Bushfire approaching the subject site from the east

A bushfire approaching the subject site from the east through scrub fuel is possible and would likely be spread by easterly winds in the morning that are common throughout the bushfire season (BoM 2018). It is likely however, that a change in wind direction in the afternoon (from the south-west) would alter the direction of fire spread, away from the subject site (BoM 2018). The subject site is separated from vegetation in this direction by Marmion Avenue which would potentially provide the opportunity for a fire suppression response that could contain a fire in this area before significant impacts are experienced at the subject site.

3 Bushfire risk assessment methodology

Australian and New Zealand Standard *AS/NZS ISO 31000:2009 Risk Management–Principles and Guidelines* (SA & SNZ 2009) provides an internationally recognised approach to risk management. Methodology for this process is further described in *Risk Management Guidelines: Companion to AS/NZS 4360/2004* (SA & SNZ 2004), which defines the risk assessment process as outlined in **Figure 1**.

AS/NZS ISO 31000:2009 is adopted by DFES, as documented in the agency's Bushfire Risk Management Framework (DFES 2015), to formalise and communicate the approach of managing bushfire risk across the department in the aim of leading to improved coordination and effectiveness of bushfire risk management processes.

From a bushfire management perspective, this methodology can be useful in determining:

1. The inherent bushfire risk (i.e. the initial level of risk prior to risk treatment and mitigation); and
2. The residual bushfire risk (i.e. the level of risk remaining following risk treatment and mitigation).

Inherent and residual bushfire risk can be determined for individual bushfire events on the basis of the following risk criteria, which is used to inform the likelihood and consequence of such events:

- **Likelihood** of ignition and bushfire occurrence takes into consideration the bushfire history of the area, risk of ignition, vegetation type, fuel age and load, slope under vegetation and predominant fire weather conditions; and
- **Consequence** or impact from bushfire on life, property and the environment takes into consideration the degree and severity of potential bushfire scenarios, location of bushfire hazard areas, assets present in the area and the level of management and suppression response available.

The two bushfire scenarios identified in **Section 2** have been subject to bushfire risk assessment through determination of likelihood and consequence in accordance with the rating tables outlined in **Table 1** and **Table 2**¹. This process determines the inherent bushfire risk of the event and informs the level of mitigation or management response required to reduce the risk to an acceptable level. The risk assessment matrix used to determine inherent and residual bushfire risk is outlined in **Table 3**.

Table 1: Likelihood rating system

Likelihood rating	Description
Almost certain	Consequence expected to occur in most circumstances; may occur once every year or more
Likely	Consequence will probably occur in most circumstances; may occur once every five years
Possible	Consequence might occur at some time; may occur once every twenty years
Unlikely	Consequence is not expected to occur; may occur once every one-hundred years
Rare	Consequence may occur only in exceptional circumstances; may occur once every five-hundred or more years

¹ The determined consequence rating is the most likely outcome, not the worst case.

Table 2: Consequence rating system

Consequence rating	Description
Catastrophic	A large number of severe injuries, widespread damage and displacement of the community, significant impact on the environment
Major	Extensive number of injuries requiring hospitalisation, significant damage and impact on the community, longer term impacts on the environment
Moderate	Some injuries requiring medical treatment but no fatalities, localised damage and short-term impact on the environment
Minor	Small number of injuries but no fatalities, some damage and disruption but no lasting effects
Insignificant	No injuries or fatalities, little damage or disruption

Table 3: Risk assessment matrix

	Consequence				
	Insignificant	Minor	Moderate	Major	Catastrophic
Likelihood					
Almost Certain	High	High	Extreme	Extreme	Extreme
Likely	Medium	High	High	Extreme	Extreme
Possible	Low	Medium	High	Extreme	Extreme
Unlikely	Low	Low	Medium	High	Extreme
Rare	Low	Low	Medium	High	High
Risk level	Risk response				
Low	Acceptable risk. Application of standard management measures will ensure risk level remains low and risk should be eliminated or reduced as time permits.				
Medium	Potentially unacceptable risk. Development of site specific management measures may be required to lower the risk level and risk should be reduced as soon as reasonably practicable.				
High	Potentially unacceptable risk. Development of additional site specific management measures will be required to lower the risk level and requires urgent action as soon as possible.				
Extreme	Unacceptable risk. Additional site-specific mitigation will be required to lower the risk level and an immediate mitigation response is required.				

