



Bushfire Assessment

Planning Proposal

Danjera Dam Camping Area

Shoalhaven City Council

13 December 2018

(Ref: 18047)

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Executive summary

Objective

This Bushfire Assessment Report was commissioned by Shoalhaven City Council to inform a Planning Proposal seeking zone modifications to allow formalisation of a camping area at Danjera Dam, Yalwal. The purpose was to assess the bushfire hazard and risk and recommend bushfire protection measures commensurate with the risk to achieve compliance with the relevant specifications and requirements for protection against bushfires.

Proposal

The proposal seeks to permit the use of the land for primitive camping at the Danjera Dam Camping Area through formalising the use by creating an improved camping facility within a safe and managed environment. The bushfire risk is a critical consideration behind the need for improvements at the site. Zone modifications are required to submit a development application to construct facilities that will provide a safe camping environment and one that will satisfy bushfire protection legislation.

Compliance with legislation and policy

A Planning Proposal on bushfire prone land must have regard to the *Environmental Planning and Assessment Act 1979* Section 9.2 Ministerial Direction No. 4.4 – ‘Planning for Bush Fire Protection’, which calls up the NSW Rural Fire Service guideline document ‘*Planning for Bushfire Protection 2006*’ and related policy including the NSW Rural Fire Service ‘*Fast Fact 1/08 Holiday Parks*’.

This report demonstrates that the Planning Proposal can comply with the above legislation and policy with recommendations ensuring a land use and operation that can manage the bushfire risk to an acceptable level, making the proposal compatible with the surrounding environment.

Bushfire environment

The subject land is surrounded by vast expanses of bushland including National Parks estate. It is these bushland areas that act as the bushfire threat to the subject land and any future development. The Shoalhaven Bushfire Risk Management Plan (SBMC 2010) has mapped the regions eventful bushfire history reflecting the risk presented to the subject land. The risk assessment of the proposal would differ to the existing situation as a future development will have compliant bushfire protection measures.

Measures to achieve compliance

Bushfire protection measures to address the risk have been recommended to achieve compliance with the legislation and policy. The measures to achieve compliance consist of:

- An onsite refuge building to be located to ensure that it is not impacted by more than 10 kW/m² of radiant heat in accordance with the performance criteria of PBP.

- Management of the APZ and campground to comply with an Inner Protection Area (IPA) standard.
- Improvements to the campground access road leading off Yalwal Road, consisting of widening where required to ensue two-way access for fire-fighting vehicles and other vehicles.
- Emergency fire trail to the south of the campground leading back up the hill to Yalwal Road.
- Perimeter fire trail around the campground as well as new/improved access roads throughout the camping and day use areas.
- Water tanks specifically for fire-fighting to be provided at the refuge building. Fire-fighting infrastructure (e.g. pump and hoses) is also be provided to allow the caretaker and occupants to utilise the water supply.
- Preparation of a 'Bushfire Emergency Management and Evacuation Plan' based on the following key principles:
 - Training for caretaker to monitor conditions, liaise with fire authorities and execute the plan. The caretaker will be responsible for the plan and the campers welfare and will be trained in the operations of the plan as required by the guidelines.
 - Closure of the campground on days of extreme or catastrophic fire danger, or if a fire is within the locality with the potential to threaten the property.
 - Emphasis on closure and safe evacuation of the campground well in advance of fire impact on the campground of access roads used for evacuation.
 - Option for 'last resort' shelter in place in the onsite refuge building with compliant asset protection zones and building construction standards.
 - The refuge building will be used and maintained as a camp kitchen and recreation space, and will be integrated with the caretakers quarters and the amenities building. The design of the building will be based on the principles within the document 'Design and Construction of Community Refuge Buildings' prepared by the Australian Building Codes Board in 2014 in response to a recommendation of the Vic 2009 fires Royal Commission.

Conclusion

The report concludes that the Planning Proposal together with the recommended bushfire protection measures satisfies the specifications and requirements of Ministerial Direction No. 4.4, 'Planning for Bushfire Protection 2006' and 'Fast Fact 1/08 Holiday Parks'.

1 Introduction

1.1 Background

Shoalhaven City Council commissioned Peterson Bushfire to prepare a Bushfire Assessment report to accompany a Planning Proposal seeking zone modifications to allow formalisation of a camping area at Danjera Dam, Yalwal. This report addresses the requirements for assessment of Planning Proposals involving bushfire prone land, namely the *Environmental Planning and Assessment Act 1979* Section 9.2 Ministerial Direction 4.4 – ‘Planning for Bush Fire Protection’.

