



## **Bushfire Assessment**

**In relation to**

**Australia Habitat & Taronga Wildlife Retreat**

**Taronga Zoo**

**Prepared for:**

**Taronga Conservation Society Australia**



**Project Number:** 15006  
**Report Issue:** FINAL\_1  
**Date:** February 2016

It is a breach of copyright for this document to be used by and/or for any persons/entities other than those for whom this document was prepared. Other than for the purpose for which this document has been prepared and subject to conditions prescribed under the Copyright Act no part of this document may in any form nor by any means be reproduced or stored in a retrieval system or transmitted without the prior written permission of ABAC Australian Bushfire Assessment Consultants.

**ABAC Australian Bushfire Assessment Consultants**

**Office:** Shop 5 (Ground Floor), Forster Tower, 12-16 Wallis Street, Forster NSW 2428

**Postal:** PO Box 34 Forster NSW 2428

**Web:** [www.bushfireconsultants.com.au](http://www.bushfireconsultants.com.au)

**Email:** [info@bushfireconsultants.com.au](mailto:info@bushfireconsultants.com.au)

**Tel:** +61 2 6555 5522



## Contents

---

1. INTRODUCTION .....	4
2. THE PROPOSAL .....	7
3. THE SITE OF THE PROPOSED TARONGA WILDLIFE RETREAT.....	9
4. PLANNING FOR BUSH FIRE PROTECTION .....	10
5. AS3959-2009 CONSTRUCTION OF BUILDINGS IN BUSHFIRE-PRONE AREAS.....	11
6. ASSESSMENT OF VEGETATION.....	13
7. ASSESSMENT OF SLOPE.....	16
8. BUSHFIRE ASSESSMENT .....	21
REFERENCES .....	26
ANNEXURE 1: CORE ENGINEERING ADVICE.....	27
ANNEXURE 2: LETTER OF SUPPORT (TCSA).....	30

## 1. Introduction

---

ABAC Australian Bushfire Assessment Consultants have been commissioned by Taronga Conservation Society Australia (TCSA) to carry out a bushfire assessment in relation to the proposed Australia Exhibit (AH) & Taronga Wildlife Retreat (TWR) project at Taronga Zoo.

The focus of this assessment is necessarily on the Taronga Wildlife Retreat (TWR) component of the project, proposed for use as guest accommodation.

Secretary's Environmental Assessment Requirements (SEARs) were issued for the project (Application Number SSD 7419) on 17 December 2015.

Item 6 of the Key Issues listed in the SEARs is entitled "Bushfire", with the requirement listed as:

*Demonstrate compliance with the relevant provisions of Planning for Bushfire Protection (PBP) 2006 and detail any bushfire management and/or mitigation measures.*

The scope of this assessment is limited to the consideration of the proposed TWR project.

The following matters, inter alia, are outside the scope of this assessment:

- maintenance of vegetation on the site;
- emergency evacuation procedures;
- compliance or otherwise of the works with the relevant provisions of the Building Code of Australia (BCA).

According to Mosman Council's bushfire prone land maps, the Taronga Zoo site is mapped as bushfire prone land.

A site inspection was carried out on 2 February 2015. Also on 2 February 2015, a meeting was held on site with officers of the NSW Rural Fire Service (RFS) in relation to the proposal and its relationship with the RFS document entitled *Planning for Bush Fire Protection 2006*.

Further site work was carried out on 6 May 2015 in the area of National Park to the eastern side of Bradleys Head Road in order to carry out an assessment of slope under vegetation within the area of National Park within 100 metres of proposed accommodation buildings forming part of the TWR project.

An additional meeting with RFS officers was held on-site on 7 August 2015.

### 1.1 Meetings with RFS Officers

The key points discussed during the meeting with RFS officers (David Boverman and Catherine Ryland) on 2 February 2015 are outlined below:

- The proposed TWR project is development for a special fire protection purpose as per Section 100B of the Rural Fires Act 1997;
- The nearest potential bushfire hazard vegetation is located to the east – within part of Sydney Harbour National Park on the opposite side of Bradleys Head Road;
- There is an apparent limited fire run from top of the rock face/cliff to east side of Bradleys Head Road (within the National Park) likely to impact on the site;
- Within the project area, the nearest accommodation building is about 24 metres west of existing stone wall to Zoo facing Bradleys Head Road;

- Vegetation on opposite side (east) of Bradley Head Road is about 25 metres further east of this stone wall.
- Mosman Fire Station is 1-2km from the site.
- The reception/entry for guests to the TWR accommodation is to be via internal means. Guests would first enter the Zoo site and would then access the reception area once inside the Zoo site.
- Taronga Zoo is a highly managed site.
- 24-hour security is present on site all year round.
- The Zoo has existing evacuation procedures allowing for the adoption of management in use procedures for the TWR project.
- In the event of a bushfire occurring within vegetation between the Taylors Bay foreshore and the eastern side of Bradleys Head Road, any evacuation of guests from the TWR would be proposed to be into the Zoo precinct to ensure that all guests of the facility can be accounted for. There is no proposal to evacuate any guests from the site to Bradleys Head Road in such an event.

The key points discussed during the meeting with RFS officers (Nika Fomin and Jason Maslen) on 7 August 2015 are outlined below:

- a) The potential exposure of entry doors and walkways along the eastern elevation of the accommodation building nearest to Bradleys Head Road. The main concern is radiant heat exposure from people evacuating the units in the event of a bushfire in vegetation to the eastern side of Bradleys Head Road.
- b) The option to relocate entry/egress from, in particular, the easternmost building, to the western side of that building as a means to mitigate issues associated with (a).
- c) The safety of people evacuating from the accommodation facility in the event of a bushfire. This can be grouped with other comments made by the RFS on site to do with the distance that people have to walk to reach the refuge (presently the Lecture Theatre plus the Centenary Theatre – when constructed), and the potential

for conflict between these people wanting to reach the refuge versus people evacuating the zoo overall.

- d) Any nearby resident objection. This is in the context of a recent proposal on Middle Head, when the residents objecting engaged a separate bushfire report to counter the bushfire report engaged by the proponent.

### *1.1.1 Discussion of key points*

#### *1.1.1.1 Meeting of 2 February 2015*

The easternmost accommodation building proposed for the TWR is about 45 metres west from vegetation (along the eastern side of Bradleys Head Road) with 50% of required APZ available as effective separation distance (existing roadway in Bradleys Head Road and the area of the site between the stone wall and the accommodation buildings).

The project raises some contextual issues with respect to the potential bushfire hazard to the east of the site both in terms of materials proposed – timber is proposed to promote ecologically sustainable development (ESD) principles – and the design objective to promote natural and cross-ventilation via incorporation of significant portions of openable windows to accommodation units.

The meeting discussed the ecotourism guidelines published by the RFS. These guidelines promote a strategy for compliance on the basis that buildings closer to the vegetation are treated as being expendable, with the emphasis placed on the ability for procedures to be implemented to relocate guests away from the vegetation within the National Park in the event of a bushfire. This raises the possibility of buildings being erected in a location where they might be subject to a Bushfire Attack Level (BAL) of BAL-29 or BAL-40, whereas a conventional tourist accommodation development would need to demonstrate that buildings would be subject to radiant heat flux no greater than 10kW/m<sup>2</sup>.

Any strategy in connection with the eco-tourism development must be reliant on management and, importantly, management of people on site. Significantly, this should include the adoption of an evacuation procedure that requires evacuation away from the hazard. The strategy also involves a degree of risk profiling given that the proposal is for ecotourism in suburbia rather than in the bush. As with any eco-tourism proposal, people going to any accommodation in a bushland setting are assumed to be going to the relevant area with an understanding that the location may be subject to a higher risk. This may involve a virtual reference design comparing the proposal, as eco-tourism to tourist accommodation.