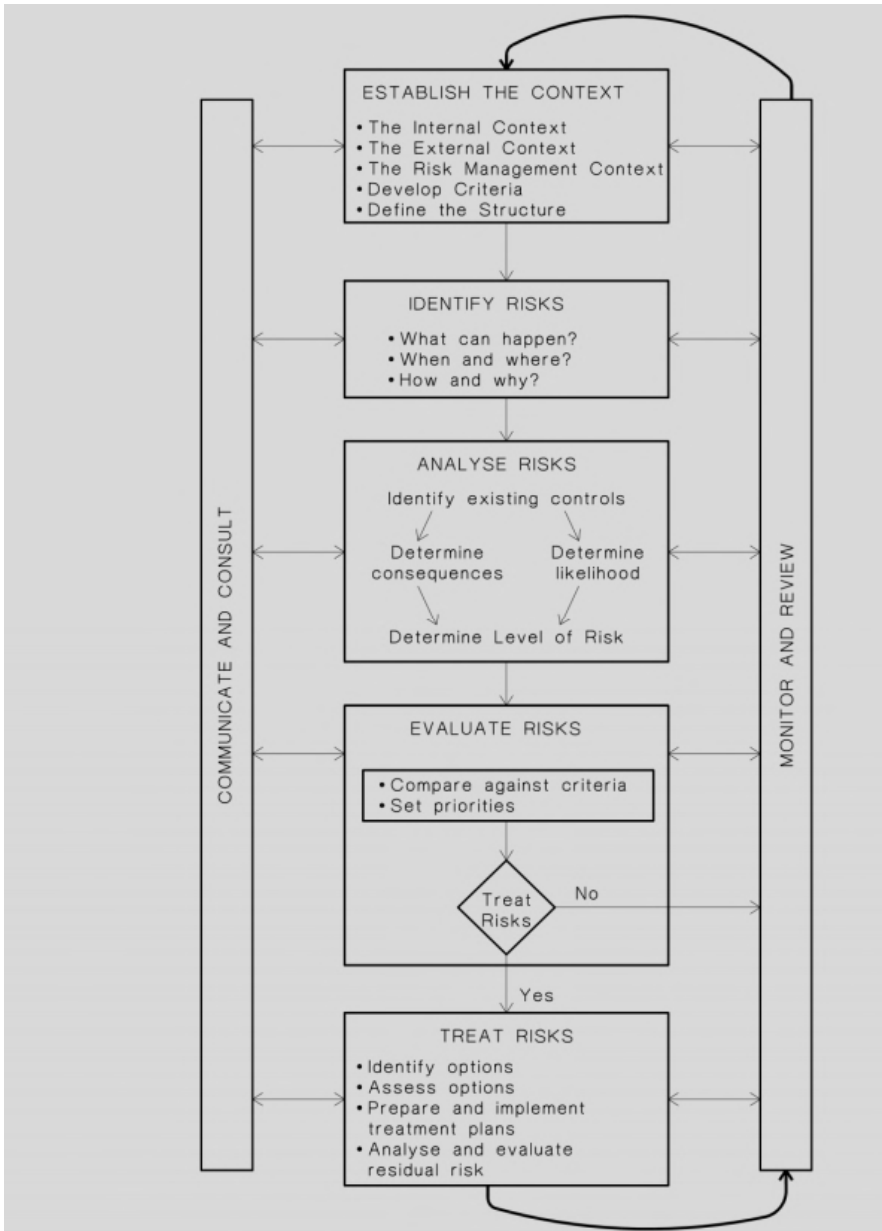


Figure 1: Risk assessment process as per AS/NZS ISO 31000:2009

4 Bushfire risk assessment

4.1 Risk context

Risk is being assessed to inform bushfire mitigation for the subject site for the protection of life and property within and adjacent to the site. The risk assessment adopts a broad area and supports a tenure blind approach to ensure wider risk impacts and adjoining lands are captured to suitably address potential risk.

4.2 Risk identification

Bushfire risk is identified in the potential bushfire scenarios outlined in **Section 2**, which indicate the potential bushfire events that could impact life and property within the subject site and adjacent land. These two scenarios are considered to cover the majority of bushfire events that could occur in order to develop suitable bushfire risk mitigation.

