BUSHFIRE PLANNING AND DESIGN CERTIFICATION
(Fire Protection Association Australia)

The following report titled and dated;

Bushfire Assessment & Recommendations for the Proposed Redevelopment of the Australian Institute of Police Management, Collins Beach Rd Manly, 13th December 2008

has been prepared by;

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Bushfire Assessment & Recommendations

Proposed Redevelopment – Australian Institute of Police Management, Collins Beach Rd Manly

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Foreword

The following report outlines a bushfire risk assessment & recommended mitigation advice for the proposed redevelopment of the Australian Institute of Police Management, Collins Beach Rd Manly (North Head).

The basis and content of the report seeks to;

- *Provide recommendations and strategies for bushfire mitigation on the AIPM property.*
- *Provide recommendations as to the type of construction standard which should be used in the construction of new buildings and the refurbishment of existing buildings, &*
- *Provide detailed information of the above for submission to the NSW Rural Fire Service for their consideration that would otherwise be required under s100B (Bushfire Safety Authority) of the NSW Rural Fires Act 1997.*

Advice & recommendations purported by the report are derived from statutory guidelines and prescriptions for bushfire safety / engineering, expert judgment & considered opinion.

Whilst every effort has been made by the Authors of the following report to ensure the accuracy and relevance of bushfire risk & management for the AIPM site , it must be remembered the phenomena of an uncontrolled wildfire and associated emergency response activities largely remains un-predictable.

Notwithstanding the precautions adopted or referred to by this plan, it should always be remembered that bushfires burn under a wide range of conditions and an element of risk, no matter how small, always remains

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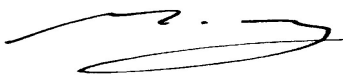
Quote from Standards Australia (AS3959), '*Although the standard is designed to improve the performance of such buildings, there can be no guarantee, because of the variable nature of bushfires, that any one building will withstand bushfire attack on every occasion.'*

Matt Jones



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List of Abbreviations

AIPM	Australian Institute of Police Management
API	Aerial Photography Interpretation
APZ	Asset Protection Zone
AS 1530	Australian Standard 1530 Methods for fire tests on building materials, components and structures
AS1596	Australian Standards 1596 (Storage and Handling of LPG)
AS 2419	Australian Standards 2419 Fire Hydrant Installations
AS 3959	Australian Standard 3959-1999 Construction of buildings in bushfire-prone areas
BEP	Bushfire Evacuation Plan
BCA	Building Code of Australia
DA	Development Application
DECC	Department of Environment & Climate Change (formerly Dept. of Env. & Conservation, incorporating NSW National Parks & Wildlife Service)
DEM	Digital Elevation Model
DTS	Deemed-to-satisfy building solutions as prescribed by the Building Code of Australia
E	East or Eastern
EP&A Act	NSW Environmental Planning & Assessment Act 1979
EWSS	External Water Spray System
FDI	Fire Danger Index
FRL	Fire Resistance Level as defined in the Building Code of Australia
IPA	Inner Protection Area (PBP 2006 and/or 2001)
LMZ	Land Management Zone
N	North or Northern
NSWFB	NSW Fire Brigades
OPA	Outer Protection Area (PBP 2006)
PBP	NSW Rural Fire Service Planning for Bushfire Protection (2006), A Guide for Councils, Planners, Fire Authorities and Developers, ISBN 0 9751033 2 6
REF	Review of Environmental Factors
RF Reg.	NSW Rural Fires Regulations 2002
RF Act	NSW Rural Fires Act 1997
RFS	NSW Rural Fire Service
S	South or Southern
SFAZ	Strategic Fire Advantage Zone
SFPP	Special Fire Protection Purpose
W	West or Western

Bushfire Assessment & Recommendations for the Proposed Redevelopment of the Australian Institute of Police Management, Collins Beach Rd Manly

Introduction

The following report has been commissioned by Brewster Hjorth Architects (on behalf of the Australian Federal Police), herein '*the proponent* ', to provide a Bush Fire Assessment and recommendations for bushfire safety and building compliance for the proposed redevelopment of the Australian Institute of Police Management (AIPM), Collins Beach Road Manly (North Head), herewith '*the subject development site* '.

The subject development site has been identified as being on, and bounded by, bush fire prone land (Manly LGA Bushfire Prone Land Map 2003), and as such legislative requirements for building development on bushfire prone land would otherwise be applicable. This report considers an area for at least 140m beyond the boundary of the subject development site, herein '*the study area* ' (denoted attached map 2).

As advised by the proponent, the AIPM site is located on NSW Crown Land and the proposed development is declared a Major Project subject to the assessment and approval instruments under Part 3A of the Environmental Planning & Assessment Act 1979 (EP& A Act). Concurrently with the assessment of the approval under Part 3A, the Commonwealth Department of Environment, Water, Heritage and the Arts have declared the AIPM redevelopment project as a controlled action and agreed that it will be subject to a 'one-off accredited assessment' under the Bilateral Agreement with NSW, resulting in the requirements of the Environmental Protection and Biodiversity Conservation Act 1999 being assessed under NSW planning and approval processes.

As the proposed use and occupancy of the subject development will incorporate both training facilities and temporary accommodation, it is considered a '*Special Fire Protection Purpose*' (SFPP) for the purposes of bushfire safety. In this regard, the following report considers the subject development as 'integrated development' which requires an assessment for bushfire safety compliance against the requirements and principals (aim and objectives, including '*acceptable solution*' or '*performance criteria* ') of the NSW document Planning for Bushfire Protection (PBP) 2006.

PBP states;

The aim of PBP 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.

More specifically, the objectives are to:

(i) afford occupants of any building adequate protection from exposure to a bush fire;
(ii) provide for a defendable 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;

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(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 measures, including fuel loads in the asset protection zone (APZ);

(vi) ensure that utility services are adequate to meet the needs of firefighters (and others assisting in bush fire fighting).

(vii) provide for the special characteristics and needs of occupants [SFPP Development].

(viii) provide for safe emergency evacuation procedures [SFPP Development].

This assessment includes an analysis of the hazard and threat to the development proposal and the associated standards and bushfire mitigation measures that should be introduced to address Building Code of Australia DTS (or AS3959) and PBP requirements where applicable and as far as reasonably practicable.

Extensive pre-development discussions have been held with the various stakeholders concerned with bushfire safety for the site. Opinions and guidance has been sought from DECC, NSWFB, the Bushfire Management Committee for North Head and the Development Control Unit for the RFS.

Considering the original 2003 Master Plan for the subject development site, significant research has been undertaken to determine the potential effect of the adjacent bushfire hazard (Sydney Harbour National Park bush land) on the proposed and existing building infrastructure. This assessment and report recommends specific building, infrastructure and landscaping design to mitigate the potential damage, building loss or injury associated with an uncontrolled bushfire event impacting upon the subject development site.

DECC is an adjoining property owner and have provided a strategy to facilitate the management and protection of the subject development site as part of the bushfire mitigation strategy. Proposed and current management of the adjoining National Park land is currently documented by the Sydney Harbour National Park Plan of Management (NPWS 1998 & 2003) and Sydney Harbour & Botany Bay (La Perouse Precinct) Fire Management Plan (NPWS 2004). DECC has also agreed to permit the maintenance of a 10m wide area on their land which adjoins the south and west boundaries of the subject development site.

Bushfire mitigation, as purported by this report, for the subject development site comprises a package of measures including asset protection zones, access and egress, construction standards, water supplies, environmental protection and emergency risk management including evacuation and property maintenance planning.

The above measures have been derived from provisions and recommendations as outlined within PBP, engineered judgment and expert opinion, and previous advice from the RFS.

The following bushfire assessment has been prepared in accordance with the *NSW Rural Fires Regulation 2002, Clause 44 - Application for a Bushfire Safety Authority.*

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1.0 Description of the property

RF Reg. Clause 44 Application for bushfire safety authority (a): *a description (including the address) of the property on which the development the subject of the application is to be carried out*

1.1 Lot and deposited plan (DP) number of the subject property

Lot: 2766
DP: 752038

1.2 Street address and locality map

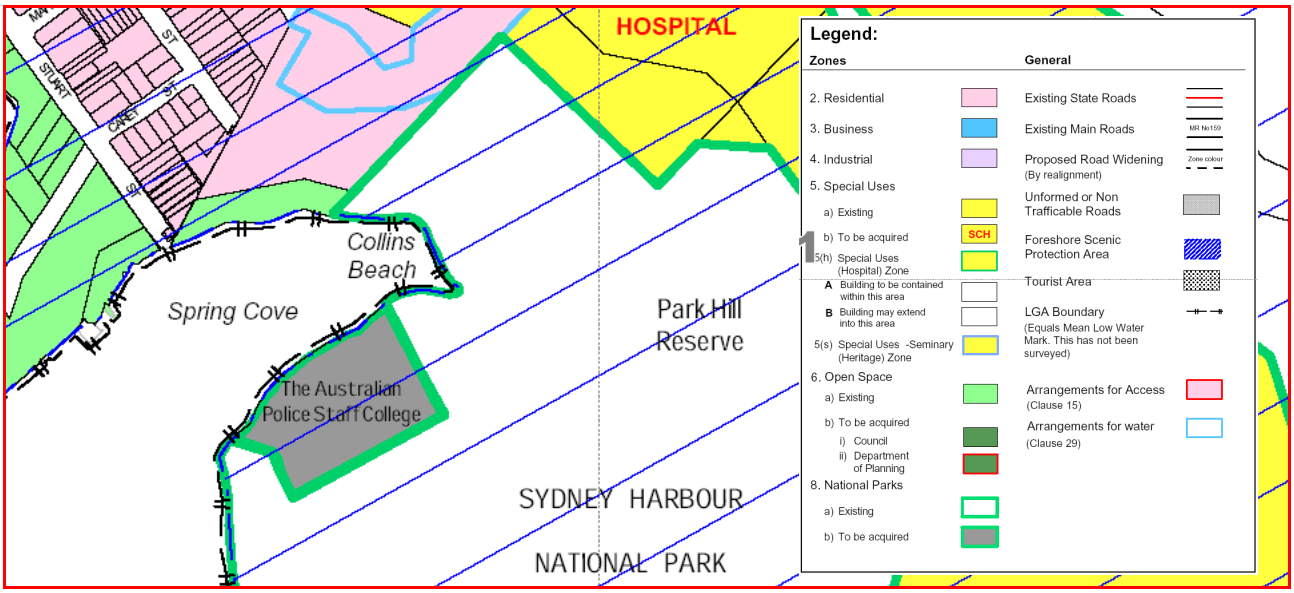
Australian Institute of Police Management, Collins Beach Road, Manly (North Head) 2095

Locality maps attached (Maps 1 & 2).