The project planner advises that the proposed eco-tourism development is to operate as an ancillary component to the zoological gardens on the site. As the proposal possesses the elements required to fall within the definition of an “eco-tourist facility” for the purposes of Mosman Local Environmental Plan 2012, then the development is also considered as eco-tourism for the purposes of *Planning for Bush Fire Protection 2006*.

#### 1.1.1.2 Meeting of 7 August 2015

In relation to (a), the view of the RFS officers was that some form of radiant heat shielding should be in place along the eastern side of the building.

The proponent has advised that this is not favoured given the impact on the architectural, structural and ESD schemes for the proposal.

Another option is for sprinklers/sprayers to be applied to the walkway areas but this raises the issue that there would need to be a mechanism for the sprinklers to be triggered in the event of a bushfire (as opposed to how they might trigger in the event of a building/structural fire).

In relation to (b), this was discussed on site, with the reasoning for the design as proposed being that the western side of the buildings would be occupied by animal exhibits.

In relation to (c), it was reiterated on site that evacuation procedures for the retreat would be established for hours when the zoo is closed and there is no potential for conflict. If evacuation of guests was required during the day, when the zoo is open to the public, then those evacuation procedures would – as a matter of procedure – override any procedures for the retreat. There is also the additional aspect in relation to consideration of the existing procedures for emergency management/evacuation and the need for clear delineation between zoo emergency procedures (zoo open) and retreat emergency procedures (zoo closed).

In relation to the issue of egress arrangements for the easternmost accommodation buildings – nearest Bradleys Head Road – the client commissioned fire engineering advice from Core Engineering Group (see Annexure 1). This advice is discussed in detail in Section 8.6 of this document. A letter of support from the client – agreeing to implement the measures outlined in the consultant’s advice is at Annexure 2.

## 2. The Proposal

The project is shown on plans prepared by Cox Architecture entitled *Australia Habitat and Taronga Wildlife Retreat* (Revision 03 – DA Issue – dated 29/02/16).

As mentioned previously, the focus of this assessment is on the Taronga Wildlife Retreat (TWR) component of the project, proposed for use of guest accommodation purposes. The following plans have been considered for the purposes of the assessment.

Drawing	Title
AR-DA-1001	Location Plan
AR-DA-1200	Proposed Site Plan
AR-DA-1300	Scope of Works Plan
AR-DA-2101	Level A (RL51) Plan
AR-DA-2102	Level B (RL54) Plan
AR-DA-2103	Level C (RL57) Plan
AR-DA-2104	Level D (RL60) Plan
AR-DA-2105	Level E (RL63) Plan
AR-DA-116	Level 1 – Restaurant (RL67)
AR-DA-117	Level 2 – Terrace (RL71)
AR-DA-3101	Pod A Elevations
AR-DA-3201	Pod B Elevations
AR-DA-3301	Pod C Elevations
AR-DA-3401	Pod D Elevations
AR-DA-3501	Pod E Elevations
AR-DA-3601	Restaurant Elevations
AR-DA-3701	Guest Lodge Elevations

The TWR is proposed to be integrated into its setting within the Zoo site, with guests able to view exhibits within the Australia Habitat from their accommodation unit.

The setting of the TWR into the Australia Habitat Precinct is shown on the Landscape Concept Plan by Green and Dale Associates entitled *Taronga Zoo, Mossman, NSW* (Sheet SK01 dated 15 Feb 2016).

The accommodation component of the project – the TWR component – is development for a special fire protection purpose as defined under the provisions of Section 100B of the *Rural Fires Act 1997*.

A letter from the project planner, Urbis, to the client outlines the project as follows:

*The proposed 'Taronga Wildlife Retreat' aims to provide short-term, high quality accommodation, which responds to the special environmental and cultural values of the site.*

*The accommodation will be sensitively designed and managed to have minimal ecological and visual impact.*

*Taronga Zoo is also exploring a number of ways in which guests will have the opportunity to experience the wildlife of the Zoo, with a commitment to integrate wildlife experiences into the Taronga Wildlife Retreat. The proposed development will seek certification from Eco Tourism Australia upon operation and will be designed with the intent of achieving the criteria for certification.*

*Taronga Zoo anticipates that the Taronga Wildlife Retreat' will be occupied by:*

- *Tourists and domestic residents wishing to visit experience and stay within the zoo.*
- *Eco-tourists who are interested in innovative wildlife experiences that foster understanding, appreciation and conservation of wildlife and nature.*

- *International and interstate visitors looking for a unique nature/wildlife-based experience close to the city with stunning harbour views.*
- *Mid-week corporate and business events market looking for a different and inspiring venue.*
- *Sydney residents and domestic visitors looking for a special night or weekend away.*
- *Function organisers and wedding parties looking for a venue with on-site accommodation.*
- *Regional and interstate school excursions to the zoo where on-site accommodation and meals are available.*

*Some of the key Environmentally Sustainable Design initiatives likely to be incorporated into the design and construction of the proposed accommodation are as follows:*

- *Achievement of a 5 star Green Star rating.*
- *All stormwater from the development will be directed to the existing Zoo's water treatment plant for recycling. Water for Taronga Zoo's various ponds and moats is recycled water taken from the Zoo's water treatment plant.*
- *Where appropriate the development will include water efficient devices and systems to reduce the consumption of water.*
- *The development will be sensitively integrated with the natural bushland, heritage items, significant trees and sloping, harbour-side location of the site.*
- *The development will be carefully sited and designed with smaller building footprints to minimise visual impact and impact on the existing vegetation and landscape qualities of the site. The site will be revegetated where necessary.*
- *The proposed materials and design treatments will reiterate the natural character of the site.*
- *The proposed accommodation buildings will incorporate heat retaining materials to reduce energy consumption through heating and include large glazed areas to provide natural light. .*
- *The development will incorporate operational plans to minimise waste.*

*Given Taronga Zoo is seeking to provide short term accommodation to visitors on a commercial basis, is located in or adjacent to an area with special ecological and cultural features and will be designed and managed to minimise any adverse environmental and visual impacts, the proposed use falls within the definition of "eco-tourist facility" as defined in Mosman Local Environmental Plan 2012 (MLEP) as an eco-tourist facility.*

*According to MLEP:*

*"**eco-tourist facility** means a building or place that:*

*(a) provides temporary or short-term accommodation to visitors on a commercial basis, and*

*(b) is located in or adjacent to an area with special ecological or cultural features, and*

*(c) is sensitively designed and located so as to minimise bulk, scale and overall physical footprint and any ecological or visual impact.*

*It may include facilities that are used to provide information or education to visitors and to exhibit or display items.*

*Note. See clause 5.13 for requirements in relation to the granting of development consent for eco-tourist facilities*

*Eco-tourist facilities are not a type of tourist and visitor accommodation—see the definition of that term in this Dictionary."*

*Furthermore, the development will provide education opportunities to guests on wildlife conservation and environmental sustainability, which will foster their understanding and appreciation of the natural environment. There is also the potential to provide Aboriginal displays and information regarding native plant and animal species within the development.*

### 3. The Site of the proposed Taronga Wildlife Retreat

---

The Taronga Wildlife Retreat (TWR) is to be located within the Taronga Zoo site, within the central eastern part of the overall Zoo site. The area proposed for the location of the Taronga Wildlife Retreat is immediately downslope from the existing Taronga Centre, which is located adjacent to Bradleys Head Road.