4.3 Risk analysis and evaluation

Risk analysis and evaluation for each of the two potential bushfire scenarios is provided in **Table 4**, which specifies the likelihood and consequence of each scenario with and without management measures to determine inherent and residual risks.

Due to the storage and handling of flammable materials within the subject site, the potential consequence of a bushfire entering the site would be greater than if flammable materials were not present.

ELA is of the view that following implementation of management measures, the risk of ignition will not be reduced due to the ongoing level of public access and presence of off-site classified vegetation and on-site flammable goods. Therefore, bushfire risk management measures are likely to reduce the level of consequence resulting from the bushfire event, rather than the likelihood of the event occurring. For example, an evacuation plan will reduce the potential impacts on life; thus reducing the level of consequence received from the bushfire event, but the likelihood of the event occurring will not be reduced.

Table 4: Bushfire risk assessment

Bushfire scenario	Comments	Likelihood	Consequence	Inherent risk	Mitigation	Likelihood	Consequence	Residual risk
1) Bushfire approaching subject site from the south-west	<p>Limited fire run, patchy fuel distribution, firebreaks and managed land present. Vegetation greater than 100 m from subject site. Greatest level of impact would occur under adverse fire weather conditions with a south-westerly wind (common during PM hours in the bushfire season).</p> <p>Consequence is not expected to occur; may occur once every one-hundred years based on fire history, suppression response capability, fuel types, anticipated rate of spread etc.</p> <p>Some injuries requiring medical treatment but no fatalities, localised damage and short-term impact on the environment based on analysis of assets.</p>	Possible	Moderate	High	Implementation of management measures identified in Section 5	Possible	Minor	Medium
2) Bushfire approaching subject site from the east	<p>Extended fire run through scrub and grass fuels. Firebreaks and roads to limit rate of spread, numerous points of access for fire suppression, greatest level of impact would occur under adverse fire weather conditions with an easterly wind (common during AM hours in the bushfire season).</p> <p>Consequence is not expected to occur; may occur once every one-hundred years based on fire history, suppression response capability, fuel types, anticipated rate of spread etc.</p> <p>Some injuries requiring medical treatment but no fatalities, localised damage and short-term impact on the environment based on analysis of assets.</p>	Possible	Moderate	High		Possible	Minor	Medium

5 Bushfire management measures

Results of the bushfire risk assessment indicate that all bushfire scenarios pose an equal level of inherent risk to life and property.

Implementation of the management measures provided in the following subsections prioritise protection of life and property and will reduce bushfire risk (residual risk) within the subject site.

5.1 Fire protection and detection equipment

The proposed service station will be fitted with a monitored alarm system, which when activated triggers an automatic response to the nominated security company.

Commented [PD1]: Caltex to confirm

Fire extinguishers will be located within the subject site at each filling point, and inside the building as required. There will be emergency stop buttons for the fuel system at each Point of Sale and externally on the front of the building. Only personnel trained in the use of extinguishers should be utilising this equipment and only if safe to do so.

Commented [PD2]: Caltex to confirm

A Spill Response Kit will be maintained on the subject site at the front of the retail building, accessible to the forecourt. Fire services are to be called in the event of a spill that covers more than 2 m² and cannot be cleaned with a spill kit at site or it is not considered safe to do so.

Commented [PD3]: Caltex to confirm

5.2 Evacuation plan and assembly points

Caltex Australia Petroleum Pty Ltd. is required to develop an emergency management plan for the subject site in accordance with *Australian Standard 3745-2010 Planning for emergencies in facilities* (SA 2010), identifying evacuation triggers and depicting muster points on-site.

5.3 Personnel training

All occupants working at the subject site must be trained in responding to and managing all emergency incidents in accordance with the emergency management plan for the site. A record of training must be kept up to date and debrief sessions held after all training exercises or incidents.

An evacuation exercise must be carried out at least annually. All occupants working on the site are required to participate.

5.4 Bushfire suppression

The Butler Fire Station (Career Station) is located approximately 4.5 km from the subject site and is expected to provide a best-case emergency suppression response time of 30 minutes in the event of an emergency.

5.5 Landscaping

All landscaping areas within the subject site will be maintained in accordance with *Standards for Asset Protection Zones* (WAPC 2017).