1.2 Location of subject land

The land subject to the Planning Proposal contains the Danjera Dam Camping Area and associated access roads and day use area, located towards the western end of Yalwal Road, Yalwal as shown on Figure 1. The subject land is comprised of three lots (Lot 1, 4 and 5 DP 252335), with the camping area and day use area located within Lot 4, and the associated access roads located in Lots 1 and 5. The land is bound by privately owned lands to the west, National park estate to the north, land owned by Nowra Local Aboriginal Land Council and the Crown to the south, and Danjera Dam to the west.

1.3 The proposal

The proposal seeks modifications to the zone to permit the use of the land for primitive camping and allow development to improve the site. The Danjera Dam Camping Area is an existing campground that has been operating for many years and provides a free and basic camping experience and day use access to Danjera Dam. There is limited daily supervision or management, and camping is largely unregulated, often leading to high numbers in peak times (primarily during summer months), environmental degradation, and anti-social behaviour. It is proposed to formalise the use by creating an improved camping facility within a safe and managed environment. The bushfire risk to the existing operations is recognised by Council and is a critical consideration behind the need for the proposed improvements at the site. Planning permission is required in order to submit a development application to construct facilities that will provide a safe camping environment and one that will satisfy bushfire protection legislation.

Figure 2 shows all the components of the proposal, and Figure 3 shows the layout of the campground. Overall, the proposal consists of the following:

- Camping area:
 - Confined to one central area and restricted to 45 tent sites,
 - Camp kitchen and recreation building that doubles as a bushfire refuge building with capacity to cater for approximately 160 people,
 - Caretakers lodge and office,

- Amenities,
- Access roads, recreation areas and associated infrastructure.
- Day use area:
 - Parking,
 - Boat ramp and jetty,
 - Access roads.
- Associated works:
 - Access road improvements,
 - Bridge replacement,
 - Additional water tanks for fire-fighting,
 - Closing all other informal camping areas and remediation.

The design of the proposal is a direct function of bushfire protection requirements (refer to Section 2). The bushfire protection strategy upon which the design was configured is outlined below:

- Restrict camping numbers to a manageable level, within one campground where evacuation can be controlled and fire response coordinated more effectively.
- Provide an onsite bushfire refuge building within the campground that can accommodate all campers. The refuge will have a compliant asset protection zone (APZ).
- Provide onsite management by way of a caretaker. This person will be responsible in facilitating the Bushfire Emergency and Evacuation Plan.
- Improve access roads to ensure perimeter protection to the campground, adequate passing opportunities along the main access road, and alternate access back to Yalwal Road.

Details off the bushfire protection strategy are discussed further in this report (refer to Section 4).



Legend

- Subject Land
- Day Use Area
- Roads/Tracks
- Proposed Campground

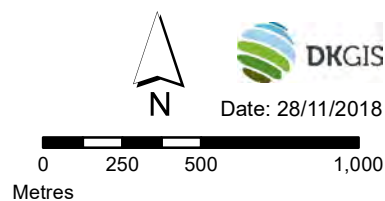


Figure 1: The Location of the Subject Land

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Dept. Finance, Services & Innovation 2017

2 Assessment requirements

The subject land and adjoining properties are identified as 'bushfire prone land' on the Shoalhaven Bushfire Prone Land Map as shown in Figure 4. When investigating a Planning Proposal on bushfire prone land, submissions must have regard to Section 9.2 Direction 4.4 – 'Planning for Bush Fire Protection' of the *Environmental Planning and Assessment Act 1979*. The objectives of Direction 4.4 are:

- *To protect life, property and the environment from bushfire hazards, by discouraging the establishment of incompatible land uses in bushfire prone areas; and*
- *To encourage sound management of bushfire prone areas.*

Direction 4.4 instructs councils on the bushfire matters which need to be addressed when drafting and amending Local Environmental Plans (LEP). They are as follows:

- *A draft LEP shall:*
 - *have regard to the document Planning for Bushfire Protection 2006;*
 - *introduce controls that avoid placing inappropriate developments in hazardous areas; and*
 - *ensure that bushfire hazard reduction is not prohibited within the asset protection zone.*
- *A draft LEP shall, where development is proposed, comply with the following provisions, as appropriate:*
 - *provide an asset protection zone incorporating at a minimum:*
 - *an Inner Protection Area bounded by a perimeter road or reserve which circumscribes the hazard side of the land intended for development and has a building line consistent with the incorporation of an APZ, within the property, and,*
 - *an Outer Protection Area managed for hazard reduction and located on the bushland side of the perimeter road.*
 - *for infill development (that is development within an already subdivided area), where an appropriate APZ cannot be achieved, provide for an appropriate performance standard, in consultation with the NSW Rural Fire Service. If the provisions of the draft LEP permit Special Fire Protection Purposes (as defined under Section 100B of the Rural Fires Act 1997), the APZ provisions must be complied with,*
 - *contain provisions for two-way access roads which links to perimeter roads and/or to fire trail networks,*


- *contain provisions for adequate water supply for fire-fighting purposes,*
- *minimise the perimeter of the area of land interfacing the hazard which may be developed,*
- *introduce controls on the placement of combustible materials in the Inner Protection Area.*

The need for Planning Proposals to comply with '*Planning for Bushfire Protection 2006*' (referred to as PBP throughout this report) is called up by Direction 4.4. The Direction 4.4 provisions are specified within PBP as well. The relevant sections of PBP as they apply to the proposal are summarised below:

- PBP Section 2.1 – describes the submission requirements for Planning Proposals. The requirements do not differ from Direction 4.4.
- PBP Section 4.2 – outlines the specific objectives (Section 4.2.3) and assessment requirements (Section 4.2.7) for Special Fire Protection (SFPP) Purpose developments. The use of the land 'tourist accommodation' (campground) is defined as SFPP development in accordance with Section 4.2.6 and RFS document '*Fast Fact 1/08 Holiday Parks*'.
- The PBP specific objectives are to:
 - provide for the special characteristics and needs of occupants. Unlike residential subdivisions which can be built to a construction standard to withstand the fire event, enabling occupants and fire fighters to provide property protection after the passage of the fire, occupants of SFPP developments may not be able to assist in property protection. They are more likely to be adversely affected by heat while being evacuated.
 - provide for safe emergency evacuation procedures. SFPP developments are highly dependent on suitable emergency evacuation arrangements, which require greater separation from bushfire threats. During emergencies, the risk to fire-fighters and other emergency services personnel can be high through prolonged exposure, where door-to-door warnings are being given and exposure to the bushfire is imminent.



Legend

 Subject Land

Bushfire Prone Land

 Vegetation
Category 1

 Roads/Tracks

Figure 4: Bushfire Prone Land



Date: 28/11/2018

0 250 500 1,000
Metres

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Dept. Finance, Services & Innovation 2017

3 Bushfire environment

This section characterises the environment surrounding the subject land that gives rise to the bushfire threat and risk.

3.1 Immediate hazard surrounding

An assessment of the hazard immediately surrounding the campground is necessary to determine the required bushfire protection measures such as asset protection zone dimension. The hazard is a combination of vegetation and slope over a distance of at least 100 m from the development boundary, which is defined as the proposed refuge building as shown on Figure 5.

The vegetation surrounding the campground and day use area has been mapped as the Coastal Valley Grassy Woodland vegetation formation, and has been identified as the Illawarra Lowlands Grassy Woodland Critically Endangered Ecological Community (CEEC). An ecological survey of the subject land by Council has resulted in the vegetation classification of woodland, as presented in the technical report 'Danjera Dam – Strategic Environmental Constraints Report' (SCC 2017). Photographs of the woodland surrounding the campground are included in Appendix 1.

The campground is situated in a gully such that the woodland surrounding the campground to the north, east and south is situated on moderate to steep upslopes. The upslope has been measured to be a minimum gradient of 9 degrees using a 2 m contour layer as shown on Figure 5. The foreshore to the west of the campground has a moderate (5 -10 degrees downslope) to steep (10-15 degrees downslope) gradient, although the length of fall is limited to the banks along the waters edge and is sparsely vegetated.

3.2 Bushfire threat

The subject land is surrounded by bushland for many kilometres in all directions comprising predominantly of National Park estate. It is this bushland that acts as the threat to the subject land that must be addressed as part of a future development proposal.