The easternmost accommodation buildings proposed as part of the TWR is to be located approximately 24 metres west of the existing (heritage listed) stone wall which defines the eastern extent of the Zoo site adjacent to Bradleys Head Road.

The TWR project is to be constructed amongst exhibits that will form part of the Australia exhibit.

The land within the Zoo site itself, although containing some vegetation, is highly managed as part of the overall operation of the Zoo attraction.

The nearest potential bushfire hazard vegetation to the TWR project is located to the east, outside the Zoo site. The vegetation is located within part of the Sydney Harbour National Park, on the opposite side of Bradleys Head Road.

The following photographs show the area on and around the proposed Taronga Wildlife Retreat site.



**Photo 3.1** View of the heritage listed stone wall that lines the eastern extent of the Zoo site adjacent to Bradleys Head Road.

#### 4. Planning for Bush Fire Protection

---

In NSW, *Planning for Bush Fire Protection 2006* applies to all development on bushfire prone land. All development on bush fire prone land must satisfy the aim and objectives of *Planning for Bush Fire Protection 2006*.

The aim of *Planning for Bush Fire Protection* is:

*to use the NSW development assessment system to provide for the protection of human life (including firefighters) and to minimise impacts on property from the threat of bush fire, while having due regard to development potential, on-site amenity and protection of the environment.*

The objectives of *Planning for Bush Fire Protection* are to:

- i. afford occupants of any building adequate protection from exposure to a bush fire;*
- ii. provide for a defensible space to be located around buildings;*
- iii. provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent direct flame contact and material ignition;*
- iv. ensure that safe operational access and egress for emergency service personnel and residents is available;*
- v. provide for ongoing management and maintenance of bush fire protection*
- vi. measures, including fuel loads in the asset protection zone (APZ); and*
- vii. ensure that utility services are adequate to meet the needs of firefighters (and others assisting in bush fire fighting).*

The controls outlined in *Planning for Bush Fire Protection* are based upon six (6) key Bush Fire Protection Measures (BPMs):

- a) The provision of clear separation of buildings and bush fire hazards, in the form of fuel-reduced APZ (and their subsets, inner and outer protection areas and defensible space);



**Photo 3.2** View looking generally south along Bradleys Head Road. The vegetation within the National Park is to the left of the photo. The TWR is to be located to the right, behind the vegetation and stone wall.

- b) Construction standards and design;
- c) Appropriate access standards for residents, fire fighters, emergency service workers and those involved in evacuation;
- d) Adequate water supply and pressure;
- e) Emergency management arrangements for fire protection and/or evacuation; and
- f) Suitable landscaping, to limit fire spreading to a building.

*Planning for Bush Fire Protection* applies specific controls to development for residential development/subdivision and other development that is defined as development for a “special fire protection purpose” (SFPP) under the provisions of Section 100B of the *Rural Fires Act 1997* (NSW) and Clause 46 of the Rural Fires Regulation 2013.

The Taronga Wildlife Retreat project is development for a special fire protection purpose as defined under the provisions of Section 100B of the *Rural Fires Act 1997*.

The aim and objectives of *Planning for Bush Fire Protection* also apply to the proposed Taronga Wildlife Retreat project.

*Planning for Bush Fire Protection 2006* (and AS3959-2009) is adopted by reference for the purposes of Volume 1 of the Building Code of Australia 2015 (BCA 2015). NSW G5.2 (Protection) of Volume 1 of BCA 2015 applies to Class 2, 3 and 4 buildings or a Class 9 building that is development for a SFPP in a bushfire prone area. NSW Clause G5.2(a) provides that these buildings must comply with AS3959-2009 except for Section 9 Construction for Bushfire Attack Level FZ (BAL-FZ).

The BCA consultant has advised the client that the accommodation buildings within the Taronga Wildlife Retreat project will be Class 3 for the purposes of the Building Code of Australia (BCA).

## 5. AS3959-2009 Construction of Buildings in Bushfire-prone areas

---

The objective of AS3959-2009 (Construction of Buildings in Bushfire Prone Areas) is to prescribe particular construction requirements/details for buildings to reduce the risk of ignition from a bushfire while the fire front passes.

The Standard notes that it is first necessary to determine the Bushfire Attack Level (BAL) – by an assessment of the site and classified vegetation impacting on the site – before construction requirements can be determined.

AS3959-2009 uses six (6) BALs, each of which are based on heat flux exposure standards. Table 3.1 of AS3959-2009 provides a description of the characteristics of each BAL used in the Standard. In summary, these are:

- BAL – LOW: there is insufficient risk to warrant specific construction requirements;
- BAL – 12.5 (heat flux exposure  $\leq 12.5\text{kW/m}^2$ ): ember attack;
- BAL – 19 (heat flux exposure  $>12.5\text{kW/m}^2$  and  $\leq 19\text{kW/m}^2$ ): increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux;
- BAL – 29 (heat flux exposure  $>19\text{kW/m}^2$  and  $\leq 29\text{kW/m}^2$ ): increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux;
- BAL – 40 (heat flux exposure  $>29\text{kW/m}^2$  and  $\leq 40\text{kW/m}^2$ ): increasing levels of ember attack and burning debris ignited by windborne embers together with increasing heat flux with the increased likelihood of exposure to flames; and
- BAL – FZ (heat flux exposure  $>40\text{kW/m}^2$ ): direct exposure to flames from fire front in addition to heat flux and ember attack.

Section 2 of AS3959-2009 provides the basis for the determination of bushfire attack level (BAL) for a site (or building). The BAL is influenced by:

- the type of and extent of potential bushfire hazard vegetation (classified vegetation);
- the distance of a site (or building) from classified vegetation; and
- the slope of the land under the classified vegetation.

Where buildings are located within 100 metres of classified vegetation, the construction of those buildings is required to comply with the construction requirements applicable for the identified BAL.

As noted in the previous section, the BCA applies the construction requirements as per AS3959-2009 to a Class 3 building that is development for a SFPP. The accommodation buildings within the Taronga Wildlife Retreat project will be Class 3 for the purposes of the Building Code of Australia (BCA).

It has been identified that the Taronga Wildlife Retreat project is development for a SFPP. As such, the application of elements of the construction requirements as per AS3959-2009 is relevant.

## 6. Assessment of vegetation

---

The Taronga Zoo site contains a considerable amount of vegetation mainly comprising landscaping and retained vegetation within the larger Zoo complex. Overall, this vegetation comprises maintained vegetation, managed as part of the operational procedures of the Zoo. The vegetation comprises some larger and smaller areas of remnant vegetation, fragmented by the constructed pathways, retaining structures, enclosures/displays and other structures and infrastructure associated with the Zoo and located within the site.

The nearest potential bushfire hazard vegetation is located to the east – within part of Sydney Harbour National Park on the opposite side of Bradleys Head Road

The land within the adjacent National Park is subject to management by National Parks under the *Fire Management Plan – Sydney Harbour & Botany Bay (La Perouse Precinct) National Parks* (December 2004) (the FMP). The site of the TWR project is near the BH4 – Taylors Gully (Bradleys Head Reserve) in the FMP.

This vegetation within the portion of National Park adjacent to the location of the proposed TWR exists mainly as *open forest* from the eastern side of Bradleys Head Road to the western shore of Taylors Bay.

In the areas of National Park containing open forest within the BH4 Management Area, the FMP identifies approximately 1.26 hectares as a Strategic Fire Management Zone (SFMZ) and approximately 6.8 hectares as a Heritage Area Management Zone. The key actions for management of these areas are:

- within the SFMZ, to maintain fuel loads at <15T/hectare by manual clearing or prescribed burning; and
- within the HAMZ, exclude fire from, and avoid any disturbance to, Red-Crowned Toadlet sites and avoid any disturbance to Aboriginal sites.