5.6 Additional measures

Manifest

Dangerous goods sites must maintain a current manifest and a dangerous goods site plan, to allow an appropriate response by Emergency responders in the event of an emergency, such as a fire.

The manifest and dangerous goods site plan for dangerous goods that will be stored and handled at the service station will need to be developed in accordance with the relevant Dangerous Goods Safety Guidance Note (DMP 2014).

The emergency management plan refers to critical information for emergency response being located in the HAZMAT/HAZCHEM emergency boxes which will be located at the front of the building and inside the retail building. This information includes the Emergency Plan, Dangerous Goods Manifest, Register of Dangerous Goods and Hazardous Materials, Safety Data Sheets for bulk products kept on site and dangerous goods site layout plan.

Ignition sources

Operators of dangerous goods sites are required to manage potential ignition sources, such as hot works and electrical equipment, within any on-site hazardous areas.

Placard and marking

A placard, readily visual for Emergency responders and providing visual warnings of the hazards associated with storage of fuel, will be required at the subject site in accordance with DMP Storage and handling of dangerous materials Code of Practice (DMP 2010).

Signage and notices will also be required in accordance with *AS 1940-2004 The storage and handling of flammable and combustible liquids* (AS 1940-2004; SA 2004) and any relevant state guidance.

6 Conclusion

ELA expects that through implementation of the management measures outlined in this BRMP, inherent bushfire risk to life and property within and surrounding the subject site can be reduced.



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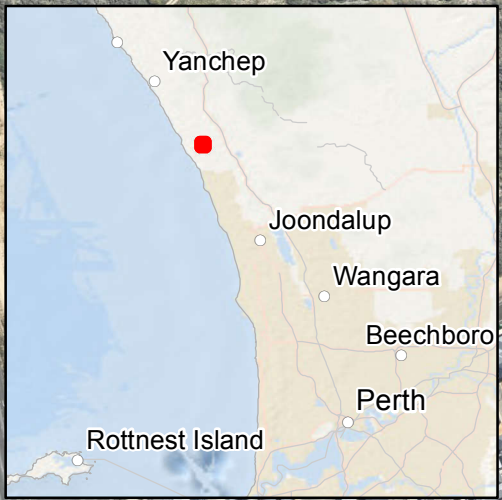


References

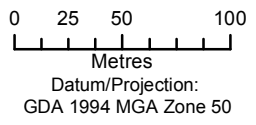
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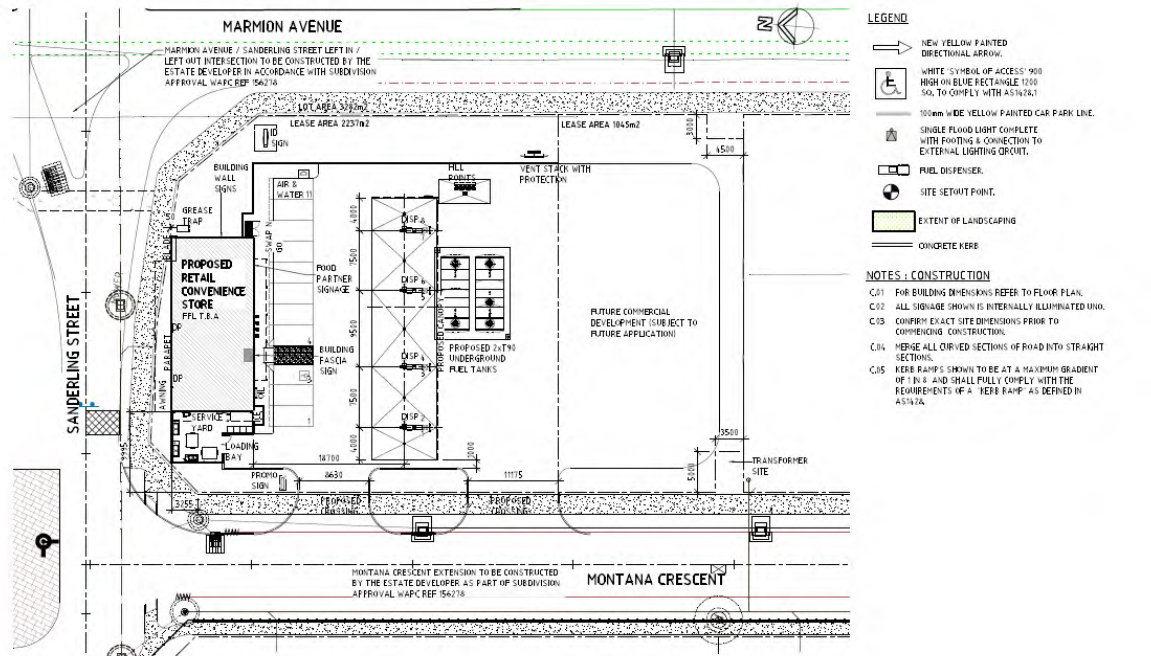
Appendix A Proposed development