According to the Shoalhaven Bushfire Risk Management Plan (SBMC 2010), the surrounding area has an eventful fire history with many recorded fires.

3.3 Bushfire risk

Assessing the impact of bushfire is better addressed by measuring risk. Bushfire risk is defined (NSW Rural Fire Service 2008) as the chance of a bushfire igniting, spreading and causing damage to assets of value. Therefore, risk is analysed not only in terms of ignition potential and fire spread, but also factors contributing to fire control and response. The Shoalhaven Bushfire Risk Management Plan (SBMC 2010) does not include the existing Danjera Dam Camping Area as an asset, therefore an existing risk ranking is not available to analyse. Notwithstanding, the risk assessment of a new campground would differ in result as a new development will have

compliant bushfire protection measures in accordance with PBP, effectively reducing the risk level by lowering the consequence of impact through passive and active measures such as asset protection zones, building construction standards, water supply for fire-fighting, access for fire control, and emergency and evacuation management. Required measures to achieve compliance are discussed in the following Section 4 – ‘Addressing Compliance’.

The risk to the campground is also modified by Danjera Dam forming a large mitigation feature along the western interface, consisting of a fuel free area of at least 160 m wide. The Shoalhaven Bushfire Risk Management Plan (SBMC 2010) states that the problematic fire scenario in the region is under north-westerly winds during the drier, hotter months. Danjera Dam would protect the campground from direct impact from a landscape-wide fire from the westerly direction. Spotting over the dam would create new fires within the subject land surrounding the campground, that would run eastwards up the ridgeline and away from the campground.



Legend

- | | | |
|----------------------|-----------------------------|-----------------------------|
| Contour - 2m | Caretakers Lodge and Office | Slope Assessment Area |
| Emergency Fire Trail | Refuge/Recreation Space | Vegetation Assessment Area |
| Amenities | Road | Asset Protection Zone - 30m |
| Camp Access Road | | |
| Camp Site | | |



Figure 5: Bushfire Hazard Analysis and Asset Protection Zone.

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Dept. Finance, Services & Innovation 2017

4 Addressing compliance

This section details how compliance with the assessment requirements listed in Section 2 is addressed. The response to requirements is set-out following the structure of Direction 4.4, followed by PBP. There is reiteration of requirements amongst the instruments/policy; in these cases, the relevant subsection is referred to for response.

4.1 Direction 4.4

The objectives of Direction 4.4 can only be satisfied once the provisions are achieved. Demonstration of achieving the provisions is provided below. A statement of how the objectives are achieved is listed below also:

“To protect life, property and the environment from bushfire hazards, by discouraging the establishment of incompatible land uses in bushfire prone areas”

The intention of the objective is to avoid a development outcome that is faced by or poses a risk that cannot be managed to an acceptable level. The assessment of ‘incompatible’, ‘inappropriate’ and ‘acceptable’ is a subjective one, and one that is not defined within the legislation or related policy.

To guide an assessment, reference should be made to the measures specified by ‘Planning for Bushfire Protection 2006’ (see Section 4.2), such as the ability to establish and maintain an adequate APZ, and the assurance of acceptable access and evacuation.

The analysis within this report demonstrates that the proposed use at the site will be faced by a risk that can be managed to an acceptable level by implementing the recommendations therefore making future development compatible with the surrounding environment. Most notably, the objective of the proposal is to formalise an existing use that is currently unregulated, and make a vast improvement to the level of bushfire protection compared to the existing situation. It is safe to say that nearly all primitive campgrounds in bushland settings face bushfire risk related to evacuation and emergency management. The proposed use has been designed to address this risk.

It is concluded that the proposed campground and day use is not considered incompatible with the surrounding bushfire prone area. Compliant passive bushfire protection measures, coupled with emergency and evacuation procedures designed to address the bushfire risk, produces a use not incompatible with the surrounding environment, and one that is not dissimilar to other bushland campgrounds across the region.

“To encourage sound management of bushfire prone areas”

The recommended bushfire protection measures demonstrate sound management of the subject land for the intended use.

The provisions and how they are to be addressed are as follows:

“have regard to Planning for Bushfire Protection 2006”

Addressing this provision is detailed in the following Section 4.2.

“introduce controls that avoid placing inappropriate developments in hazardous areas”

The proposed use is not considered inappropriate. Controls (bushfire protection measures) will be set in place commensurate with the level of risk for a future development proposal. These controls would comply with PBP as set out in Section 4.2.