There were no apparent signs of recent management of any vegetation within the area of National Park during the initial inspection on 2 February 2015 or the later field work on 6 May 2015.

The roadway in Bradleys Head Road is located between the TWR project and vegetation within the National Park. This provides a significant effective separation distance between the project site and any potential bushfire hazard vegetation.

The vegetation within the National Park to the east of the Zoo site, for a distance of 140 metres from the location of the TWR project, has been considered as open forest vegetation.

The following photos show the characteristics of areas of vegetation within the National Park.



Photo 6.1



Photo 6.2



Photo 6.3



Photo 6.4

## 7. Assessment of slope

---

As mentioned in the Introduction, further site work was carried out on 6 May 2015 in the area of National Park to the eastern side of Bradleys Head Road in order to carry out an assessment of slope under vegetation within the area of National Park within 100 metres of proposed accommodation buildings forming part of the TWR project.

The result of this field work is shown in Figure 7.1, which identified slope throughout three (3) transects to the east of the location of the TWR project.

Figures 7.2, 7.3 and 7.4 show a cross-section through each transect.



The maximum slope identified in each transect, within 100 metres of the TWR project is shown in Table 7.1.

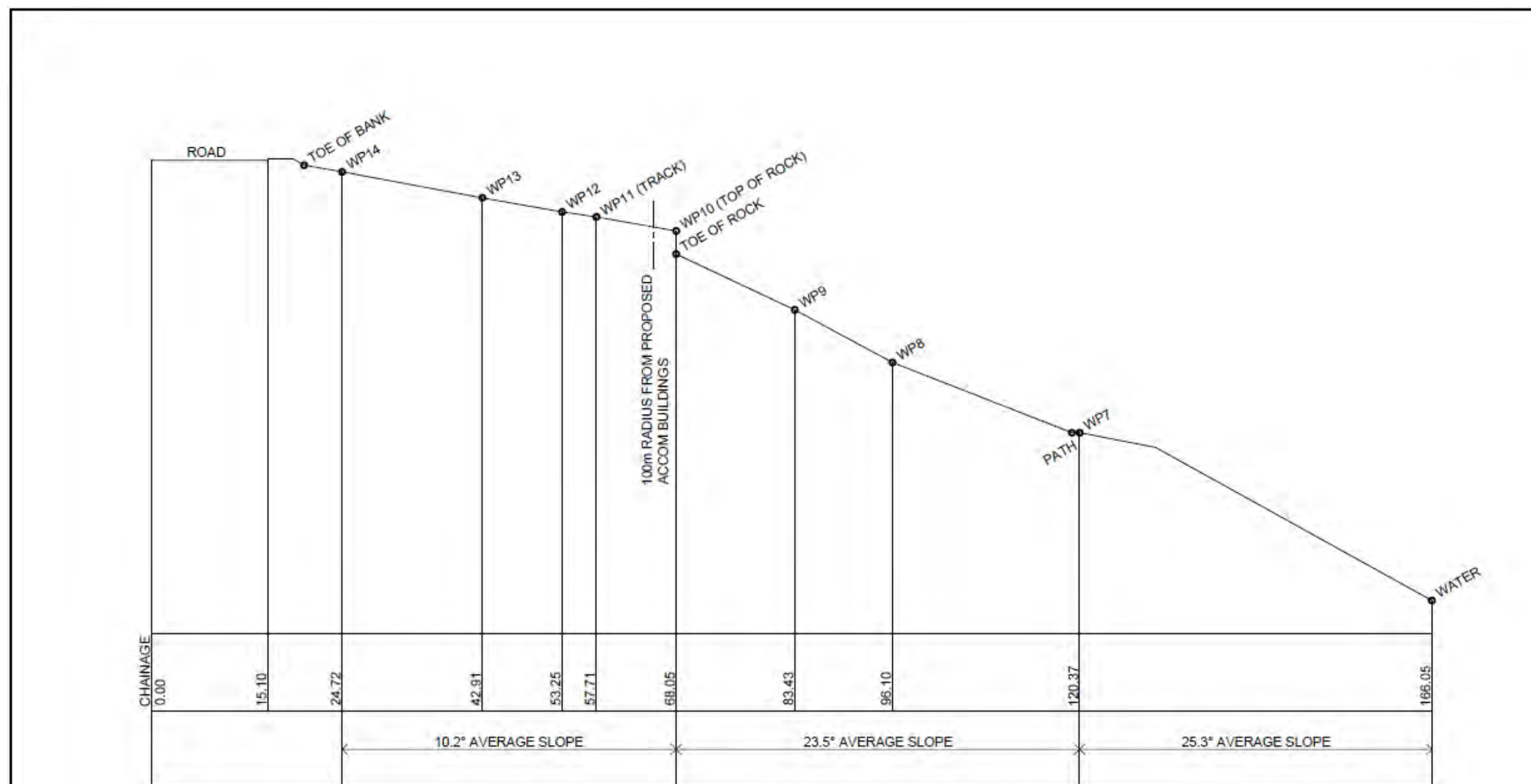
**Table 7.1 (Maximum Slope ≤100 metres from TWR Project)**

Transect	1	2	3
Slope	10.2° downslope	17° downslope	5° downslope

In terms of the worst case slope in relation to the TWR project, the determination of Bushfire Attack Level (BAL) for the easternmost accommodation building will be based on the maximum slope measured for Transect 2. It is to be noted, however, that the BAL for the southernmost accommodation building will be based on the maximum slope measured for Transect 3.