1.3 Zoning of the subject land and any adjoining lands

The subject land is zoned 8(b) National Park [to be acquired] (Manly LEP 1988).

All adjoining land is zoned 8(a) National Park [existing] (Manly LEP 1988), being part of Sydney Harbour National Park.



Source: Manly Local Environmental Plan 1988

1.4 Staging issues, if relevant, and description of the whole proposal

There exists on the subject development site a number of buildings which are currently used to provide training, conference, accommodation and library facilities for a range of leadership management courses and development services for Australian law enforcement.

The AIPM has been providing these facilities since 1960.

The existing buildings have been constructed over many years dating back to the early 1900's and it would appear that there has been little or no consideration given in to protection from bushfire attack from adjoining lands.

Photographic evidence of the subject development site and surrounds are appended to this report.

Apart from a relatively small remnant patch (<0.1ha) of unmanaged native vegetation still occurring towards the southern boundary of the subject development site (between the existing administration buildings and southern boundary to adjoining National Park), the subject development site is almost entirely cleared and managed of available* bushfire vegetation.

* *available bushfire vegetation being dead or dry vegetative material less than 6mm in width / diameter, readily available for combustion if ignited.*

An ephemeral watercourse crosses the subject development site, draining from the southern boundary north towards Spring Cove (North Harbour). Apart from a small section of the watercourse between the southern boundary (National Park) and the existing administration building which retains some natural riparian and vegetated features, the watercourse is mostly channeled and modified for onsite drainage.

Adjoining the south, east and west boundaries is existing National Park [and foreshore scenic protection], Sydney Harbour National Park – North Head. Adjoining the northern boundary is Spring Cove Manly, North Harbour.

The proposed development is to upgrade the existing facilities and grounds by both either re-developing or demolishing existing buildings and constructing new buildings as currently outlined by drawings titled *Australian Institute of Police Management (A04 Site Ground Floor Plan)*, as prepared by Brewster Hjorth Architects dated November 2008 (attached as Map 3a).

For the purposes of this report, attached map 3b denotes the proposed development (new or refurbished buildings) as considered by this assessment. Table 1.4.1 describes the proposed development and approximate buildings areas.

Based on the calculated areas of existing building outlines within the subject development site, it is estimated there is approximately;

- 3'220 sqm of total building area currently existing, of which
- 1'170 sqm total building area will be demolished and removed (approx. 36% of the current building development).

Based on the calculated areas of proposed new buildings or sections within the subject development site, it is estimated that approximately 1'760 sqm of new building development will be constructed within the subject development site. The proposed redevelopment effectively resulting in approximately 3'810 sqm of new and retained building development within the subject development site.

All new buildings constructed within the subject development site provide building entry / exit points on the side of the building not exposed to the bushfire hazard or otherwise the shielded side of the building.

The subject development site is currently serviced by an overhead power line supply and reticulated town water supply.

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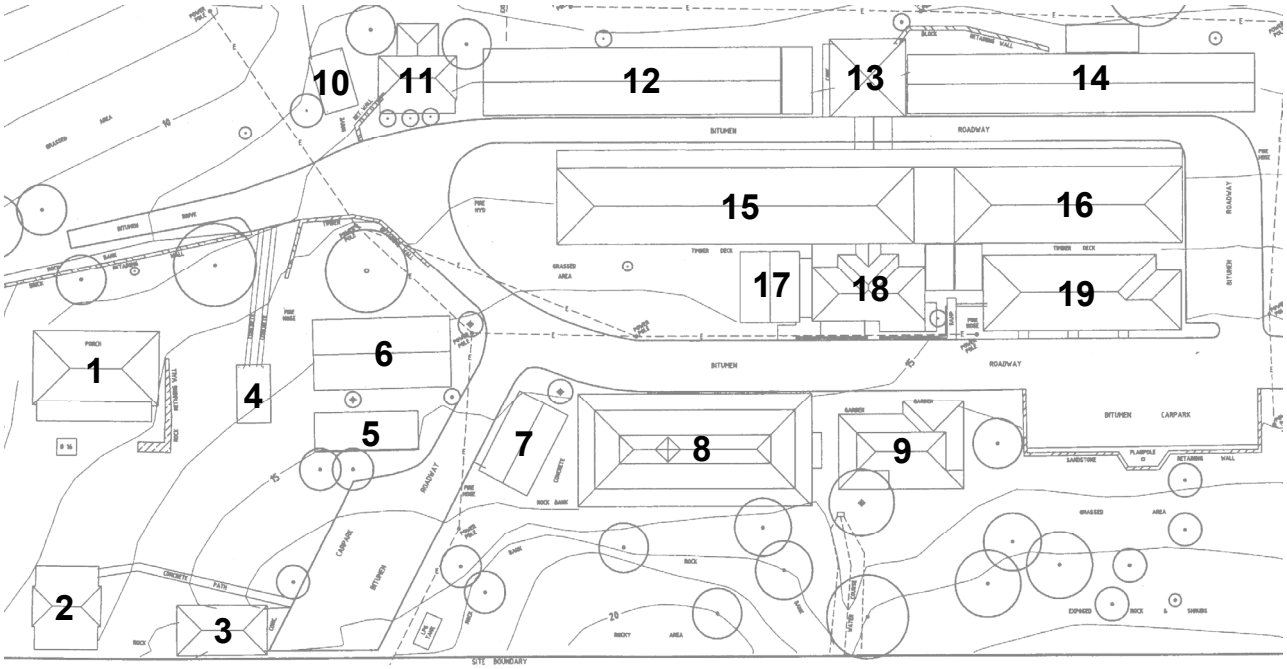
Table 1.4.1 – Building Development

No.	Building	Status	BCA Class	Proposed Development	Area (sqm)
1	Harbour Cottage	Existing	1a	Retained	200
2	Garden Cottage	Existing	1a	Retained	90
3	Store	Existing	10	Demolished & Removed	(60)
4	Garage	Existing	10a	Demolished & Removed	(30)
5	Laundry / Toilets	Existing	10a	Demolished & Removed	(60)
6	Common Room	Existing	9b	Demolished & Removed	(140)
7	Staff Office	Existing	5	Demolished & Removed	(70)
8	Library / Office	Existing	9b	Retained & extended	370
9	Staff Office (Admin)	Existing	5	Demolished & Removed	(110)
10	Workshop	Existing	10a	Retained	40
11	Kookaburra Cottage	Existing	1a	Retained	80
12	Accommodation	Existing	3	Demolished & Removed	(320)
13	Spring Cove Cottage	Existing	1a	Retained	90
14	Accommodation	Existing	3	Demolished & Removed	(320)
15	Teaching / Dinning	Existing	9b	Retained	530
16	Teaching / Office	Existing	9b	Retained	300
17	Toilets / Store	Existing	10a	Demolished & Removed	(60)
18	Kitchen / Store	Existing	10a	Retained	130
19	Syndicate	Existing	9b	Retained	220
-	Accommodation (1)	Proposed	3	New	540
-	Accommodation (2)	Proposed	3	New	540
-	Library	Proposed	9b	New (extension to existing / retained library)	110
-	Administration	Proposed	5	New (replacing old Admin Staff Offices)	430
-	Store	Proposed	10a	New (replacing old toilet / store buildings)	140
				Proposed Total Building Area	*3'810*



For Class 3 buildings, PBP states that they '*will be a special fire protection purpose for the purposes of section 100B of the Rural Fires Act 1997*.'

For Class 9 buildings, PBP also states '*those Class 9 buildings not being a SFPP should be considered as if they were a SFPP. These buildings will not have specific bush fire provisions applying under the BCA, but their location should be carefully considered. In such cases the aim and objectives of PBP should be used to assess the merits of the proposal*.'

Considering the above, the subject development site would require 'Special Fire Protection' for the pruposes of bushfire safety and asscociated compliance.

1.5 Aerial or ground photographs of the subject land including contours and existing and proposed cadastre

Ground / site photography of the subject property and associated photo location points are appended to this report (Map 8 & Appendix 3).

Contours and slope analysis as shown / considered by this report are derived from 5m grid cell DEM data, as denoted attached Map 4.

Existing cadastral boundaries are as denoted attached maps. The subject development does not incorporate any new or changed cadastral boundaries.

Source: NSW Dept. of Lands Spatial Information Exchange (20/11/08)

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2.0 Classification of vegetation out to 140m from the development

RF Reg. Clause 44 Application for bushfire safety authority (b): a classification of the vegetation on and surrounding the property (out to a distance of 140 metres from the boundaries of the property) in accordance with the system for classification of vegetation contained in Planning for Bushfire Protection

2.1 Structural description consistent with the identification key in Keith D (2004) and PBP

Vegetation extent (bushfire hazard) within the study area is derived from aerial photo interpretation and inspections of the subject development site on the 6/09/05 & more recently 17/10/08. As a general observation, the extent and formation of vegetation within and surrounding the subject development site had not significantly altered from the initial 2005 inspection.

Internal vegetation / bushfire hazard

The subject development site is almost entirely developed and maintained and there would be very little threat from bushfire attack emanating from within the subject development site. It is noted the subject development site currently consist of existing buildings and infrastructure, vehicle access roads, pathways, sandstone rock outcrops, and maintained lawn and landscape gardening (see attached photos). In this respect, the majority of the subject development area and property is currently not considered a formation or classification of vegetation deemed to be a bushfire hazard.

PBP states; *for the purposes of assessment, the following are not considered a hazard or as a predominant vegetation class / formation and can be included within an asset protection zone:*
(a) non-vegetated areas including roads, footpaths, cycle ways, waterways, buildings, rocky outcrops and the like; and
(b) reduced vegetation including maintained lawns, golf course fairways, playgrounds or sports fields, vineyards, orchards, cultivated ornamental gardens and commercial nurseries.

This report recommends that the vegetation within the subject development site is managed in accordance with Asset Protection Zone (APZ) requirements of PBP. In this respect, this would mean the current regime of vegetation and property maintenance which appears to be occurring within should be continued in perpetuity for the life of the subject development.

However, notwithstanding the above, it is noted that a small area of forest and shrub vegetation is persisting between the existing building development and S boundary of the subject development site (denoted Map 2 – 'persisting remnant'). Additional bushfire fuel reduction or management (over and above the current regime of vegetation and property maintenance) would be required to achieve APZ compliance and performance for this area of the subject development site.