The design is centered around controlling the spatial pattern of camping across the landscape coupled with a significant reduction in numbers. The primary control introduced to the site is restricting camping to the main campground and closing all other informal camping areas that are scattered over the subject land (refer to Figure 2). Numbers will be capped according to the limit of the onsite refuge building (160 persons).

“ensure that bushfire hazard reduction is not prohibited within the asset protection zone”

The campground and designated APZ will be confined to an area already cleared or highly disturbed from past camping activities.

“provide an asset protection zone incorporating at a minimum:

an Inner Protection Area bounded by a perimeter road or reserve which circumscribes the hazard side of the land intended for development and has a building line consistent with the incorporation of an APZ, within the property, and,

an Outer Protection Area managed for hazard reduction and located on the bushland side of the perimeter road”

The provision of a compliant APZ to the refuge building and tent sites is detailed in Section 4.2 and shown on Figure 5.

“for infill development (that is development within an already subdivided area), where an appropriate APZ cannot be achieved, provide for an appropriate performance standard, in consultation with the NSW Rural Fire Service. If the provisions of the draft LEP permit Special Fire Protection Purposes (as defined under Section 100B of the Rural Fires Act 1997), the APZ provisions must be complied with”

The proposal is not considered infill development. The APZ provisions are to be complied with.

“contain provisions for two-way access roads which links to perimeter roads and/or to fire trail networks”

The existing access roads (see Figure 6) will be improved to ensure compliance. The road network will include the existing Yalwal Road, main campground access, emergency fire trail, and perimeter trail around the campground. Addressing this provision is detailed in the following Section 4.2.

“contain provisions for adequate water supply for fire-fighting purposes”

The existing tank supply and fire-fighting infrastructure will be augmented commensurate with the proposed additional built form at the site. Addressing this provision is detailed in the following Section 4.2.

“minimise the perimeter of the area of land interfacing the hazard which may be developed”

This provision relates to larger developments. The proposal involves a small area with an existing bushland interface that is round in shape, hence limiting edge effects.

“introduce controls on the placement of combustible materials in the Inner Protection Area”

Section 4.2 details the how the site and APZ is to be maintained as an IPA.

4.2 Planning for Bushfire Protection 2006 (PBP)

The proposed use is defined by PBP as Special Fire Protection Purpose (SFPP) development. The PBP Specific Objectives for SFPP development are achieved by addressing the standards for bushfire protection. The standards consist of ‘Acceptable Solutions’ and corresponding ‘Performance Criteria’ for the provision of asset protection zones, access, services (water supply for fire-fighting) and emergency and evacuation planning.

Discussion on the standards and statements on how each protection measure can be complied with are listed in the following subsections.

4.2.1 Asset protection zones

Using the hazard parameters of vegetation and slope discussed in Section 3.1, a suitable APZ distance has been determined, and is indicated on Figure 5. The APZ allows an onsite refuge building to be located to ensure that it is not impacted by more than 10 kW/m² of radiant heat in accordance with the performance criteria of PBP. The refuge building will allow shelter in place for any campers during an emergency if safe offsite evacuation before the arrival of fire impact cannot be assured. When not used during an emergency, the refuge building will form part of the day-to-day operation of the campground.

The APZ was determined by an alternate solution via modelling using the NBC Bush Fire Attack Assessor V3.0. The only input change was the upslope underneath the vegetation in the north-east, east and south-east directions, whereby the slope is a minimum of 9 degrees upslope. The model output contained in Appendix 2 demonstrates that a 30 m APZ will prevent heat loads on the refuge building from exceeding 10 kW/m².

As shown on Figure 5, the refuge building has an APZ exceeding 30 m in the east direction, increasing in dimension in both the north and south directions whereby the upslope decreases in gradient. The APZ reaches over 75 m wide in the west direction towards the dam where vegetation along the foreshore will remain.

Although not a requirement of PBP, the 30 m APZ will offer protection (defendable space and perimeter protection) to the tent sites.