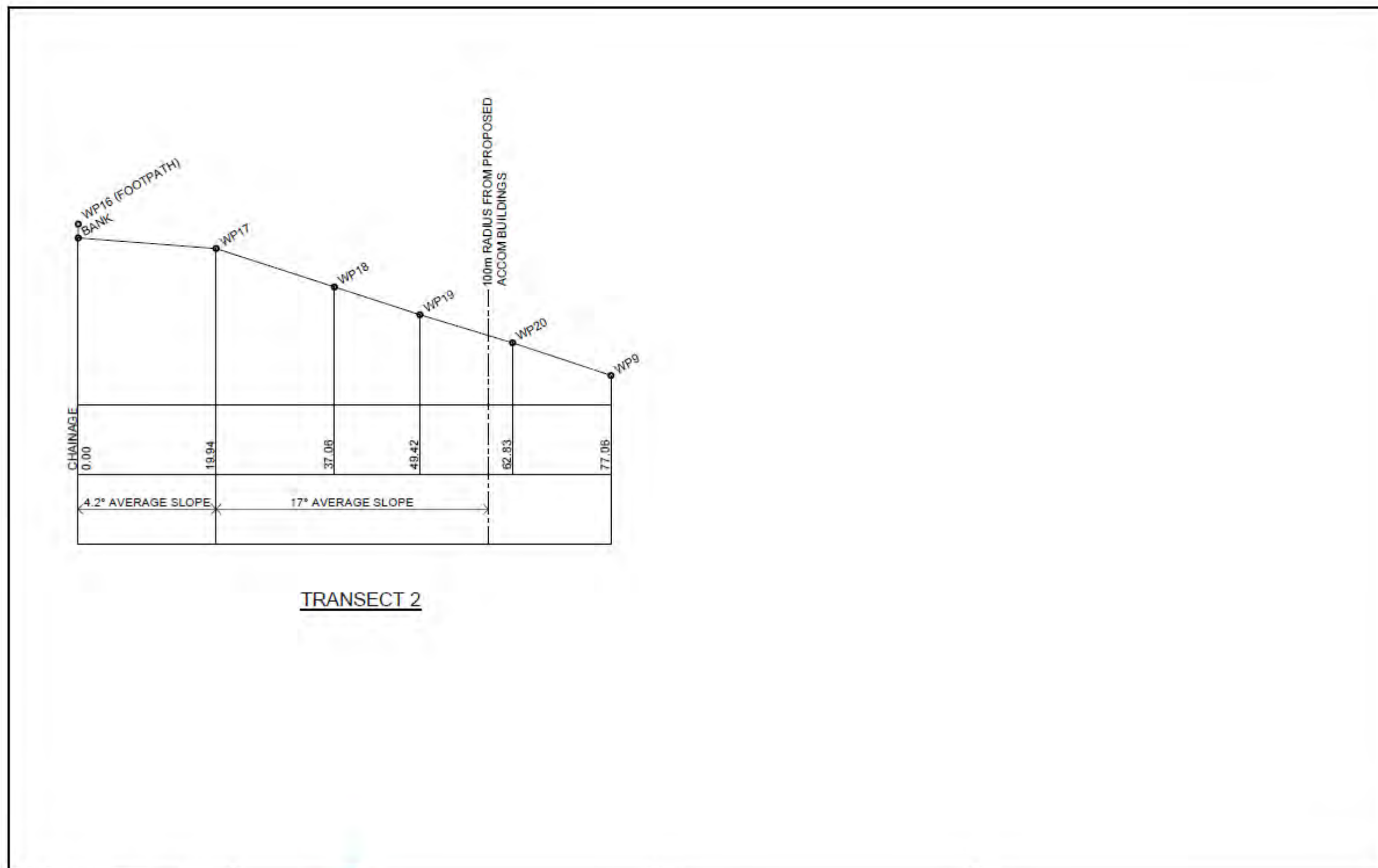


ISSUE	DESCRIPTION	DATE			CLIENT	TITLE		
A	PRELIMINARY	08/05/15	Phone 0407 221 488 www.bushfireconsultants.com.au simon@bushfireconsultants.com.au		TARONGA CONSERVATION SOCIETY AUSTRALIA	PLAN SHOWING 100m RADIUS		
B	FINAL	23/02/16			TARONGA WILDLIFE RETREAT	DRAWN WR	JOB 15006_B	SHEET S01



TRANSECT 1

ISSUE	DESCRIPTION	DATE	Australian Bushfire ASSESSMENT CONSULTANTS		CLIENT	TITLE		
A	PRELIMINARY	08/05/15		Phone 0407 221 488 www.bushfireconsultants.com.au simon@bushfireconsultants.com.au	TARONGA CONSERVATION SOCIETY AUSTRALIA	TRANSECT 1		
B	FINAL	23/02/18			TARONGA WILDLIFE RETREAT			
			DRAWN	JOB	SHEET	SCALE		
			WR	15006_B	S02	1:500 AT A3		



TRANSECT 2

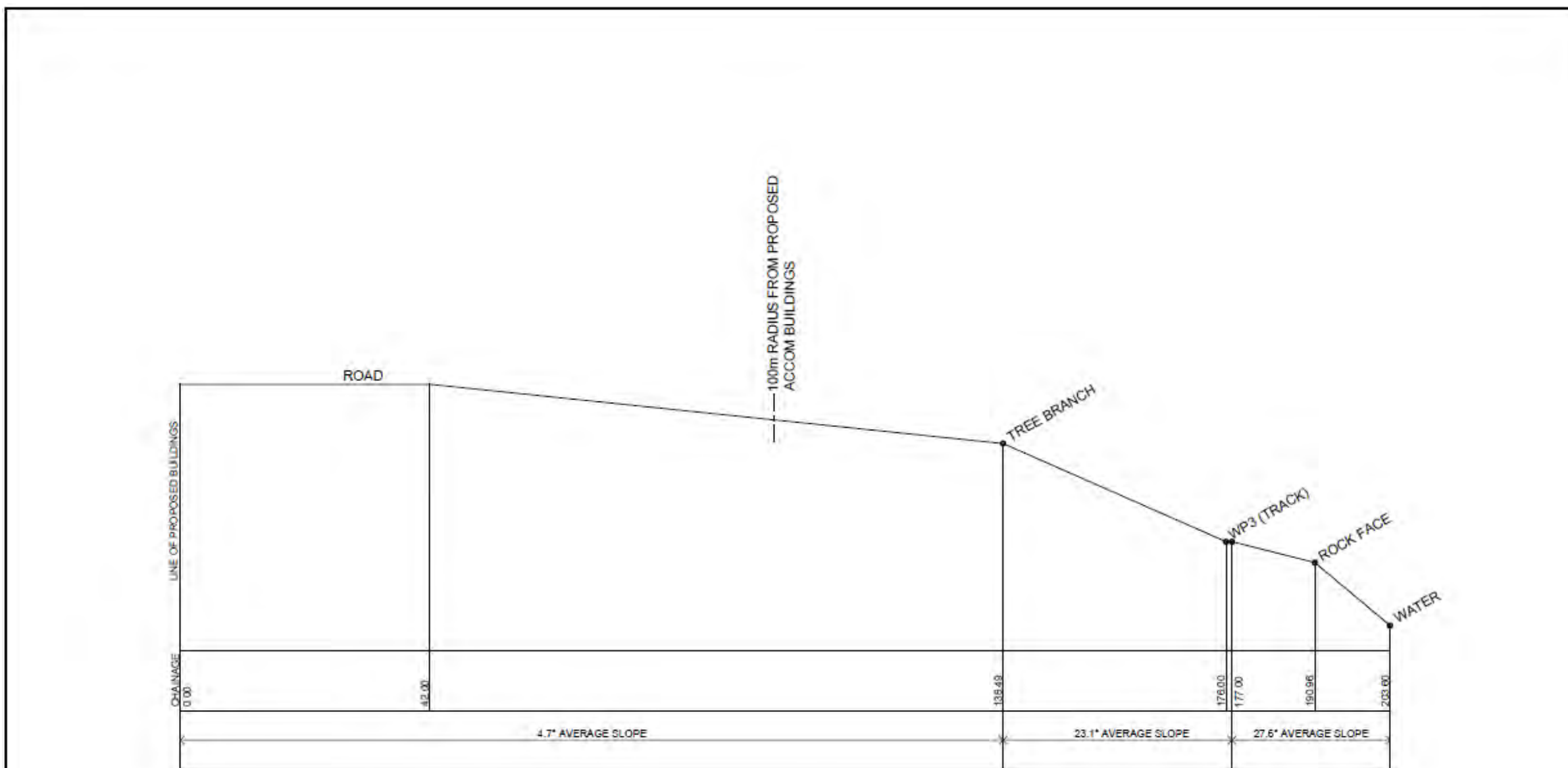
ISSUE	DESCRIPTION	DATE
A	PRELIMINARY	08/05/15
B	FINAL	23/02/16
B	FINAL	01/03/16



Phone 0407 221 488  
www.bushfireconsultants.com.au  
simon@bushfireconsultants.com.au

CLIENT	TARONGA CONSERVATION SOCIETY AUSTRALIA
PROJECT	TARONGA WILDLIFE RETREAT

TITLE			
TRANSECT 2			
DRAWN	JOB	SHEET	SCALE
WR	15006_B	S03	1:500 AT A3



TRANSECT 3

ISSUE	DESCRIPTION	DATE	Australian Bushfire ASSESSMENT CONSULTANTS		CLIENT	TITLE			
A	PRELIMINARY	08/05/15	Phone 0407 221 488 www.bushfireconsultants.com.au simon@bushfireconsultants.com.au		TARONGA CONSERVATION SOCIETY AUSTRALIA	TRANSECT 3			
B	FINAL	23/02/16			TARONGA WILDLIFE RETREAT				
					DRAWN	JOB	SHEET	SCALE	
					WR	15006_B	S04	1:750 AT A3	

## 8. Bushfire Assessment

---

The Bushfire Assessment for the TWR project is set out below.