External (neighbouring) vegetation / bushfire hazard

- North to North West - the N boundary of the subject development site is deep water frontage to Spring Cove Manly - North Harbour, there being little or no threat of bushfire attack from this direction. In this respect, any vegetation to the N of the subject development site is currently not considered a formation or classification of vegetation deemed to be a bushfire hazard.

- West - the W boundary adjoins Sydney Harbour National Park and investigation has shown that there is a variation in the classification of the vegetation for this direction in comparison to the vegetation to the south and east.

The vegetation in this direction is an elongated strip which reduces in width to a northern point. The deepwater frontage of North Harbour is to the west and north of this vegetation.

As a considered opinion regarding the anticipated fire behavior of an approaching fire from the W, for the purpose of this assessment the classification of vegetation from this direction is considered '<u>remnant vegetation</u>'* (elongated - <50m wide and unlikely to promote a fully developed crown fire).

* PBP describes remnant vegetation as '*a parcel of vegetation with a size less than 1ha or a shape that provides a potential fire run directly towards buildings not exceeding 50m. These remnants are considered a low hazard and APZ setbacks and building construction standards for these will be the same as for <u>rainforests</u>*.'

- South West to South East - the S boundary of the subject development site adjoins Sydney Harbour National Park which is under the control and management of DECC. This area of Sydney Harbour National Park is heavy vegetated, dominated by taller eucalypt species and a well developed understory. For the purposes of a bushfire safety assessment, the classification of vegetation adjacent to the SW-SE is considered <u>Dry Sclerophyll Forest</u>.

- East - the E boundary adjoins the Sydney Harbour National Park. Similar to the S, this area of Sydney Harbour National Park is heavy vegetated, dominated by taller eucalypt species and a well developed understory. For the purposes of a bushfire safety assessment, the classification of vegetation adjacent to the E is considered <u>Dry Sclerophyll Forest</u>.

- North East - the E boundary adjoins the Sydney Harbour National Park. This area of Sydney Harbour National Park is heavy vegetated, albeit dominated by continuous and closed canopy tree species with a more moist and fertile understory. For the purposes of a bushfire safety assessment, the classification of vegetation adjacent to the NE is considered <u>Rainforest</u>.

The above is more accurately denoted attached map 2.

2.2 Past disturbance factors and any future intended land uses that could alter the vegetation classification in the future

Considering the current zoning of immediately adjoining land (8a National Park) to the subject development site, it would be reasonable to assume that the current extent and type of vegetation would persist mostly unchanged for the life of the subject development.

3.0 Assessment of the effective slope to a distance of 100m

RF Reg. Clause 44 Application for bushfire safety authority (c): an assessment of the slope of the land on and surrounding the property (out to a distance of 100 metres from the boundaries of the property)

Slope analysis (used by this assessment) is derived from 5m grid DEM and an inspection of the subject development site. This includes deriving contours for each 5m change in elevation, an estimate of 'effective slope' and the approximate areas of slope / gradient based on PBP slope classes.

PBP describes the effective slope as '*the gradient within the hazard (vegetation) which will most significantly influence the fire behaviour of the site having regard to vegetation class found*.'

The subject development site falls from the southern to northern boundary at an average of <10 degrees to the edge of a cliff several meters from the Sydney Harbour foreshore. From the eastern to western boundary the subject development site and is generally level, partly falling away (average 5 degrees) near the western side.

Slope influencing a bushfire event potentially affecting the subject development site includes;

- S: >5° up slope (effective slope calculated 6-7° up slope)
- SSW: 0-5° down slope (effective slope calculated 3° down slope)
- SW-W: 5° down slope initially then increasing to 10-15° down slope to a cliff top and drop off (cliff) to Sydney Harbour Foreshore.
- E: flat / level
- ENE – NE: >5-10° down slope to the north-east towards Collins Beach (effective slope calculated 8° down slope)

Considering roadway access and asset protection zone maximum acceptable slope gradient (as defined by PBP), slope within or adjacent to the subject development site will not restrict the location of new or upgraded roadways or the proposed and existing locations of asset protection zones.

The slope on and surrounding the subject development site is more accurately denoted attached Map 4.

4.0 Identification of any significant environmental features

RF Reg. Cl. 44 Application for bushfire safety authority (d): identification of any significant environmental features on the property

Apart from some very minor areas of remnant shrub still occurring within the subject site, no other significant environmental features (likely to be adversely affected by uncontrolled bushfire or mitigation measures for the subject development site) have been noted, recorded or advised of as part of this assessment.

In general, the past history and use of the subject development site has significantly altered and degraded naturally occurring vegetation within the subject development site.

Based on a brief desktop assessment of the subject property, the following table outlines significant environmental features potentially affected by the subject development.

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Table 4.1	Present within Subject Property	Present within Study Area	Comment
Riparian Corridor	Yes	Yes	The watercourse within the subject property is mostly channeled and modified for onsite drainage.
Areas of Geological Interest	Undetermined	Undetermined	
Environmental Protection Zones	Undetermined	Undetermined	
Steep Lands (>18°)	No	Yes	Not including waterfront cliff / drop areas, steep lands exceeding 18 degrees or 32.5% is identified within neighbouring National Park areas. Recommended APZ areas will not affect any land exceed 18 degrees slope.
Land Slip Area	Undetermined	Undetermined	
National Park Estate	-	Yes	The design of the subject development will incorporate building and fire safety measures commensurate with the surrounding risk of a bushfire emanating from the adjoining NP areas.

5.0 Details of threatened species, populations, endangered ecological communities and critical habitat known to the applicant

RF Reg. Clause 44 Application for bushfire safety authority (e): the details of any threatened species, population or ecological community identified under the Threatened Species Conservation Act 1995 that is known to the applicant to exist on the property

As advised by the proponent, it is understand a flora and fauna assessment of the subject development site has been undertaken to identify threatened or significant species that may potentially be impacted by the subject development.

Most notably, the endangered / vulnerable ground dwelling fauna such Long-nosed Bandicoot *Perameles nasuta* (NPWS 2000), the Manly population of Little Penguins *Eudyptula minor* (NPWS 2003) and Red-crowned toadlet *Pseudophryne australis* are known to potentially exist on (or immediately adjacent to) the subject development site and within the study area.

At least three threatened plant species are also noted to potentially occur within the study area; *Genoplesium baueri* , *Chamaesyce psammogeton* & *Eucalyptus camfieldii* (Heart leaved stringybark).

The long-nosed bandicoot is known to occupy (at North Head), '*to varying degrees, all of the habitat types available including woodlands, scrub, heath and open areas* '(NPWS 2000). The watercourse at the site may also provide habitat for the red-crowned toadlet.

Populations of the little penguin are also known to '*occur in Sydney Harbour at North Head* '(NPWS 2003). Considering the study area, critical habitat (terrestrial) for the little penguin has been specifically identified (Little Penguin Critical Habitat Map) on and immediately adjacent to Collins Beach and within 50m of the majority of the Spring Cove mean high water mark.

Given that there may be potential for bandicoots, little penguins or red-crowned toadlets to inhabit sections of the subject development site or associated asset protection zones (see section 8.0), the subject development site should consider its impact upon potential habitat for these species.

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An assessment to determine the potential impact of the redevelopment and associated bushfire mitigation measures (APZ) upon the sites natural ecology and processes has been undertaken. This assessment has concluded that the potential affect of the subject development and associated bushfire mitigation requirements upon the sites natural ecology or threatened species are acceptable.

6.0 Details of Aboriginal heritage known to the applicant

RF Reg. Clause 44 Application for bushfire safety authority (f): the details and location of any Aboriginal relic (being a relic within the meaning of the National Parks and Wildlife Act 1974) or Aboriginal place (within the meaning of that Act) that is known to the applicant to be situated on the property

As advised by the proponent, it is understood that the subject development site includes one Aboriginal heritage site as identified by a previous heritage assessment. The documented indigenous site has been identified along the escarpment face within the AIPM site (towards the N boundary), comprising a large rock shelter, a faint fish engraving and midden deposit. The site is described as being in a degraded condition.

Considering the extent of APZ area as further recommended by this report, the location of the above indigenous site should not be affected.

Apart from the above, a brief review of the Sydney Harbour (National Park) Fire Management Plan – NH5 Collins Flat Management Area (NPWS 2004) indicates no known indigenous cultural assets to exist within the immediate vicinity of the subject development site.

In this respect, no culturally significant Aboriginal relics or places identified within or immediately adjacent to the subject development site should be adversely affected by bushfire safety or mitigation measures for the subject development site.

7.0 Bush fire assessment (including methodology)

RF Reg. Clause 44 Application for bushfire safety authority (g): a bush fire assessment for the proposed development (including the methodology used in the assessment) that addresses the following matters [sub clauses i – viii]

Methodology for this site assessment for bushfire attack and recommended mitigation measures are based on PBP guidelines (Appendix 2 & 3), and prior consultation with (and subsequent advice from) the NSW Rural Fire Service Development Control Services.

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Estimated asset protection zone areas and separation distances for bushfire protection are derived using the RFS on-line;

- Bushfire Attack Assessor 2006 and associated radiant heat flux calculations (http://bfaa.rfs.nsw.gov.au/bfaa.html), &
- APZ Calculator (http://bfaa.rfs.nsw.gov.au/apzcalc.html).

All figures & calculated results are shown Appendix 2.

The Manly LGA is designated as potentially having a Fire Danger Index (FDI) of 100 as a 1:50 year event (PBP Appendices 2 – Table A2.3, Greater Sydney Region).

It should be noted that previous reports prepared by Australian Bushfire Assessment Consultants® used prescribed APZ distances outlined within PBP, including;

- PBP Appendices 2 – A2.4 - Residential development otherwise within an FDI 100, &
- PBP Appendices 2 – A2.6 - Special Fire Protection Purpose (SFPP) development.

Radiant heat flux calculations using view factor modelling as described by Douglas & Tan 2004 were also considered by previous reports. The previous radiant heat flux calculations / estimations were based on an FDI of 80 only.