Figure 2: Site Overview



- Legend**
- Subject site
 - 100m site assessment
 - 150m site assessment





PROJECT CONSULTANTS WA
 P T V L T D
 ACN 802 024 338 ABN 40 415 457 574
 150 WATSON BAY RD WATSON BAY WA 6140

<p>CALTEX Caltex Australia Petroleum Pty Ltd</p> <p><small>NOTES: THE DESIGN & DEVELOPMENT WILL NOT BE ORIGINALLY PART OF THE PROJECT. THE PROJECT IS THE PROPERTY OF CALTEX AUSTRALIA PETROLEUM PTY LTD.</small></p>	REV. BY DATE DESCRIPTION OF CHANGE	PROJECT	TITLE	SCALE	DEVELOPMENT	
	B JS 14.06.16 BUILDING REVISED, ROLL OVER HERE REMOVED	ALKIMOS - WA	SITE; PLAN	1:4.00	APPROVED	DATE
	C JS 12.09.16 BOUNDARY REVISED	MARMION AVENUE	PROPOSED	A3	DRAWN BY	D
	D JS 03.10.16 DEVELOPER SITE PERMITTED BUILDING ADAPTED, POSITION REVISED	CNR SANDERLING STREET			PROJECT NO.	P1565-A100

Figure 3: Proposed development

Appendix B November to February wind roses for Gingin Aero (Station No. 9178; BoM 2018)

Rose of Wind direction versus Wind speed in km/h (01 May 1996 to 11 Aug 2018)

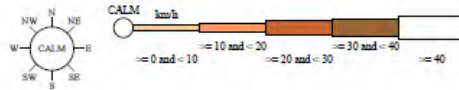
Custom times selected, refer to attached note for details

GINGIN AERO

Site No: 005178 • Opened Jan 1968 • Still Open • Latitude: -31.4628° • Longitude: 115.8642° • Elevation 73m

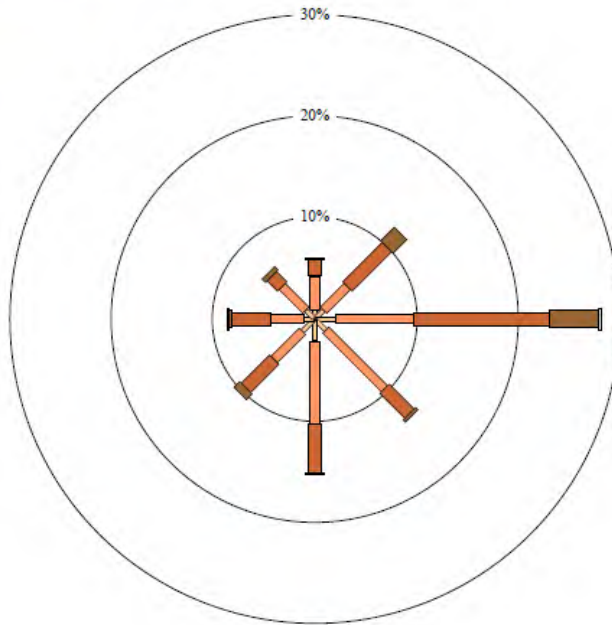
An asterisk (*) indicates that calm is less than 0.5%.

Other important info about this analysis is available in the accompanying notes.