4.2.2 Vegetation management

The APZ is either currently in place or heavily disturbed. The APZ will require some vegetation management to achieve the performance requirements of an Inner Protection Area (IPA) as specified by PBP. The following guide can be used:

- **Canopy treatment:** The tree canopy is to be discontinuous with gaps between crowns of at least 2 to 5 m. Small clumps of trees can remain forming one larger crown providing larger gaps to the next adjacent crown of minimum 5 m is achieved.
- **Understorey treatment:** Shrubs, saplings and understorey vegetation should not be within the APZ.
- **Groundcover treatment:** Groundcovers such as grasses are to be regularly mowed or slashed to minimal height (i.e. 100 mm), and ground fuels are to be maintained in a minimal state by removing all dead vegetative material by raking and removing leaf litter and other fine fuels such as sticks and fallen dead-wood.

To achieve the above fuel management guidelines, it is expected that mature canopy trees can remain, as these already form an open and discontinuous canopy. Most vegetation removal would consist of Black Wattle (which have regenerated from past disturbance and now in a state of senescence) and shrubs, regenerating saplings and grass cover.

4.2.3 Access

Figure 6 shows the access to the subject land consists of Yalwal Road leading west from Nowra. The length of unsealed, one-way road is 15 km, with the last 3 km becoming a winding and steep road down to the Yarramunmun Creek crossing and the turn-off for the campground access road. The campground access road is approximately 700 m long from Yalwal Road. All roads are well maintained by Council and provide passing opportunities.

In appreciation of the one-way access through a bushfire prone area, the strategy of incorporating an onsite refuge will be relied upon for the campground use (refer to Section 4.2.5).

Improvements will be made to the campground access road leading off Yalwal Road. The improvements will consist of widening to 6.5 m to allow two-way access for fire-fighting vehicles and other vehicles, with an allowance for short constrictions down to 3.5 m (such as on steeply sloping land or between significant trees) providing sight lines can be achieved.

The trail to the south of the campground leading back up the hill to Yalwal Road will be maintained as a 4 m wide emergency fire trail.

The campground will have a 4 m wide perimeter fire trail as well as improved access roads throughout the camping and day use areas.