8.0 Asset protection zones (including any management arrangements or easements including those contained on adjoining lands)

RF Reg. Clause 44 Application for bushfire safety authority (g)(i): the extent to which the development is to provide for setbacks, including asset protection zones

Asset protection zones, or else those areas set aside to limit or retard the progression of an un-controlled wildfire from the bushfire hazard (bush land vegetation) towards the subject development site, are considered in line with the description and performance intent of PBP. This includes;

- *radiant heat levels of greater than 10kW/m^2 will not be experienced by occupants or emergency services workers entering or exiting a building,*
- *applicants demonstrate that issues relating to slope are addressed: maintenance is practical, soil stability is not compromised and the potential for crown fires is negated,*
- *APZs are managed and maintained to prevent the spread of a fire towards the building, &*
- *vegetation is managed to prevent flame contact and reduce radiant heat to buildings, minimise the potential for wind driven embers to cause ignition and reduce the effect of smoke on residents and fire-fighters.*

Currently, almost the entire area of the subject development site is a managed landscape and would reasonably meet the requirements of an asset protection zone. The small area of forest / shrub vegetation persisting between the existing building development and S boundary of the subject development site has also been identified by this report for APZ management.

DECC has also agreed to permit the maintenance of a 10m wide area on their land (for the purposes of an APZ in favour of the subject development site) which adjoins the south and west boundaries of the subject development site. Similarly, an additional 1m wide area has also been agreed to along the existing masonry wall extending south of the main vehicle point to the subject development

site (*pers comm*. Andrew Bayley, Ranger Harbour North). The above as denoted attached Map 5a – 'Permissible APZ'.

The additional extent of 'Permissible APZ' over the adjoining National Park land is considered for all calculations / estimations shown by this report for APZ compliance and AS3959 requirements.

The following table summarise the extent to which the subject development site provides for APZ compliance and minimum construction standards. The proposed new or redeveloped building locations and extent considered for this assessment are based upon drawings titled *Australian Institute of Police Management (A04 Site Ground Floor Plan)*, as prepared by Brewster Hjorth Architects dated November 2008 (attached Map 3a).

Table 8.1 - APZ / PBP 2006 Compliance Estimation

Direction	**Distance of Existing / Available APZ**	**Vegetation classification**	**Assessment of slope away from the development (effective slope)**	**Min. required APZ / Separation to achieve 10kW/m^2 (SFPP)**	**Min. required APZ to achieve 29kW/m^2 AS3959 Level 3**
North	>140m	N/A Deep water frontage to Sydney Harbour	<5° down slope initially then a vertical drop to the waterfront	N/A	N/A
South	11-27m *Note: Garden Cottage 11m only from bushfire haz.*	Forest	5-10° up slope (6-7° up slope)	46-48m	14m
East	15-17m	Forest	0-5° down slope (0-3° up slope)	61-67m	20-23m
North East	19m	Rainforest	5-10° down slope (8° down slope)	45m	13m
West	12-31m *Note: Harbour Cottage 12m only from bushfire veg.*	Remnant (rainforest equiv.)	0-5° down slope (5° down slope)	39m	10-16m

Distances described in Table 8.1 are better shown attached Maps 3b & 5a.

Considering that the minimum required / estimated APZ distances generally exceed the available area within and adjacent to the subject development site, APZ areas cannot be provided in accordance with the requirements of PBP for a SFPP development. Similarly, sections of new proposed buildings within the subject development site will not technically facilitate minimum BCA DTS provisions.

Proposed sections of new and existing buildings within the subject development site are technically within a 'Flame Zone' or otherwise potentially prone to direct flame contact (or else radiant heat exceeding 29kW/m^2) from an uncontrolled bushfire emanating from the adjacent bushfire hazard. In this respect, an assessment for building and bushfire safety / design compliance should be performance based with recommendations providing alternate solutions to offset the limited APZ area available for the subject development site.

An assessment of building standard compliance, and recommendations for the same, are further described section 14 of this report.

Recommendations to address APZ requirements within the subject development site are further described section 17.2 of this report.

9.0 Siting & adequacy of water (in relation to reticulation rates or where dedicated water storage will be required)

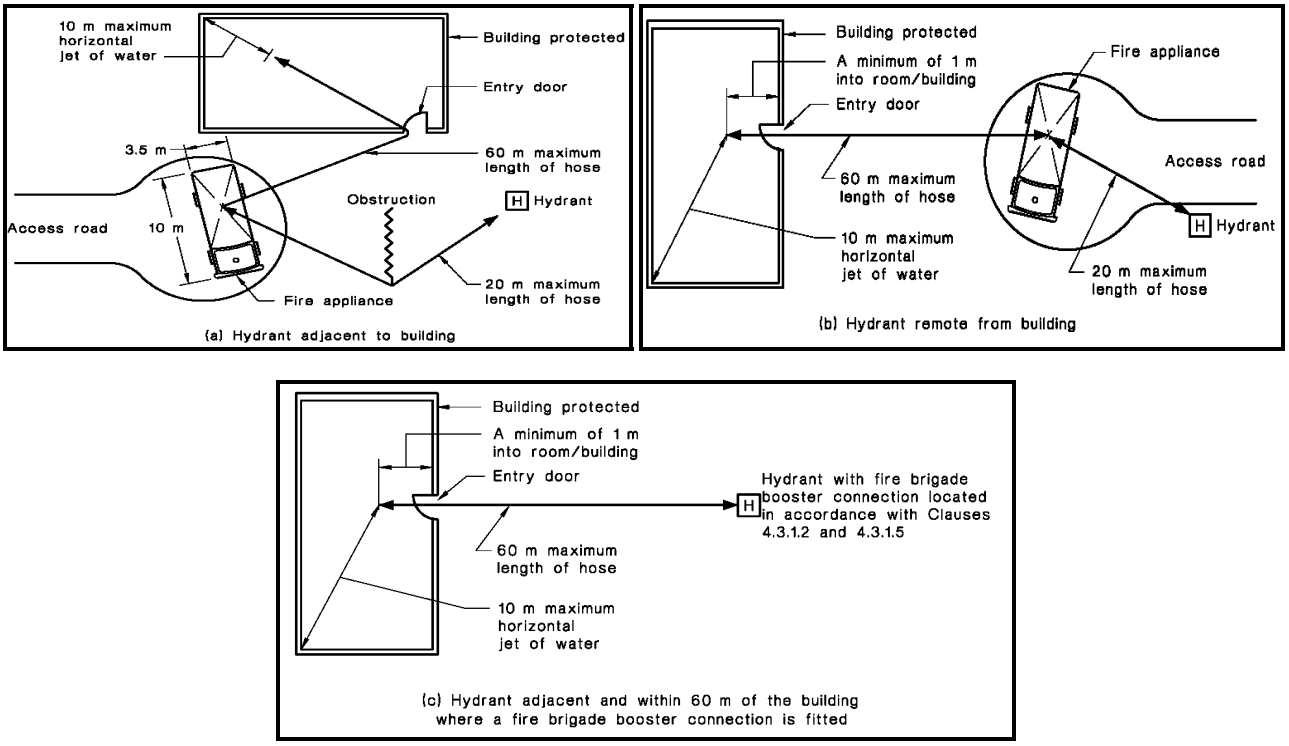
RF Reg. Clause 44 Application for bushfire safety authority (g)(ii): the siting and adequacy of water supplies for fire fighting

The subject development site currently has a reticulated water supply with numerous fire hydrant connection points (pillar outlets) and fire hose reels located at strategic locations throughout the subject development site.

Manly Council requirements and AS2419 for the placement of hydrant connection services within the subject development site should reasonably ensure adequate water is available for firefighting operations (both structural and wildfire).

Based on AS2419 requirements, hydrant connection points;

- fed by mains supply only, should be located so as to be no greater than 90m from the furthest most point of buildings or areas that may require protection or water supply during a fire event, or
- connected to a fire brigade booster in accordance with Clauses 4.3.1.2 & 4.3.1.5 of AS2419, should be located so as to be no greater than 70m from the furthest most point of buildings or areas that may require protection or water supply during a fire event



(source: AS2419.1- External Fire Hydrant Location)

This report specifically notes the subject development site currently incorporates at least three pillar hydrant connection points which are easily located within 70m of the furthest most point of any existing or proposed building development within the subject development site.

PBP acceptable solutions for reticulated water supply to SFPP development requires that;

- *access points for reticulated water supply to SFPP developments incorporate a ring main system for all internal roads*, &
- *fire hydrant spacing, sizing and pressures comply with AS 2419.1 – 2005. Where this cannot be met, the RFS require a test report of the water pressures anticipated by the relevant water supply authority, once development has been completed. In such cases, the location, number and sizing of hydrants shall be determined using fire engineering principles.*

PBP guidelines further state;

- *In SFPP areas, reticulated water should be available for firefighting purposes and fire hydrants should be regularly spaced and comply with Australian Standards (AS 2419.1 - 2005).*
- *Where mains water supply is available, the determination of a guaranteed water supply can only be made by the water supply authority.*

Considering the relative interface of the subject development site with significant areas of bushfire vegetation, and the chance mains pressure may fail during a significant wildfire event, it is recommended that the subject development site incorporates an additional static water supply for firefighting purposes independent of the mains system.

Based on our previous discussions within the NSW RFS Development Control unit (*pers comm*. Mr. Lew Short, Development Control Manager), the subject development site should include the provision of a water storage supply with a minimum 22,000 litres capacity in the absence of a guaranteed reticulated water supply. This water supply / tank should be installed on site and be permanently available, and dedicated, for fire protection purposes.

This report notes a fire fighting water supply storage facility and hydrant booster / pump connection is proposed to be incorporated within the subject development site. The firefighting water storage supply and booster / pump connection is to be incorporated as part of the south east section of the proposed new classroom and accommodation building, directly adjacent to the internal vehicle access and turning facility (as otherwise shown attached Map 3c).

Recommendations to address fire fighting water supply (for bushfire safety) within the subject development site is further described section 17.3 of this report.

10.0 Capacity of public roads (especially perimeter roads and traffic management treatments)

RF Reg. Clause 44 Application for bushfire safety authority (g)(iii): the capacity of public roads in the vicinity to handle increased volumes of traffic in the event of a bush fire emergency

The subject development site has direct access to Collins Beach Road which is a well constructed, sign-posted and sealed 6m wide road at the narrowest point and should easily have a load carrying capacity in excess of that which is required for Fire Fighting vehicles.

The road has been designed to allow adequate passing of emergency vehicles traveling in opposite directions and appears to be reasonably maintained.

Collins Beach Road leads directly onto North Head Scenic Drive which in turn leads north into Manly Central Business District.

With respect to the above, the existing system of public roadway servicing the subject development site should easily have the capacity to handle an increased volume of traffic during a bushfire emergency, including fully loaded Firefighting Appliances / Tankers (e.g. Category 1 Firefighting Tanker, ≈3000L carrying capacity). The use of Collins Beach Road to access or egress the subject development site during a bushfire event on North Head should also be managed / supervised as recommended by this report (section 13.0 Emergency Procedures)

11.0 Public roads link to fire trails and have two-way access

RF Reg. Clause 44 Application for bushfire safety authority (g)(iv): whether or not public roads in the vicinity that link with the fire trail network have two-way access

Public roadway links to fire trails in the vicinity are not considered relevant to the subject development site and proposed redevelopment design.