9 am Nov
635 Total Observations

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Figure 4: Wind Rose (November – 9am)

Rose of Wind direction versus Wind speed in km/h (01 May 1996 to 11 Aug 2018)

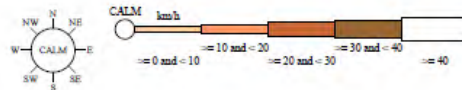
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GINGIN AERO

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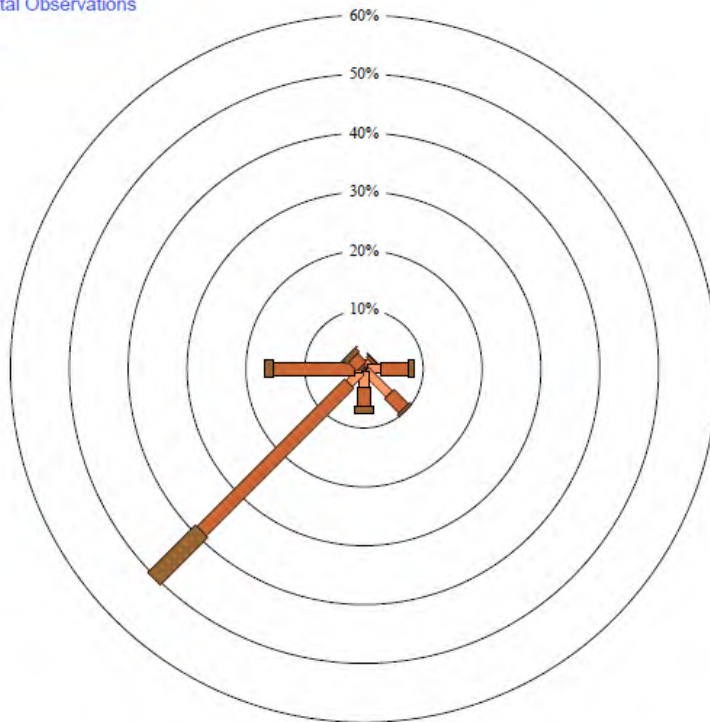
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Figure 5: Wind Rose (November – 3pm)

Rose of Wind direction versus Wind speed in km/h (01 May 1996 to 11 Aug 2018)

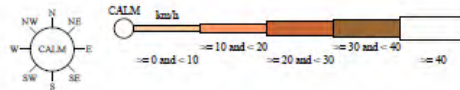
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GINGIN AERO

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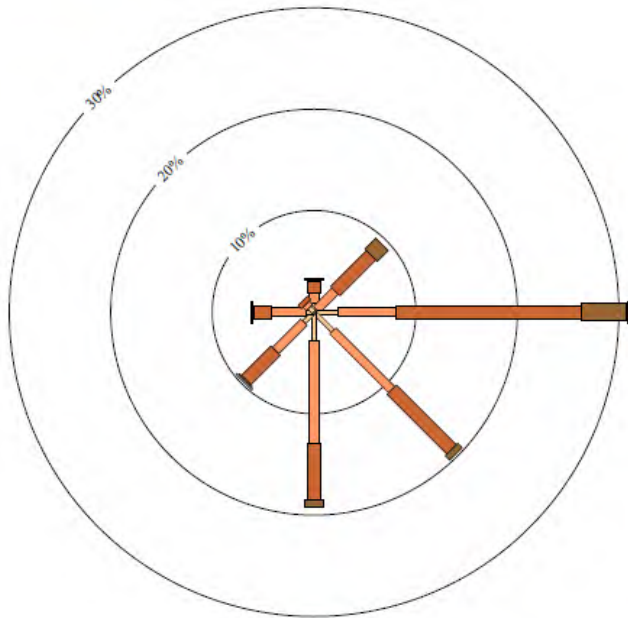
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Figure 6: Wind Rose (December – 9am)

Rose of Wind direction versus Wind speed in km/h (01 May 1996 to 11 Aug 2018)

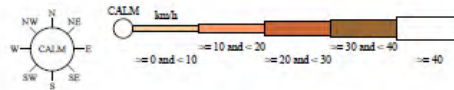
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GINGIN AERO