### 8.1 The extent to which the development is to provide for setbacks including Asset Protection Zones

The proposed development incorporates the construction of the Taronga Wildlife Retreat, an eco-tourist facility within the confines of the Taronga Zoo site.

The site is located within the Mosman local government area. According to Table A2.3 of *Planning for Bush Fire Protection 2006*, the site is located in the Greater Sydney fire weather area and is subject to a fire danger index rating of 100.

The classification of vegetation and assessment of effective slope have been based on the following assumptions:

- The predominant vegetation classification(s) within a distance of 140 metres of the subject sites is classified as open forest.
- The effective slope of land under vegetation is:
  - >15-18° downslope (Transect 2)
  - >5-10° downslope (Transect 3).

According to Table A2.6 of *Planning for Bush Fire Protection 2006*, the Asset Protection Zones (APZs) that are required for the accommodation buildings for the TWR are:

- North-east (transect 2) 100 metres; and
- East/south-east (transect 3) 85 metres.

The location of the TWR in relation to the eastern boundary of the Zoo site and the vegetation hazard to the east of Bradleys Head Road is such that APZs cannot be contained within the eastern boundary of the Zoo site.

As the TWR is proposed as an eco-tourism development, the key issue then becomes the provision of a suitable refuge building that will be subject to a radiant heat flux of not greater than 10kW/m<sup>2</sup> on any part of the building.

In the event of a bushfire in vegetation to the east of the TWR, within that part of Sydney Harbour National Park between the eastern side of Bradleys Head Road and Taylors Bay, guests of the eco-tourist facility will be evacuated into the Zoo site to an emergency refuge building (and not towards Bradleys Head Road). The emergency refuge building(s) identified for guests of the TWR is the Lecture Theatre building or the Centenary Theatre (in construction and scheduled for completion in late 2016, prior to construction and occupation of the TWR project).

The emergency refuge building is located well in excess of 100 metres from any vegetation/hazard to the east of the TWR and will not experience a radiant heat level greater than 10kW/m<sup>2</sup> on any part of the building.

### 8.2 The siting and adequacy of water supplies for fire fighting

In terms of water supply for fire fighting, reticulated water is available to the site. The proposed TWR is subject to a detailed fire services hydraulic design to ensure compliance with AS2419. The accommodation buildings are also proposed to be sprinklered.

### 8.3 The capacity of public roads to handle increased volumes of traffic in the event of a bushfire emergency

Vehicular access to the site is via Bradleys Head Road.

The site is located in a highly urbanised setting and the public roads in the vicinity of the site have the capacity to handle traffic attributable to the TWR.

8.4 Whether or not public roads in the vicinity have two-way access

To the north of the site, Bradleys Head Road intersects with numerous roads within the road network throughout the suburb of Mosman.

Bradleys Head Road joins Athol Wharf Road at its southern end. Athol Wharf Road terminates in a turnaround area at the ferry terminal adjacent to the southern/south-western extent of the Zoo site.

8.5 The adequacy of arrangements for access to and egress from the development site for the purposes of an emergency response

Bradleys Head Road joins Military Road at its northern end. The length of Bradleys Head Road from the north-eastern corner of the Zoo site towards the north does not traverse bushfire prone land. The road network in relation to access to and egress from the site is adequate for the purposes of an emergency response.

8.6 The adequacy of bushfire maintenance plans and fire emergency procedures for the development site

Given the location of the TWR accommodation buildings in relatively close proximity to vegetation to the east of the site, evacuation procedures will be a critical component of the overall bushfire protection package for the site.

RFS Factsheet 1/14 'Ecotourism' provides that emergency management planning shall be provided which complies with Section 4.2.7 of PBP and shall address use/closure of the facility on extreme and catastrophic fire rating days. The closure of the site is not practical in relation to the Taronga Zoo site. The site is highly managed, subject to 24-hour security presence and provides a range of areas and buildings within the Zoo

site that could potentially be utilised as alternative refuge points for guests of the TWR in the event that the designated emergency refuge building was unsuitable for whatever reason.

In relation to the issue of egress arrangements for the easternmost accommodation buildings – nearest Bradleys Head Road – the client commissioned fire engineering advice from Core Engineering Group (see Annexure 1).

The advice from Core Engineering Group notes that:

*“the priority will be for occupants to evacuate safely prior to the onset of untenable conditions. The BAL levels and proposed construction methodology does not warrant occupants remaining in place; as such an earlier means of warning should be provided to afford potentially sleeping occupants as much time as necessary to reach the refuge area or similar in the event of a bushfire. Given the lack of fire detection that is appropriate for bushfire type incidents, in this instance Taronga Zoo has the benefit of having 24 hours on site security and management that deal with various types of emergencies. A bushfire potentially affecting the TWR would be an extension to the already comprehensive emergency procedures that exist. In order for any potential situation to be detected as early as possible it would be feasible to recommend some form of CCTV Cameras that are positioned at the high point of the function centre that would overlook the National Park and alert staff of a potential bushfire threat. This earlier notification coupled with an updated comprehensive emergency management plan will far exceed the benefit of upgrading the construction methodology or installing external suppression systems which may assist in protecting the buildings but will certainly have less effect than a system that alerts occupants to a fire threat before the onset of untenable conditions.”*

The advice recommends the positioning of CCTV cameras at the high point of the Taronga Centre/function centre directed to overlook the National Park. The purpose of this is to allow for monitoring of the area by 24 hours on site security staff in order to allow for early detection of any potential bushfire threat. The advice proposes this measure in combination with an updated comprehensive emergency management plan to provide for the early detection and alert to occupants of the TWR to enable them to be evacuated to the emergency refuge locations prior to onset of untenable conditions. A letter of support from the client – agreeing to implement the measures outlined in the consultant’s advice is at Annexure 2.

The Taronga Zoo site is subject to a range of emergency procedures. The proponent has advised that After Hours emergency procedures for the Zoo are to be updated prior to commissioning/occupation of the proposed retreat development in order that provision for the proposal is fully integrated into the emergency and evacuation procedures for the overall site.

8.7 The construction requirements to be used for building elements in the development

RFS Factsheet 1/14 ‘Ecotourism’ requires that sufficient APZs are provided to ensure that the dwelling (refuge building) will not experience a radiant heat level greater than 10kW/m<sup>2</sup>. RFS Factsheet 1/14 ‘Ecotourism’ also requires that refuge buildings are designed and sited in accordance with the principles listed in *Planning for Bush Fire Protection 2006* and constructed to the requirements for construction to BAL-12.5 as per AS3959-2009.

As mentioned previously, In the event of a bushfire in vegetation to the east of the TWR, within that part of Sydney Harbour National Park between the eastern side of Bradleys Head Road and Taylors Bay, guests of the eco-tourist facility will be evacuated into the Zoo site to an emergency refuge building (and not towards Bradleys Head Road). The emergency refuge building(s) for guests of the TWR is the Lecture Theatre building or

the Centenary Theatre (discussed in 8.1). The emergency refuge building(s) are located well in excess of 100 metres from any vegetation/hazard to the east of the TWR. The refuge building(s) will not experience a radiant heat level greater than 10kW/m<sup>2</sup> on any part of the building. The additional emergency refuge capacity that will be provided by the Centenary Theatre building, once constructed, will also be located well in excess of 100 metres from any vegetation/hazard to the east of the TWR.