12.0 Adequacy of access and egress for emergency response

RF Reg. Clause 44 Application for bushfire safety authority (g)(v): the adequacy of arrangements for access to and egress from the development site for the purposes of an emergency response

Emergency response to the site is from Collins Beach Road which has been described in section 10.0 of this report.

Current vehicular access roads within the subject development site are well formed and sealed, generally 4-6m wide, with at least 3 currently designated parking areas and roadside areas / verges for additional parking.

As part of the proposed redevelopment, vehicle access and parking arrangements will be modified so as to facilitate at least a 4m wide unobstructed carriageway for the main access drive and provide a turning facility / area for larger vehicles (i.e. garbage trucks, fire fighting appliances) which may enter the site. Attached maps 3b & 3c denote the extent & areas of proposed vehicle access, parking and turning facility.

All internal access roads (existing or proposed) servicing the subject development site are <200m from the primary access point off Collins Beach Rd.

It is also noted that all proposed or retained buildings (or the furthest most point of the building) within the subject development site are located within 60m or less of the main access way and turning area.

In the event that fire fighting appliances may require entry to the subject development site for fire suppression purposes, provided stationary vehicles are located within designated parking locations, a standard firefighting appliance should easily access and egress the subject development site.

Relevant to the subject development site PBP acceptable solutions for vehicle access (internal roads) to SFPP development requires that;

- *internal roads are two-wheel drive, sealed, all-weather roads*
- *the internal road surfaces and bridges have a capacity to carry fully-loaded firefighting vehicles (15 tonnes).*

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- *a minimum vertical clearance of four metres to any overhanging obstructions, including tree branches, is provided,*
- *dead end roads incorporate a minimum 12 metre outer radius turning circle, &*
- *roads are clearly sign-posted (including dead end signage).*

PBP acceptable solutions for vehicle access (property access) would also require a minimum carriage width of four metres for vehicle access within the subject development site.

With respect to PBP guidelines for property access roads, it is recommend that any new or redeveloped vehicular access roadway which may be accessed by larger firefighting appliances incorporate the above design criteria as far as reasonably practicable. As a considered opinion, in the event of either a structural fire or bush fire event impacting upon the site, a larger fire fighting appliance is only likely to use (or be located on) the main internal access way which runs through the middle of the subject development site (between Collins Beach Road & the Accommodation buildings).

This assessment also notes previous comments from the RFS Development Control unit (*pers comm*. Lew Short) which suggested the subject development should also include the provision for the safe turn-around (three-point turn) of Category 1 fire fighting vehicles that may enter the subject development site.

Recommendations to address vehicle access (for bushfire safety) within the subject development site is further described section 17.4 of this report.

13.0 Adequacy of maintenance plans and emergency procedures

RF Reg. Clause 44 Application for bushfire safety authority (g)(vi): the adequacy of bush fire maintenance plans and fire emergency procedures for the development site

As advised by the proponent, the AIPM has a current Emergency Procedures Handbook which is located in every room and office, and staff and course members are advised of these procedures on the orientation tour of the site.

As also advised by the proponent, the AIPM is currently working with the NPWS and North Head Stakeholders to update the current Bush Fire Management Strategy Plan. This strategy will include threatened flora & fauna management.

A bushfire maintenance plan for the subject development site should consider the cyclic maintenance and upkeep of established APZ areas and building design and function for bushfire protection.

This report recommends that nearly the entire area of the subject development site (or at least 20m beyond any existing or proposed new building) is managed in accordance with IPA standards as specified by PBP Guidelines (see map 5 – Recommended IPA Extent). Furthermore, additional 'off-site' APZ areas affecting the adjoining sections of National Park (along east, south & west boundaries) are also to be incorporated to facilitate building separation and BCA compliance. In this respect, it is recommended that the subject development site should incorporate a bushfire maintenance plan.

This report also recognises that there is a need to address the issues of evacuation in the event of a bushfire event. Considering NSW bushfire safety guidelines and legislation, the development of a Bushfire Evacuation Plan (herewith '*BEP* ') is now a requirement for new developments that have a higher concentration of people than a normal residential dwelling. Proposals (development) that require

a BEP are known as Special Fire Protection Development as identified section 100B of the *Rural Fires Act*. In this regard, it is recommended the subject development site prepare and implement a BEP when applicable.

The objective of the BEP is to increase the preparedness of managers, employees and occupants to ensure a rapid and safe evacuation from the premises in the event of a bushfire emergency.
Many premises have an Emergency Evacuation Plan as a requirement under AS3745 Emergency Control Organisation and Procedures for Buildings Structures and workplaces or AS4083-1997 Planning for Emergencies – Health Care Facilities.

The NSW Rural Fire Service recognise that to provide a standard and consistent approach it is envisaged that any Bushfire Evacuation Plan would be a sub-plan of any Emergency Evacuation Plan under AS3745 or AS4083.

An Emergency Procedures Handbook has been provided which outlines general procedures for fire located within or adjacent to the subject development site. A BEP should be formulated so as to address the specific issue of evacuation in the event of bushfire attack to the subject development site.

It is recognised that a BEP would be an essential component of Emergency Risk Management for the subject development site. In this regard it is recommended that a BEP should be included as part of the overall package of fire protection measures.

Fire Emergency Procedures should include the availability of active fire protection equipment, training, procedures and preparation of staff for emergency management.

It is recommended that a BEP should be formulated to facilitate pre-planning for an evacuation of the occupants of the subject development site in the event that the need arises to relocate occupants to another place.

The purpose and scope of such a plan will be to provide details of:

- The circumstances under which the subject development site will be evacuated,
- The location/s that the persons will be evacuated to,
- The role and responsibilities of persons coordinating the evacuation,
- The role and responsibility of persons remaining with the premises after evacuation,
- A procedure to contact and liaise with the appropriate emergency authorities.

The current Emergency Procedures Handbook for the subject development site reasonably addresses the above dot points or otherwise their intent. In this respect, the existing Emergency Procedures Handbook and its ongoing review and update should facilitate the provision of a BEP.

Recommendations to address bushfire maintenance and evacuation planning within the subject development site is further described section 17.5 of this report.

14.0 Construction standards to be used

RF Reg. Clause 44 Application for bushfire safety authority (g)(vii): the construction standards to be used for building elements in the development

Construction standards as identified and recommended by this report are predicated upon;

- any new (proposed) building development within the subject development site should incorporate full BCA DTS provisions [AS3959] for bushfire safety (irrespective of the buildings classification), &
- any retained (existing) building development within the subject development site should incorporate at least the minimum BCA DTS provisions [AS3959 Level 1] for bushfire safety (irrespective of the buildings classification) wherever reasonably practicable.

Table A3.2 of PBP identifies 5 Categories of bushfire attack and the corresponding AS3959 construction level. These levels of bushfire attack include;

- Flame Zone; beyond the scope of AS3959 (radiant heat levels >29kW/m^2). Building design and construction should address BCA performance requirements – AS3959 Level 3 plus alternate buildings solutions to compensate for elevated radiant heat levels,
- Extreme; AS3959 Level 3 design & construction should be incorporated on the elevations of buildings potentially exposed to radiant heat levels >19-29kW/m^2,
- High;, AS3959 Level 2 design & construction should be incorporated on the elevations of buildings potentially exposed to radiant heat levels >12.5-19kW/m^2,
- Medium; AS3959 Level 1 design & construction should be incorporated on the elevations of buildings potentially exposed to radiant heat levels up to 12.5 kW/m^2, &
- Low; No AS3959 design and construction required.

As previously stated, APZ areas cannot be provided in accordance with the requirements of PBP for a SFPP development. Similarly, sections of new proposed buildings within the subject development site will not technically facilitate the required separation distance to facilitate minimum BCA DTS provisions.

14.1 Proposed New Buildings

Table 14.1.1 and Map 5a outline the estimated bushfire attack and associated AS3959 construction levels required for BCA DTS compliance (new buildings). The 'Exposed Elevation' refers to the elevation(s) of the buildings that would be impacted by increased bushfire attack mechanisms (i.e. radiant heat >12.5kW/m^2, embers and airborne debris). 'Radiant Heat' refers to the highest estimated radiant heat flux level potentially received at the buildings (see also appendix 2 of this report – Determination of Bushfire Attack).

Table 14.1.1 – Estimated Bushfire Attack & Required AS3959 Construction Level (Proposed New Buildings)

Building	Exposed Elevation	Radiant Heat	AS3959 West Elevation	AS3959 South Elevation	AS3959 East Elevation	AS3959 North Elevation	AS3959 Roof
Accommodation (1)	W, S & E	19	L2	L2	L2	L1	L2
Accommodation (2)	-	9	L1	L1	L1	L1	L1
Library (extension)	W, S & E	15	L2	L2	L2	L1	L2
Administration (eastern half)	S, E & N	39	-	L3+	L3+	L3+	L3
Administration (western half)	S, W	16	L2	L2	-	L2	L2
Store	-	7	L1	L1	L1	L1	L1

Attached Map 5b more accurately denotes the specific sections of the proposed new buildings and corresponding AS3959 construction standard recommended for bushfire safety compliance.

It should be noted that RFS Fast Facts 5/05 (Varying AS3959 Construction Levels) and 9/07 (View Factor) are considered in determining the specific AS3959 level.

> *'it is acceptable to recommend a lower construction level on the elevation of the building furthest from the hazard. Façades of the dwelling directly exposed to the hazard (in line of sight from the hazard) still require the assessed level of construction. An elevation is deemed to be exposed to the source of the bushfire if an unobstructed line can be drawn between the façade and any part of the hazard' (RFS Development Control 2005) .*

> *'view factor for the purposes of bush fire assessment is the direct line or path of radiant heat that is emitted by a bush fire directly onto another surface. The general rule for understanding the view factor is that whatever the fire front can 'see' (within the limits of the radiant heat transfer) will be impacted by radiant heat.' (RFS Development Control 2007)*

Considering the above the assessment, apart from the eastern most section of the proposed new administration building the majority of proposed new buildings within the subject development site are separated by at least the minimum distances to facilitate BCA DTS requirements (AS3959). However, whilst the proposed new buildings can facilitate BCA DTS requirements, they would not meet PBP requirements for a SFPP in as far as their separation distances from the potential bushfire hazard.