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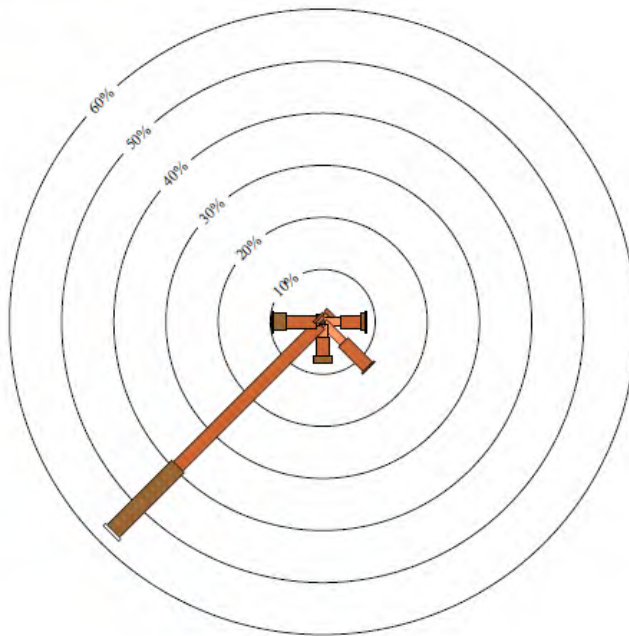
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Figure 7: Wind Rose (December – 3pm)

Rose of Wind direction versus Wind speed in km/h (01 May 1996 to 11 Aug 2018)

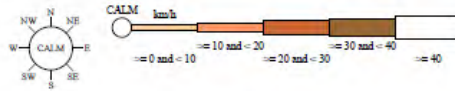
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GINGIN AERO

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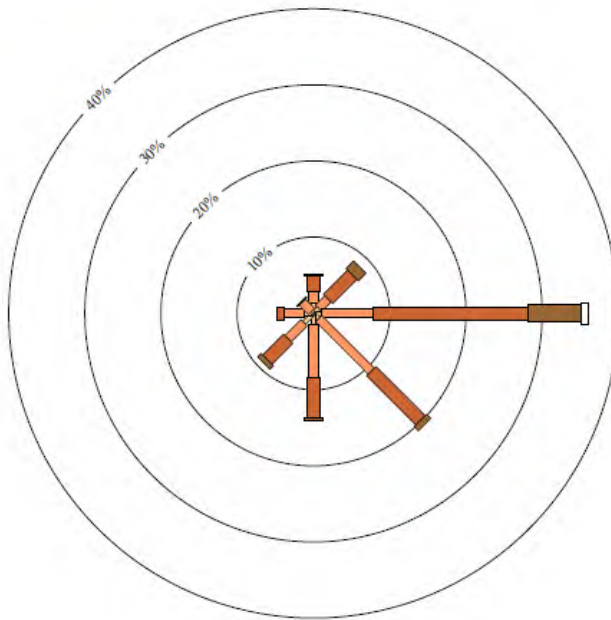
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Figure 8: Wind Rose (January – 9am)

Rose of Wind direction versus Wind speed in km/h (01 May 1996 to 11 Aug 2018)

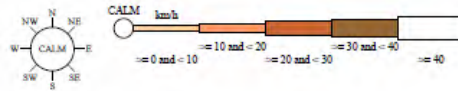
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GINGIN AERO

Site No: 009178 • Opened Jan 1968 • Still Open • Latitude: -31.4628° • Longitude: 115.8642° • Elevation 73m

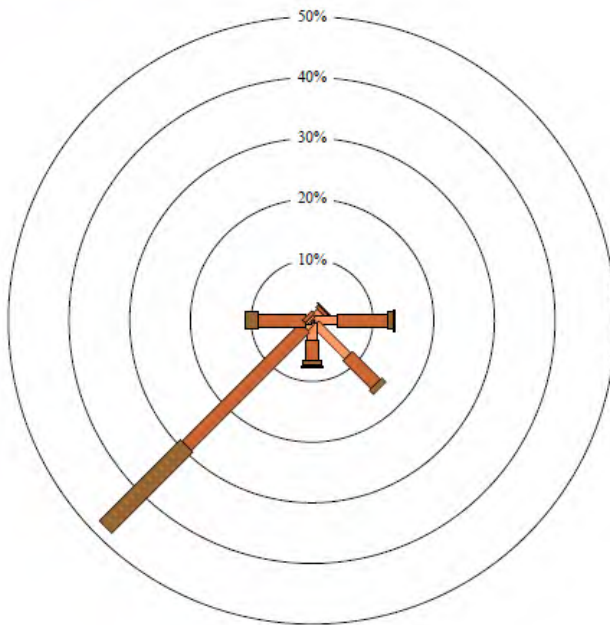
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Figure 9: Wind Rose (January – 3pm)

Rose of Wind direction versus Wind speed in km/h (01 May 1996 to 11 Aug 2018)