In terms of the likely BALs for the TWR accommodation buildings, it was noted in Section 7 that the determination of BAL for the:

- easternmost accommodation building will be based on the maximum slope measured for Transect 2; and
- the BAL for the southernmost accommodation building will be based on the maximum slope measured for Transect 3.

For the purposes of identifying the BALs for the respective accommodation buildings, the buildings have been numbered as follows:

- North-western building                      Building A
- Central northern building                      Building B
- Eastern building                                      Building C
- South-eastern building                      Building D
- South-western building                      Building E

On this basis, the highest assessed BAL for the respective buildings are shown in Table 8.7.1 on the following page.

**Table 8.7.1**

Building	BAL
A	29
B	40
C	40
D	29
E	19

According to the note to Part A3.5 of *Planning for Bush Fire Protection*: “where more than one façade is exposed to a hazard, then the façade with the highest construction requirement is used to determine the appropriate level of construction. All other façades may be reduced by one level of construction unless that façade is also subject to the same bush fire attack level.” A corresponding clause is contained within Section 3.5 of AS3959-2009.

Tables 8.7.2 to 8.7.6 show the BALs applicable to the various elevations of the buildings on the basis of application of Part A3.5 of *Planning for Bush Fire Protection* and Section 3.5 of AS3959. Figure 8.7.1 shows the BALs for the respective elevations of the accommodation buildings.

**Table 8.7.2 – Building A**

Elevation	BAL
NE	29
SE	29
SW	19
NW	19

**Table 8.7.3 – Building B**

Elevation	BAL
N/NE	40
E/SE	40
SW	29
NW	29

**Table 8.7.4 – Building C**

Elevation	BAL
E/NE	40
SE	40
SW	29
N/NW	29

**Table 8.7.5 – Building D**


Elevation	BAL
N/NW	19
E/NE	29
S/SE	29
SW	19

**Table 8.7.6 – Building E**

Elevation	BAL
N/NE	19
SE	19
NW	12.5
SW	12.5



**FIGURE 8.7.1**

ISSUE	DESCRIPTION	DATE	 Phone 0407 221 488 www.bushfireconsultants.com.au simon@bushfireconsultants.com.au	CLIENT	TARONGA CONSERVATION SOCIETY AUSTRALIA			TITLE	PLAN OF BAL LEVELS		
A	PRELIMINARY	08/05/15		PROJECT	TARONGA WILDLIFE RETREAT			DRAWN	JOB	SHEET	SCALE
B	FINAL	23/02/16			WR	15006_B	S05	1:500 AT A3			
C	FINAL	01/03/16									

## References

---

NSW Rural Fire Service (2006)

*Planning for Bush Fire Protection.*

AS 3959, "Construction of buildings in bushfire-prone areas" (incorporating Amendments Nos. 1, 2 and 3), Standards Australia, 2009.

National Parks & Wildlife Service

*Fire Management Plan – Sydney Harbour & Botany Bay (La Perouse Precinct) National Parks* (December 2004)

## ANNEXURE 1: CORE ENGINEERING ADVICE



Core Engineering Group • Fire • Risk • Emergency Management

### CONSULTANTS ADVICE

<b>Project:</b>	Taronga Zoo Eco Retreat Accommodation	<b>Ref No.:</b>	S141588
<b>From:</b>	Sandro Razzi	<b>Date:</b>	30 <sup>th</sup> September 2015
		<b>Issue:</b>	Rev A

	Attention	Company	Email/Fax
<b>To:</b>	Paul McDonald	Compass Project Management	paul.mcdonald@compassprojects.net

**RE: Bushfire Assessment – Egress Management Proposal**

#### INTRODUCTION

This Consultant Advice has been prepared to provide comment on the proposed egress arrangement as a result of the issues identified by the Rural Fire Service (RFS) post review of the current bushfire report prepared by Australian Bushfire Assessment Consultants (ABAC) Draft\_3 dated June 2015, the following items of concern have been reported:

- a) The exposure of entry doors and walkways along the eastern elevation of the accommodation building nearest to Bradleys Head Road (BH Rd). Their concern is radiant heat exposure to people evacuating the units in the event of a bushfire in vegetation to the eastern side of BH Rd.
- b) The option to relocate entry/egress from, in particular, the easternmost building, to the western side of that building as a means to mitigate issues associated with (a).
- c) The safety of people evacuating from the accommodation facility in the event of a bushfire and the potential for conflict between these people wanting to reach the refuge vs people evacuating the zoo overall.

#### OBJECTIVES

The objective of this Consultant Advice Notice is to provide input into the concerns raised and make recommendations of how they can be addressed.

In relation to:

- a) RFSs view is that some form of radiant heat shielding should be in place along the eastern side of the building. An option for sprinklers/sprayers to be applied to the walkway areas was also flagged.
- b) This has been deemed not possible due to the western side of the buildings would be occupied by animal exhibits.
- c) Evacuation procedures for the TWR would need to be established to alleviate any conflict.

Sydney  
Suite 401, Driffton Bond Building  
201 Kent Street, Sydney NSW 2000  
Phone | + 61 2 9299 6605  
Fax | + 61 2 9299 6615  
Email | sydney@coreengineering.com.au

Melbourne  
Suite 25, Level 27  
101 Collins Street, Melbourne VIC 3000  
Phone | + 61 3 9653 7460  
Email | melbourne@coreengineering.com.au

www.coreengineering.com.au

Core Engineering Group • Fire • Risk • Emergency Management

Taronga Wildlife Retreat – Egress CAN\_01\_Rev A 30/9/2015

#### ASSESSMENT

The bushfire assessment undertaken by ABAC has been summarised below:

*The extent to which the development is to provide for setbacks including Asset Protection Zones*

*The proposed development incorporates the construction of the Taronga Wildlife Retreat, an eco-tourist facility within the confines of the Taronga Zoo site. The site is located within the Mosman local government area. According to Table A2.3 of Planning for Bush Fire Protection 2006, the site is located in the Greater Sydney fire weather area and is subject to a fire danger index rating of 100.*

*The classification of vegetation and assessment of effective slope have been based on the following assumptions:*

- *The predominant vegetation classification(s) within a distance of 140 metres of the subject sites is classified as open forest.*
- *The effective slope of land under vegetation is:*
  - *>15-18° downslope (Transect 2)*
  - *> 5-10° downslope (Transect 3).*

*According to Table A2.6 of Planning for Bush Fire Protection 2006, the Asset Protection Zones (APZs) that are required for the accommodation buildings for the TWR are:*

- *North-east (transect 2) 100 metres; and*
- *East/south-east (transect 3) 85 metres.*

*The location of the TWR in relation to the eastern boundary of the Zoo site and the vegetation hazard to the east of Bradleys Head Road is such that APZs cannot be contained within the eastern boundary of the Zoo site.*

*As the TWR is proposed as an eco-tourism development, the key issue then becomes the provision of a suitable refuge building that will be subject to a radiant heat flux of not greater than 10kW/m2 on any part of the building.*

*In the event of a bushfire in vegetation to the east of the TWR, within that part of Sydney Harbour National Park between the eastern side of Bradleys Head Road and Taylors Bay, guests of the eco-tourist facility will be evacuated into the Zoo site to an emergency refuge building (and not towards Bradleys Head Road). The emergency refuge building(s) identified for guests of the TWR is the Lecture Theatre building or the Centenary Theatre (in construction and scheduled for completion in late 2016, prior to construction and occupation of the TWR project). The emergency refuge building(s) is located well in excess of 100 metres from any vegetation/hazard to the east of the TWR and will not experience a radiant heat level greater than 10kW/m2 on any part of the building.*