With regard to the proposed new administration building, its eastern elevation / extent (prone elevation) is technically located within a flame zone and would require additional building material and design performance measures (alternate building solution) to address the potential for elevated bushfire radiant heat levels up to 39kW/m^2 and significant ember attack. Recommended alternate building solutions are outlined section 17.6 of this report.

14.2 Existing (Retained) Buildings

As previously stated, the existing buildings have been constructed over many years dating back to the early 1900's and appear to have been designed and constructed without consideration to protection from potential bushfire attack emanating from the adjoining land. In this regard, it would be reasonable to suggest that the existing buildings would not entirely meet BCA DTS requirements for buildings (residential or otherwise) constructed on bushfire prone land.

It is not practical to retrospectively impose full AS3959 design and construction standards, particularly where Level 2-3 construction standards are technically required to protect against elevated radiant heat levels which may impact upon the building (i.e. toughened glazing, fire retardant timber, non-combustible roofing). However, the retrospective application of AS3959 Level 1 construction standards can be reasonably undertaken as the intent of this construction level is only to guard the building from ignition by wind driven or airborne embers (ember attack).

In this regard, this report recommends all existing buildings within the subject development retrospectively incorporate AS3959 Level 1 design and construction standards ('ember proofing') wherever reasonably practicable. This also includes the installation of gutter guard system that complies with AS3959 section 3.12, or otherwise the removal of gutters and downpipes from buildings within the subject development site.

This report also notes that whilst the majority of existing buildings are reasonably separated from the potential bushfire hazard to the extent required to facilitate AS3959 Level 1 (Medium bushfire attack), a number of existing buildings or sections are located in closer proximity to the bushfire hazard (potentially

exposed to Extreme to Flame Zone bushfire attack). The existing buildings specifically noted include Garden Cottage, Harbour Cottage and the eastern elevations of the Syndicate & Teaching / Dinning buildings.

14.2.1 Garden Cottage

Garden Cottage is located only 1m from the southern boundary and 6m from the western boundary of the subject development site, effectively separated from the bushfire hazard by only 11 & 16m respectively. Considering the minimum separation distance required for AS3959 L3 (to the S-SW) is estimated to be 20-23m, this building is technically located in the flame zone and further does not facilitate any reasonable area of defendable space between the building and adjacent bushfire hazard. It is also noted that the external wall sections and window frames are of timber construction (combustible).

In this regard, it is recommended that radiant heat barrier be installed between the Garden Cottage and the bushfire hazard. The height and extent of the radiant heat barrier should ensure all exposed glazing is shielded from a bushfire emanating from the adjacent National Park area (as otherwise denoted attached Map 6).

It is also recommended than any exposed glazing on the west, south & east elevation of Garden Cottage (that is not otherwise shielded behind the radiant heat barrier – based on view factor assessment) should be of a toughened standard or otherwise covered by heavy mesh screening (e.g. Firetuff or Crimsafe ®) to attenuate potential radiant heat impact upon the glazing (as otherwise denoted attached Map 7). The screening should cover both openable and fixed glazing areas.

14.2.2 Harbour Cottage

Harbour Cottage is located approximately 2.5-5m from the western boundary of the subject development site, effectively separated from the bushfire hazard (remnant) by at least 15m. Considering the minimum separation distance required for AS3959 L3 (to the W-SW) is estimated to be 11m, this building is technically located in a high to extreme bushfire attack position (potentially exposed to >12.5kW/m^2 radiant heat from a bushfire event). It is specifically noted that this building appears to incorporate standard float glass / glazing to doorways on its west elevation and to all windows on all other elevations.

PBP Fast Fact 7/07 - Window Protection states '*standard float glass may fail when exposed to the radiant heat loads experienced in Level 2 construction. The NSW Rural Fire Service would support the use of toughened glass or the screening of the entire glazed area for Level 2 construction'.*

In this regard, it is recommended than any exposed glazing on the west & south elevation of Harbour Cottage should be of a toughened standard or otherwise covered by heavy mesh screening (e.g. Firetuff or Crimsafe ®) to attenuate potential radiant heat impact upon the glazing (as otherwise denoted attached Map 7). The screening should cover both openable and fixed glazing areas.

14.2.3 Dinning / Lounge & Syndicate Buildings

The Dinning / Lounge (Common) & Syndicate Buildings are located approximately 15-20m from the eastern boundary of the subject development site and adjoining bushfire hazard. Considering the minimum separation distance required for AS3959 L3 (to the NE-E) is estimated to be 15-23m, the eastern elevations of these buildings may technically (arguably) be located in an extreme to flame zone bushfire attack position (potentially exposed to >29kW/m^2 radiant heat from a bushfire event). It is specifically noted that noted that the external wall sections and window frames are of timber construction (combustible) and standard float glass / glazing has been used in the windows on the exposed elevation.

Similar to Harbour Cottage, it is recommended than any exposed glazing on the east elevation of the Dinning / Lounge (Common) & Syndicate Buildings should be of a toughened standard or otherwise covered by heavy mesh screening (e.g. Firetuff or Crimsafe ®) to attenuate potential radiant heat impact upon the glazing (as otherwise denoted attached Map 7). The screening should cover both openable and fixed glazing areas.

Table 14.2.1 – Recommended Retrospective Building Design (Existing Buildings)

Building	Radiant Heat Shielding	Toughened Glazing or Screening Attenuation to Glazing
Harbour Cottage	-	Recommended on W & S elevation
Garden Cottage	Recommended along S & W boundary adjacent to building	Recommended on W, S & E elevation (where not protected by radiant heat shield)
Library / Office	-	-
Workshop	-	-
Kookaburra Cottage	-	-
Spring Cove Cottage	-	-
Teaching / Dinning / Office	-	Recommended on E elevation
Kitchen / Store	-	-
Syndicate	-	Recommended on E elevation

Recommendations to address building design & construction standard (for bushfire safety) within the subject development site is further described section 17.6 of this report.

15.0 Adequacy of sprinkler systems

RF Reg. Clause 44 Application for bushfire safety authority (g)(viii): the adequacy of sprinkler systems and other fire protection measures to be incorporated into the development

Sprinkler systems are neither recommended nor necessarily required for building development within the subject development site (based on the recommended building safety designs and sitings as considered by this report).

The emphasis of fire protection for the subject development site will be focused on;

- robust fire protection measures that need little or no human intervention (resilient building design and materials),
- active fire protection in the form of training and the availability of first aid fire protection equipment,
- an ongoing maintenance program for the building elements,
- asset protection zones (separation between buildings and bushfire hazards) and
- emergency evacuation planning.

Alternate fire protection measures recommended by this report include;

- radiant heat barrier protection (adjacent to Garden Cottage) to mitigate potential heat flux beyond the scope of AS3959,
- retrospective enclosing all openings or covering openings with a non-corrosive metal screen or other non-combustible barrier (as per recommendation 16 of this report),
- heavy mesh screening to attenuate radiant heat levels on existing / standard glazing (not toughened) potentially exposed to radiant heat flux levels >12.5kW/m^2, &
- fire rated or protected glazing, capable of withstanding radiant heat up to 40kW/m^2, for the eastern most section / elevations of the subject development.

16.0 An assessment of how the development complies with the acceptable solutions, performance requirements and relevant specific objectives within Chapter 4 of PBP

RF Reg. Clause 44 Application for bushfire safety authority (h): an assessment of the extent to which the proposed development conforms with or deviates from the standards, specific objectives and performance criteria set out in Chapter 4 (Performance Based Controls) of Planning for Bush Fire Protection

16.1 Performance criteria / acceptable solution compliance

The following table outlines how the subject development complies (or otherwise) with PBP provisions for a Special Fire Protection Purposes development. Compliance is stated as;

- ***YES*** – the subject development currently facilitates the acceptable solution for bushfire safety,
- ***REASONABLY ASSUMED*** – the subject development can reasonably facilitate the acceptable solution for bushfire safety, predicated on assumptions of the existing and future design, and activities that are recommended occur,
- ***NOT APPLICABLE (N/A)*** – the acceptable solution is not applicable to the design or construction of the subject development,
- ***NOT CONSIDERED*** – the acceptable solution for bushfire safety is considered unnecessary or otherwise overly exceeds the relative risk associated with a bushfire event affecting the subject development. Bushfire safety compliance is based on performance criteria,
- ***NO*** – the subject development will not facilitate the acceptable solution for bushfire safety compliance. Bushfire safety compliance is based on performance criteria or alternate solution.

Table 16.1.1 Derived from PBP Chapter 4; 4.2.7 – Standards for Bush Fire Protection Measures for Special Fire Protection Purpose Development

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
radiant heat levels of greater than 10kW/m^2 will not be experienced by occupants or emergency services workers entering or exiting a building	*an APZ is provided in accordance with the relevant tables and figures in PBP*	*No*	Recommendations 17.1.1 & 17.1.2 of this report
	exits are located away from the hazard side of the building	*Yes*	
	the APZ is wholly within the boundaries of the development site	*No*	
applicants demonstrate that issues relating to slope are addressed: maintenance is practical, soil stability is not compromised and the potential for crown fires is negated	*mechanisms are in place to provide for the maintenance of the APZ over the life of the development*	*Yes*	Recommendations 17.1.1, 17.1.2 & 17.4.1 of this report
	the APZ is not located on lands with a slope exceeding 18 degrees	*Yes*	
APZs are managed and maintained to prevent the spread of a fire towards the building	*in accordance with the requirements of 'Standards for Asset Protection Zones (RFS 2005)* *(Note - a Monitoring and Fuel Management Program should be required as a condition of development consent)*	*Yes*	Recommendations 17.1.1, 17.1.2 & 17.4.1 of this report