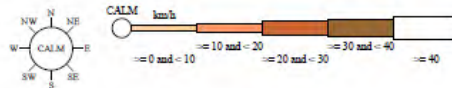
Custom times selected, refer to attached note for details

GINGIN AERO

Site No. 009178 • Opened Jan 1968 • Still Open • Latitude: -31.4623° • Longitude: 115.8642° • Elevation 73m

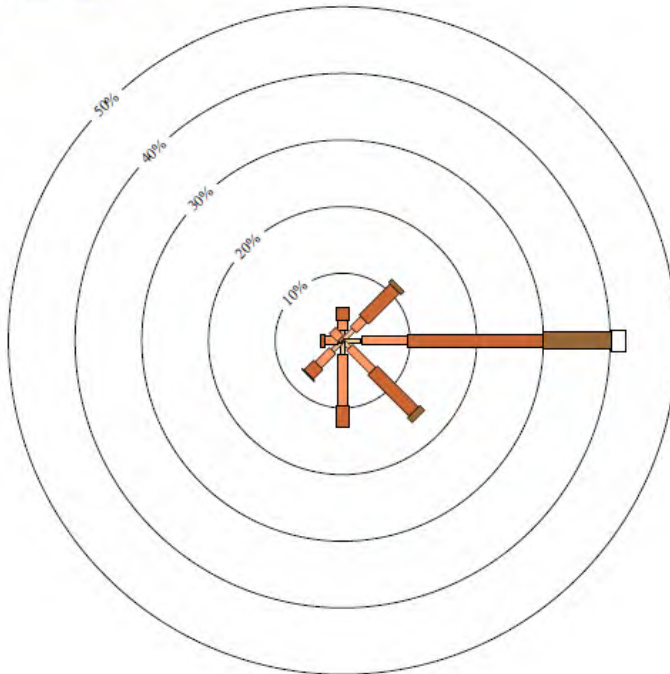
An asterisk (*) indicates that calm is less than 0.5%.

Other important info about this analysis is available in the accompanying notes.



9 am Feb
597 Total Observations

Calm *



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Figure 10: Wind Rose (February – 9am)

Rose of Wind direction versus Wind speed in km/h (01 May 1996 to 11 Aug 2018)

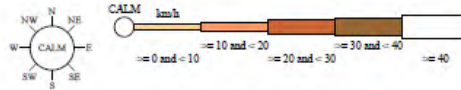
Custom times selected, refer to attached note for details

GINGIN AERO

Site No: 009178 • Opened Jan 1968 • Still Open • Latitude: -31.4628° • Longitude: 115.8642° • Elevation 73m

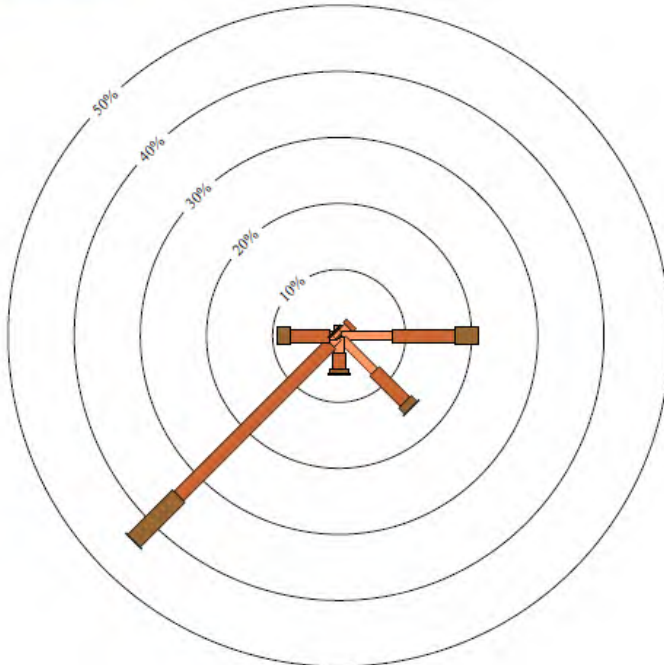
An asterisk (*) indicates that calm is less than 0.5%.

Other important info about this analysis is available in the accompanying notes.



3 pm Feb
600 Total Observations

Calm *



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Figure 11: Wind Rose (February – 3pm)

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