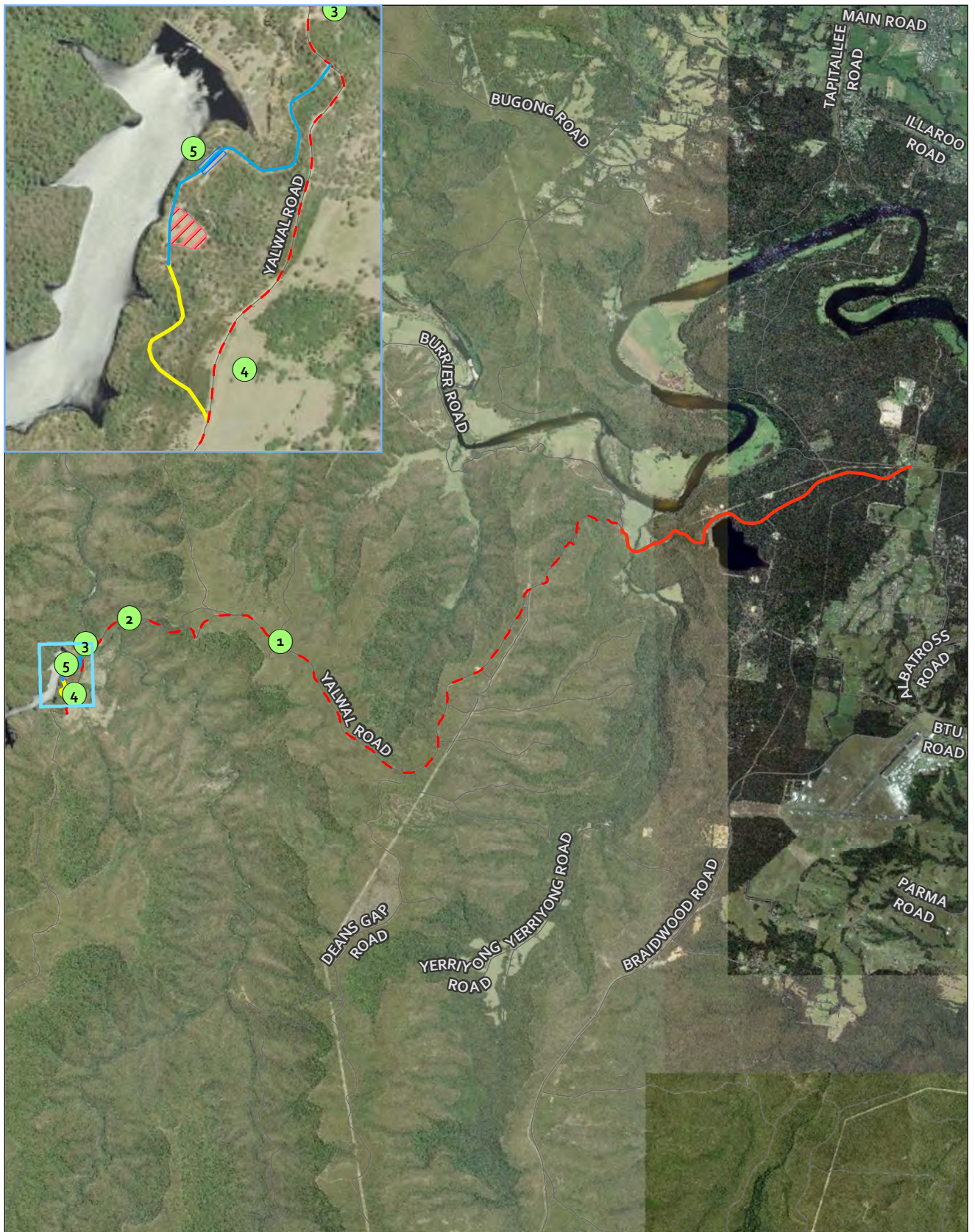
4.2.4 Water supply for fire-fighting

The existing water supply (Location F – Figure 3) will be improved, and tanks specifically for fire-fighting will be provided at the refuge building. Fire-fighting infrastructure (e.g. pump and hoses) will also be provided to allow the caretaker and occupants to utilise the water supply.

4.2.5 Emergency and evacuation planning

A Bushfire Emergency Management and Evacuation Plan will be required in accordance with the NSW Rural Fire Service guidelines '*A Guide to Development a Bushfire Emergency Management and Evacuation Plan*' (NSW RFS 2014). The plan will be required prior to Occupation Certificate. The recommended overriding principles of the plan are:

- Training for caretaker to monitor conditions, liaise with fire authorities and execute the plan. The caretaker will be responsible for the plan and the campers welfare and will be trained in the operations of the plan as required by the guidelines.
- Closure of the campground on days of extreme or catastrophic fire danger, or if a fire is within the locality with the potential to threaten the property.
- Emphasis on closure and safe evacuation of the campground well in advance of fire impact on the campground of access roads used for evacuation.
- Option for 'last resort' shelter in place in the onsite refuge building with compliant asset protection zones and building construction standards.
- The refuge building will be used and maintained as a camp kitchen and recreation space, and will be integrated with the caretakers quarters and the amenities building. The design of the building will be based on the principles within the document 'Design and Construction of Community Refuge Buildings' prepared by the Australian Building Codes Board in 2014 in response to a recommendation of the Vic 2009 fires Royal Commission.



Legend

- Photo Point
- Campground Access
- Emergency Fire Trail
- Yalwal Road - Sealed
- - Yalwal Road Unsealed
- Day Use Area
- Proposed Campground



Date: 29/11/2018

0 1 2 4
Kilometers

Figure 6: Access

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Dept. Finance, Services & Innovation 2017

5 Conclusion and recommendations

The information presented in this Bushfire Assessment Report demonstrates that the proposal to use the subject land as a campground and day use area can satisfy the Ministerial Direction No. 4.4 – ‘Planning for Bush Fire Protection’ and the requirements of ‘*Planning for Bush Fire Protection 2006*’. This is achieved by providing a vastly improved level of bushfire protection compared to the existing operation, by introducing controls such as an asset protection zone, refuge building, improved campground access, water supply for fire-fighting, and the preparation of a Bushfire Emergency Management and Evacuation Plan that will address the bushfire risk.

The proposal is not considered incompatible with the surrounding environment and bushfire risk. With sound bushfire management, the proposal can coexist within the bushland setting.