Performance Criteria	Acceptable Solution	Compliance	Assessment / Comment
vegetation is managed to prevent flame contact and reduce radiant heat to buildings, minimise the potential for wind driven embers to cause ignition and reduce the effect of smoke on residents and fire-fighters	compliance with Appendix 5 (PBP)	*Yes*	Recommendations 17.1.1 & 17.1.2 of this report
internal road widths and design enable safe access for emergency services and allow crews to work with equipment about the vehicle.	*internal roads are two-wheel drive, sealed, all-weather roads*	*Yes*	Recommendations 17.3.1, 17.3.2, 17.3.3, 17.3.4 of this report
	internal perimeter roads are provided with at least two traffic lane widths (carriageway 8 metres minimum kerb to kerb) and shoulders on each side, allowing traffic to pass in opposite directions	*N/A*	
	roads are through roads. Dead end roads are not more than 100 metres in length from a through road, incorporate a minimum 12 metres outer radius turning circle, and are clearly sign posted as a dead end	*Reasonably Assumed*	
	traffic management devices are constructed to facilitate access by emergency services vehicles.	*Reasonably Assumed*	
	a minimum vertical clearance of four metres to any overhanging obstructions, including tree branches, is provided.	*Yes*	
	curves have a minimum inner radius of six metres and are minimal in number to allow for rapid access and egress	*Not Considered*	
	the minimum distance between inner and outer curves is six metres	*Not Considered*	
	maximum grades do not exceed 15 degrees and average grades are not more than 10 degrees	*Yes*	
	cross-fall of the pavement is not more than 10 degrees	*Yes*	
	roads do not traverse through a wetland or other land potentially subject to periodic inundation (other than flood or storm surge)	*Yes*	
	roads are clearly sign-posted and bridges clearly indicate load ratings	*Yes*	
	the internal road surfaces and bridges have a capacity to carry fully-loaded firefighting vehicles (15 tonnes)	*Yes*	

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Reticulated water supplies are easily accessible and located at regular intervals	*access points for reticulated water supply to SFPP developments incorporate a ring main system for all internal roads*	*Yes*	Recommendations 17.2.1, 17.2.2, 17.2.3 of this report. Parking provisions and fire hydrant locations to considered as hydrant points will be pillar connections.
	fire hydrant spacing, sizing and pressures comply with AS2419. Where this cannot be met, the RFS will require a test report of the water pressures anticipated by the relevant water supply authority, once development has been completed. In such cases, the location, number and sizing of hydrants shall be determined using fire engineering principles	*Yes*	
	the provisions of public roads in section 4.1.3 (PBP) in relation to parking are met	*Not Considered*	
location of electricity services will not lead to ignition of surrounding bush land or the fabric of buildings or risk to life from damaged electrical infrastructure	electrical transmission lines are underground	*No*	Recommendation 17.6.2 of this report
location of gas services will not lead to ignition of surrounding bush land or the fabric of buildings	*reticulated or bottled gas is installed and maintained in accordance with AS 1596 - 2002 and the requirements of relevant authorities. Metal piping is to be used.*	*Reasonably assumed*	Recommendation 17.6.1 of this report
	all fixed LPG tanks are kept clear of all flammable materials and located on the non hazard side of the development	*Reasonably assumed*	
	If gas cylinders need to be kept close to the building, the release valves must be directed away from the building and away from any combustible material, so that they do not act as catalysts to combustion	*Reasonably assumed*	
	polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not to be used	*Reasonably assumed*	
an Emergency and Evacuation management Plan is approved by the relevant fire authority for the area	*an emergency/evacuation plan is prepared consistent with the RFS guidelines for the Preparation of Emergency / Evacuation Plan*	*Reasonably assumed*	Recommendation 17.4.2 of this report
	compliance with AS 3745-2002 'Emergency control organisation and procedures for buildings, structures and workplaces for residential accommodation'	*Reasonably assumed*	
	compliance with AS 4083-1997 'Planning for emergencies - for health care facilities'	*N/A*	
suitable management arrangements are established for consultation and implementation of the emergency and evacuation plan	*an Emergency Planning Committee is established to consult with residents (and their families in the case of aged care accommodation and schools) and staff in developing and implementing an Emergency Procedures manual.*	*N/A*	Recommendation 17.4.2 of this report
	detailed plans of all Emergency Assembly Areas including "onsite" and "offsite" arrangements as stated in AS 3745-2002 are clearly displayed, and an annual (as a minimum) trial emergency evacuation is conducted.	*Reasonably assumed*	

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16.2 PBP 2006 specific objective assessment

Table 16.2.1

PBP 2006 Specific Objective	Assessment / Comment
(i) afford occupants of any building adequate protection from exposure to a bush fire	Where the recommendations stated by this report are reasonably and adequately incorporated (where practicable), occupants remaining within the subject development site during a significant bushfire event would be afforded the benefit bushfire protection '*measures in combination* '. In this respect, fire fighters or occupants remaining within the subject development site or else defending an asset or building during a passing bushfire event should reasonably be better afforded a greater level of protection than otherwise currently exists.
(ii) provide for a defendable space to be located around buildings	Where the recommendations relating to APZ management as stated by this report are reasonably and adequately incorporated, all existing and proposed building structures would be afforded defendable space.
(iii) provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent direct flame contact and material ignition	Where the recommendations relating to proposed and increased construction standards (ember proofing and screening attenuation) & APZ areas stated by this report are reasonably and adequately incorporated (where practicable), all buildings would be afforded a greater chance of withstanding or avoiding direct flame contact and material ignition.
(iv) ensure that safe operational access and egress for emergency service personnel and residents is available	Where the recommendation relating to internal roadway maintenance as stated by this report is reasonably and adequately incorporated, both emergency services personnel and occupants should be afforded reasonable vehicle access / egress within the subject development site for firefighting or evacuation purposes.
(v) provide for ongoing management and maintenance of bush fire protection measures, including fuel loads in the asset protection zone (APZ)	Where the recommendations relating to construction standards, APZ areas and vegetation maintenance planning stated by this report are reasonably and adequately incorporated, it would be reasonable to assume that regular maintenance works within the subject development would ensure ongoing management and maintenance of bush fire protection measures.
(vi) ensure that utility services are adequate to meet the needs of firefighters (and others assisting in bush fire fighting)	Where the recommendations relating to fire fighting water supply facilities within the subject development site are reasonably and adequately incorporated, occupants or fire fighters defending buildings during a bushfire event should have access to an adequate and reliable water supply. Similarly, where the installation or connection to electrical and gas services incorporates the recommendations as stated by this report, both emergency services personnel or occupants assisting in bush fire fighting should safely be able to manage potential electrical and gas hazards associated during a bushfire event.
(vii) provide for the special characteristics and needs of occupants [SFPP Development]	Where all recommendations relating to emergency evacuation procedures (planning) as stated by this report are reasonably and adequately incorporated, occupants or staff located within the subject development site during or preceding a bushfire event should be reasonably aware of safe access / egress options and associated actives to be undertaken.
(viii) provide for safe emergency evacuation procedures [SFPP Development]	As above.

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17.0 Summary of Recommendations

The following recommendations are made for the bushfire protection measures for the Proposed Redevelopment of the Australian Institute of Police Management at Collins Beach Road Manly (North Head).

17.1 Asset Protection Zones

17.1.1 The entire area of the subject development site, or at least within 20m of any new or existing building, should be managed as an Inner Protection Area (IPA) in accordance with requirements of PBP (with specific reference to Appendix 5 of PBP, Bush Fire Provisions – Landscaping & Property Maintenance).

17.1.2 Existing and proposed APZ areas to be maintained over National Park land directly adjacent to the subject development site (ie. 10m adjacent to the western & southern boundaries & 1m adjacent to the eastern boundary along the masonry wall section south of the main entry point), should be managed as an Inner Protection Area (IPA) in accordance with requirements of PBP.

17.2 Water Supplies

17.2.1 Where it cannot be guaranteed that the existing mains pressure and flows will be consistently maintained during a bushfire event, a water storage facility / tank of at least 22,000 litres capacity should be installed on site and permanently available, and dedicated to, fire fighting and protection from bushfire attack.

17.2.2 The water storage facility / tank should be fitted with a 65/70mm storz outlet couplings or otherwise standard fire fighting fittings compatible with NSW Fire Brigade Appliances and if installed in the open should be constructed of masonry or metal.

17.2.3 As applicable, all existing or relocated hydrant connection point(s) within the subject development site be located to ensure all building sections / elevations are <90m from an available hydrant point.

17.3 Vehicular Access and Egress

17.3.1 As far as practicable, any new or redeveloped vehicular access roadway area within the subject development site, which may be accessed for firefighting purposes, be constructed & maintained to minimum design criteria as outline in PBP, including but not limited to;

- at least 4m wide unobstructed carriageway,
- capacity to carry fully loaded fire fighting vehicles (15 tonnes),
- minimum vertical clearance of 4m to any overhanging obstructions, &
- be clearly sign posted, indicating dead end / no through access and no parking areas.

17.3.2 The proposed vehicle turning area should be clearly sign-posted to restrict any vehicle parking or other obstacles potentially blocking the turn-around area.

17.3.3 Roll-over drainage (or an equivalent design) be incorporated between the formed carriageway area of the proposed turning area and the road side / verge area and orientation space on the N-NE side of the turning area (as otherwise denoted attached Map 3c of this report).

17.3.4 The road side / verge area and orientation space on the N-NE side of the turning area should be kept clear of any obstructions (i.e. further building, infrastructure, landscaping, vegetation, shallow drainage / plumbing etc) so as to permit the temporary passage or parking of vehicles for emergency purposes (as otherwise denoted attached Map 3c of this report).

17.4 Emergency & Bushfire Maintenance Planning / Management

17.4.1 A Bushfire & Vegetation Maintenance Plan be developed, in consultation with the local fire authorities (ie. NSWFB, RFS, NPWS), for the subject development site which, at least, clearly identifies;

- Forest and shrub vegetation to be retained and allowed to naturally accumulated available bushfire vegetation (unmanaged vegetation),
- Fire management zones within and surrounding the subject development site (e.g. APZ areas, Strategic Fire Advantage, Heritage Area Management, etc),
- Prescriptions or performance measures for proposed fire management zones,
- Contemporary biodiversity fire threshold analysis for the subject site and adjoining natural vegetation,
- A proposed schedule of maintenance and activities which ensure the provisions of proposed fire management zones.

17.4.2 The existing Emergency Procedures Handbook be periodically reviewed, in consultation with the local fire authorities, for the subject development site which, at least, clearly identifies;

- The circumstances under which the subject development site will be evacuated,
- The location/s that the persons will be evacuated to,
- Traffic supervision / management along Collins Beach Road during a bushfire event,
- The role and responsibilities of persons coordinating the evacuation,
- The role and responsibility of persons remaining with the premises after evacuation,
- A procedure to contact and liaise with the appropriate emergency authorities.

17.5 Construction Standards

17.5.1 All proposed new buildings and extension to existing buildings shall be constructed in accordance with the AS3959, 1999 levels 1-3 as shown maps 5a & 5b, and table 14.1.1 of this report.