The report also makes the following observations:

*The Adequacy of bushfire maintenance plans and fire emergency procedures for the development site.*

*Given the location of the TWR accommodation buildings in relatively close proximity to vegetation to the east of the site, evacuation procedures will be a critical component of the overall bushfire protection package for the site.*

*The Taronga Zoo site is subject to a range of emergency procedures. These procedures will be amended to incorporate the TWR project. RFS Factsheet 1/14 'Ecotourism' provides that emergency management planning shall be provided which complies with Section 4.2.7 of PBP and shall address use/closure of the facility on extreme and catastrophic fire rating days. The closure of the site is not*

## ANNEXURE 1: CORE ENGINEERING ADVICE (continued)

Core Engineering Group • Fire • Risk • Emergency Management

Taronga Wildlife Retreat – Egress CAN\_01\_Rev A 30/9/2015

practical in relation to the Taronga Zoo site. The site is highly managed, subject to 24 hour security presence and provides a range of areas and buildings within the Zoo site that could potentially be utilised as alternative refuge points for guests of the TWR in the event that the designated emergency refuge building was unsuitable for whatever

### DISCUSSION

As can be seen from the following images, the issue relates to a bushfire in vegetation to the east of the TWR within that part of Sydney Harbour National Park between the eastern side of Bradleys Head Road and Taylors Bay (see figure 2), guests of the eco-tourist facility will be evacuated into the Zoo site to an emergency refuge building (and not towards Bradleys Head Road). In terms of the likely BALs for the TWR accommodation buildings, it was noted in Section 7 of the ABAC report that the determination of BAL for the:

- Northern and easternmost accommodation buildings will be based on the maximum slope measured for Transect 2; and
- the BAL for the southernmost accommodation buildings will be based on the maximum slope measured for Transect 3.

For the purposes of identifying the BALs for the respective accommodation buildings, the buildings have been numbered as follows along with the highest assessed BAL for the respective buildings.

Building	BAL
A: North-western building	29
B: Central northern building	40
C: Eastern building	40
D: South-eastern building	29
E: South-western building	19

Table 1: Buildings and corresponding BAL ratings

The emergency refuge building(s) for guests of the TWR is the Lecture Theatre building or the Centenary Theatre (see figure 3). The emergency refuge building(s) are located well in excess of 100 metres from any vegetation/hazard to the east of the TWR. The refuge building is not expected to experience a radiant heat flux level greater than 10kW/m<sup>2</sup> on any part of the building according to the ABAC report.

Therefore based on the above the priority will be for occupants to evacuate safely prior to the onset of untenable conditions. The BAL levels and proposed construction methodology does not warrant occupants remaining in place; as such an earlier means of warning should be provided to afford potentially sleeping occupants as much time as necessary to reach the refuge area or similar in the event of a bushfire. Given the lack of fire detection that is appropriate for bushfire type incidents, in this instance Taronga Zoo has the benefit of having 24hour on site security and management that deal with various types of emergencies. A bushfire potentially affecting the TWR would be an extension to the already comprehensive emergency procedures that exist. In order for any potential situation to be detected as early possible it would be feasible to recommend some form of CCTV Cameras that are positioned at the high point of the function centre that would overlook the National Park and alert staff of a potential bushfire threat. This earlier notification coupled with an updated comprehensive emergency management plan will far exceed the benefit of upgrading the

Core Engineering Group • Fire • Risk • Emergency Management

Taronga Wildlife Retreat – Egress CAN\_01\_Rev A 30/9/2015

construction methodology or installing external suppression systems which may assist in protecting the buildings but will certainly have less effect than a system that alerts occupants to a fire threat before the onset of untenable conditions.

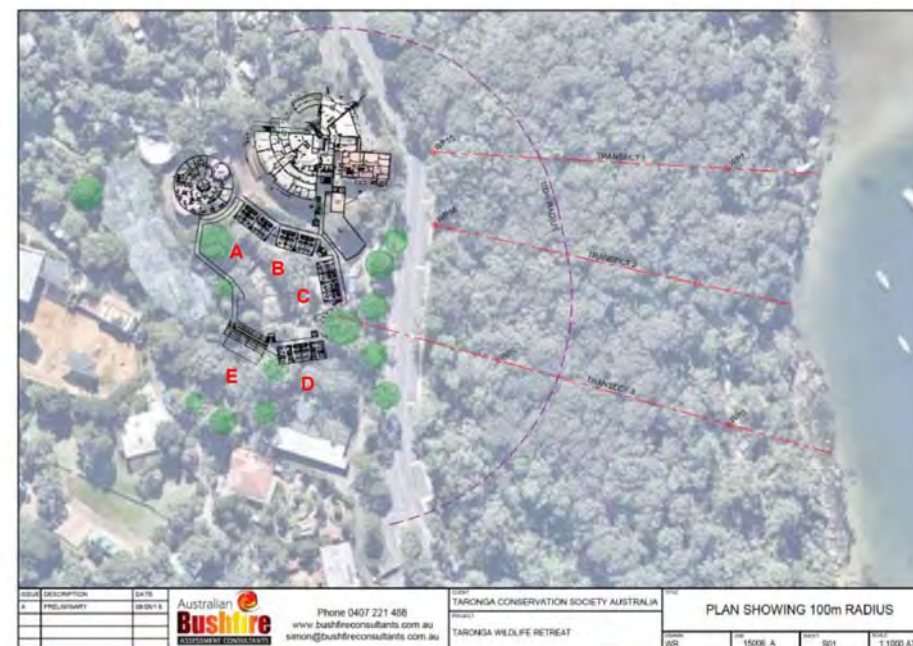


Figure 2: Aerial photos with Function Centre and TWR overlay

## ANNEXURE 1: CORE ENGINEERING ADVICE (continued)

Core Engineering Group • Fire • Risk • Emergency Management

Taronga Wildlife Retreat – Egress CAN\_01\_Rev A 30/9/2015



**Figure 3: extract from Taronga Zoo Fire Panels, Routes and Hazards drawing**

Going forward we recommend that the next steps will be to gain RFS and Taronga Zoo management support for the proposal and engage with the required stakeholders in drafting the necessary scope of work required to achieve the requirements noted herein.

For and on behalf of CORE Engineering Group Pty Ltd

Sandro Razzi  
 Managing Director  
 CORE Engineering Group

## ANNEXURE 2: LETTER OF SUPPORT (TCSA)

---



Wednesday 28 October 2015

Sandro Razzi,  
Managing Director  
Core Engineering Group

Via email: [sandro@coreengineering.com.au](mailto:sandro@coreengineering.com.au)

**Re: Taronga Wildlife Retreat: Bushfire Assessment – Egress Management Proposal**

Dear Sandro,

I refer to your Consultant Advice dated 30 September 2015 (Your reference: S141588) regarding the proposed Taronga Wildlife Retreat and Bushfire Assessment egress advice.

Taronga supports the proposed recommendations and will work with the relevant stakeholders to develop the necessary scope of work required to achieve the requirements as set out in the advice.

Should you have further queries I may be contacted on t: 02 9978 4603 or e: [tbain@zoo.nsw.gov.au](mailto:tbain@zoo.nsw.gov.au)

Sincerely,

A handwritten signature in black ink, appearing to read "T-Bain".

Tim Bain  
Director,  
Property, Infrastructure & Operations+

Cc: Simon Carroll (Australian Bushfire Assessment Consultants)