Bushfire protection measures for future development recommended within this report to achieve the requirements are listed below:

- An onsite refuge building to be located to ensure that it is not impacted by more than 10 kW/m² of radiant heat in accordance with the performance criteria of PBP.
- Management of the APZ and campground to comply with an Inner Protection Area (IPA) standard.
- Improvements to the campground access road leading off Yalwal Road, consisting of widening where required to ensure two-way access for fire-fighting vehicles and other vehicles.
- Emergency fire trail to the south of the campground leading back up the hill to Yalwal Road.
- Perimeter fire trail around the campground as well as new/improved access roads throughout the camping and day use areas.
- Water tanks specifically for fire-fighting to be provided at the refuge building. Fire-fighting infrastructure (e.g. pump and hoses) is also to be provided to allow the caretaker and occupants to utilise the water supply.
- Preparation of a ‘Bushfire Emergency Management and Evacuation Plan’ based on the following key principles:
 - Training for caretaker to monitor conditions, liaise with fire authorities and execute the plan. The caretaker will be responsible for the plan and the campers welfare and will be trained in the operations of the plan as required by the guidelines.
 - Closure of the campground on days of extreme or catastrophic fire danger, or if a fire is within the locality with the potential to threaten the property.

- Emphasis on closure and safe evacuation of the campground well in advance of fire impact on the campground of access roads used for evacuation.
- Option for 'last resort' shelter in place in the onsite refuge building with compliant asset protection zones and building construction standards.
- The refuge building will be used and maintained as a camp kitchen and recreation space, and will be integrated with the caretakers quarters and the amenities building. The design of the building will be based on the principles within the document 'Design and Construction of Community Refuge Buildings' prepared by the Australian Building Codes Board in 2014 in response to a recommendation of the Vic 2009 fires Royal Commission.



David Peterson



References

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Appendix 1 - Photographs



Photograph 1: Yalwal Road on the plateau - refer to Figure 6 for location



Photograph 2: Yalwal Road to Yarramunmun Creek - refer to Figure 6 for location



Photograph 3: Yalwal Road at Yarramunmun Creek crossing - refer to Figure 6 for location



Photograph 4: Yalwal Road east of campground where emergency trail connects - refer to Figure 6 for location



Photograph 5: Campground access road - refer to Figure 6 for location



Photograph 6: View of existing campground taken from eastern end towards Danjera Dam



Photograph 7: Foreshore between campground and Danjera Dam



Photograph 8: Northern perimeter of campground showing vegetation to be maintained as APZ



Photograph 9: Southern perimeter of campground showing vegetation to be maintained as APZ

Appendix 2 – APZ model report



NBC Bushfire Attack Assessment Report V3.0

AS3959 (2009) Appendix B - Detailed Method 2

Print Date: 29/11/2018

Assessment Date: 28/11/2018

Site Street Address: Danjera Dam, Yalwal

Assessor: David Peterson; Peterson Bushfire

Local Government Area: Shoalhaven

Alpine Area: No

Equations Used

Transmissivity: Fuss and Hammins, 2002

Flame Length: RFS PBP, 2001/Vesta/Catchpole

Rate of Fire Spread: Noble et al., 1980

Radiant Heat: Drysdale, 1985; Sullivan et al., 2003; Tan et al., 2005

Peak Elevation of Receiver: Tan et al., 2005

Peak Flame Angle: Tan et al., 2005

Run Description: APZ campground upslope

Vegetation Information

Vegetation Type: Woodland

Vegetation Group: Forest and Woodland

Vegetation Slope: 9 Degrees

Vegetation Slope Type: Upslope

Surface Fuel Load(t/ha): 10

Overall Fuel Load(t/ha): 15

Vegetation Height(m): 0

Only Applicable to Shrub/Scrub and Vesta

Site Information

Site Slope: 9 Degrees

Site Slope Type: Upslope

Elevation of Receiver(m): Default

APZ/Separation(m): 30

Fire Inputs

Veg./Flame Width(m): 100

Flame Temp(K): 1200

Calculation Parameters

Flame Emissivity: 95

Relative Humidity(%): 25

Heat of Combustion(kJ/kg): 18600

Ambient Temp(K): 308

Moisture Factor: 5

FDI: 100

Program Outputs

Category of Attack: LOW

Peak Elevation of Receiver(m): 7.65

Level of Construction: BAL 12.5

Fire Intensity(kW/m): 4998

Radiant Heat(kW/m2): 8.8

Flame Angle (degrees): 75

Flame Length(m): 5.99

Maximum View Factor: 0.097

Rate Of Spread (km/h): 0.64

Inner Protection Area(m): 30

Transmissivity: 0.816

Outer Protection Area(m): 0