17.5.2 The roof area of each proposed new building be constructed to the highest estimated AS3959 level assigned to its elevations (as otherwise shown table 14.1.1 of this report)

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17.5.3 For sections / elevations of the subject development identified as 'flame zone (i.e. eastern extent of the proposed new administration building);

- There should be no external exposed timber or any other combustible building element in the flame zone.
- All glazing in the flame zone should be fire rated or capable of withstanding radiant heat flux up to 40kW/m^2 or otherwise protected with metal / bushfire shutters.
- Where fitted, bush fire shutters shall —

  a) be fixed to the building and be non-removable,

  b) when in the closed position, have no gap between the shutter and the wall, the sill or the head greater than 2mm,

  c) be readily manually operable from either inside or outside,

  d) protect the entire window or door assembly,

  e) be made from non-combustible material,

  f) where perforated, have—

  (i) uniformly distributed perforations with a maximum aperture of 2mm, and

  (ii) a perforated area no greater than 20% of the shutter.

- Windows, including frames, in the flame zone shall have;

  a) the openable portions screened using a mesh with a maximum aperture of 2mm made of corrosion resistant steel or bronze, and

  b) the window assemblies protected by a complying bush fire shutter or;

  c) where window assemblies are not protected by a complying bush fire shutter -

  (i) Window frames, window joinery and hardware shall be metal.

  (ii) Hardware fitted externally that supports the sash in its functions of opening and closing shall be metal.

  (iii) Glazing shall be toughened glass minimum 5mm.

  (iv) Seals to stiles, head and sills or thresholds shall be manufactured from materials having a Flammability Index no greater than 5.

Note: Glazing recommendations derived from RFS Fast Fact 4/08, Glazing in the Flame Zone (2008)

17.5.4 Gutter guards that comply with AS3959 section 3.12 should be installed on all buildings (proposed and existing) to prevent the buildup of debris in the gutters and down pipes, or alternatively the building does not incorporate gutters and down pipes where practicable.

17.5.5 As far as practicable, all existing buildings to be retained within the subject development site be upgraded to improve ember protection (Level 1 construction) by enclosing all building openings or covering openings with a non-corrosive metal screening (with a max. aperture of 1.8mm) or equivalent non-combustible barrier. This includes corrosion resistant metal screening, spark guards or barrier system to wind driven / airborne embers to;

- any openable windows or external doors,
- vents or weep holes, &
- sub-floor areas & eaves.

17.5.6 Exposed glazing (windows & doorways, openable and fixed sections) on existing building sections located less than 20m from the bushfire hazard and within view of the adjacent bushfire hazard, as otherwise shown map 7 and table 14.1.2 of this report, should be;

- Entirely covered by heavy mesh screening (e.g. Firetuff or Crimsafe ®), or
- Toughened glass of minimum 5mm thickness.

17.5.7 A 2.0m high radiant heat barrier (or else of a height that will reasonably deflect radiant bushfire heat from impacting upon exposed glazing), e.g. non-combustible fencing, masonry wall, etc, be installed between Garden Cottage and persisting unmanaged bushfire vegetation within Sydney Harbour National Park (i.e. to the W-SE of Garden Cottage). The recommended location and extent of a radiant heat barrier is as otherwise denoted map 6.

17.6 Utility Services (Gas & Electrical)

17.6.1 As applicable, any existing or future proposed gas supply connections should be designed & located in accordance with PBP, including;

- Bottled gas should be installed and maintained in accordance with AS1596 - 2002 and the requirements of relevant authorities. Metal piping is to be used.
- Fixed LPG tanks should be kept clear of all flammable materials and preferably located on the non hazard side of the residential building.
- If gas cylinders need to be kept close to the building, the release valves must be directed away from the building and away from any combustible material, so that they do not act as catalysts to combustion.
- Polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not used.

17.6.2 As applicable, any future proposed or relocated electrical supply connections should be designed & located in accordance with PBP including;

- Any new or re-located power line connections within the subject development site be located underground.
- Any existing overhead power lines within the subject development site should be separated from any adjacent tree or shrub vegetation in accordance with recognised specifications (e.g. ISSC 3 Guideline for Managing Vegetation Near Power Lines 2005, or Vegetation Safety Clearances' as issued by Energy Australia 2002)

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Conclusion

This report outlines a bushfire risk assessment and recommendations to address NSW bushfire safety requirements for the proposed redevelopment of the Australian Institute of Police Management at Collins Beach Road Manly (North Head).

The report concludes that the subject development site could be subject to a threat from bushfire attack from the bush land to the south, east and to a lesser degree from the west. NSW legislative requirements for development in bushfire prone areas would otherwise be applicable.

Consultation has taken place with DECC to provide effective APZ areas adjacent to the subject development site boundaries and with the NSW RFS Development Control Unit to provide an effective package of fire protection and bushfire mitigation measures for the subject development site. As a consequence there has been an emphasis in this report on conforming to the requirements and principals as outlined in the document *Planning for Bushfire Protection 2006* particularly with regard to APZ and radiant heat management (from a bushfire event) within the site.

This report has considered all of the elements of bushfire attack and the compensation measures listed are only of value and capable of providing the required protection from bushfire attack if they are considered as a complete package.

Provided the proposed development is constructed in accordance with the recommendations as described throughout this report and as summarised section 17.0 of this report, it is a considered opinion that the proposed new, redeveloped and retained buildings can reasonably satisfy the objectives and performance requirements of the BCA, AS3959 and the aim and specific objectives of NSW Planning for Bushfire Protection 2006.

It is also reasonable to suggest that the final and completed construction of the subject development would afford a greater level of bushfire safety protection, for both buildings and occupants, than as otherwise exists within the subject development site. The subject development will provide an improved outcome for bushfire safety by the application of the principle '*measures in combination*'.

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References

Australian Standard 3959:1990, Incorporating amendment Nos. 1 & 2, Construction of buildings in bushfire-prone areas.

Australian Standard 2419:1994 Fire Hydrant Installations / System Design, Installation & Commissioning.

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Fast Fact 7/07, Window Protection (2007) – NSW Rural Fire Service, Development Control Services.

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Manly Local Government Area Bushfire Prone Land Map (2003).

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Sydney Harbour & Botany Bay (La Perouse Precinct) Fire Management Plan (2004) – NSW National Parks & Wildlife Service, Sydney.

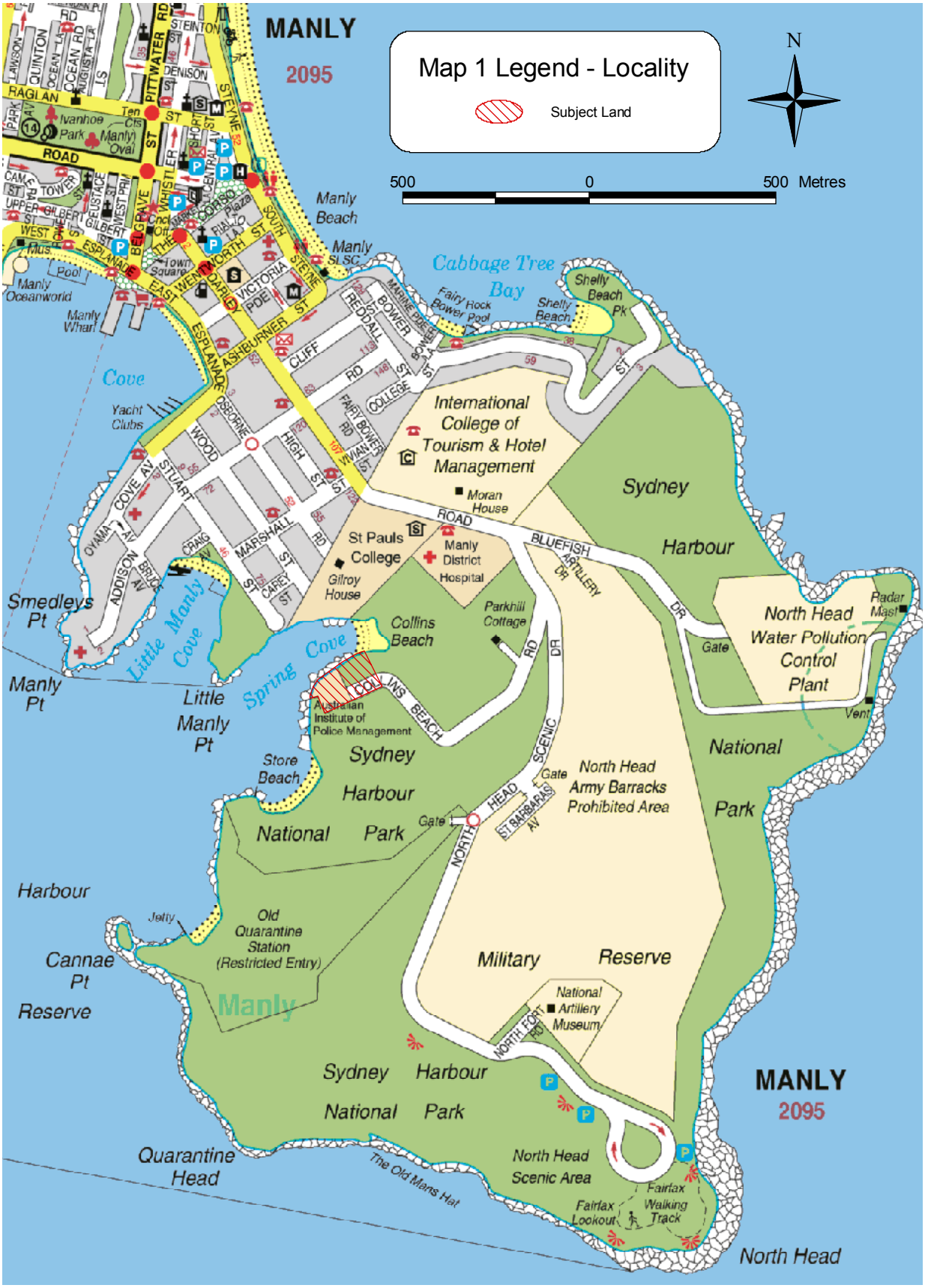
Sydney Harbour National Park Amendments to the 1998 Plan of Management (2003) – NSW National Parks & Wildlife Service, Sydney.

Sydney Harbour National Park Plan of Management (1998) – NSW National Parks & Wildlife Service, Sydney.

Personal Communications

- Lew Short, Manager Development Control Unit – NSW Rural Fire Service, 13/09/05, 10/10/05 & 19/10/05.
- Andrew Bayley, Ranger Harbour North – Department of Environment & Conservation (Parks & Wildlife Division), 7/11/08.

Map 1 – Overview & Subject Land



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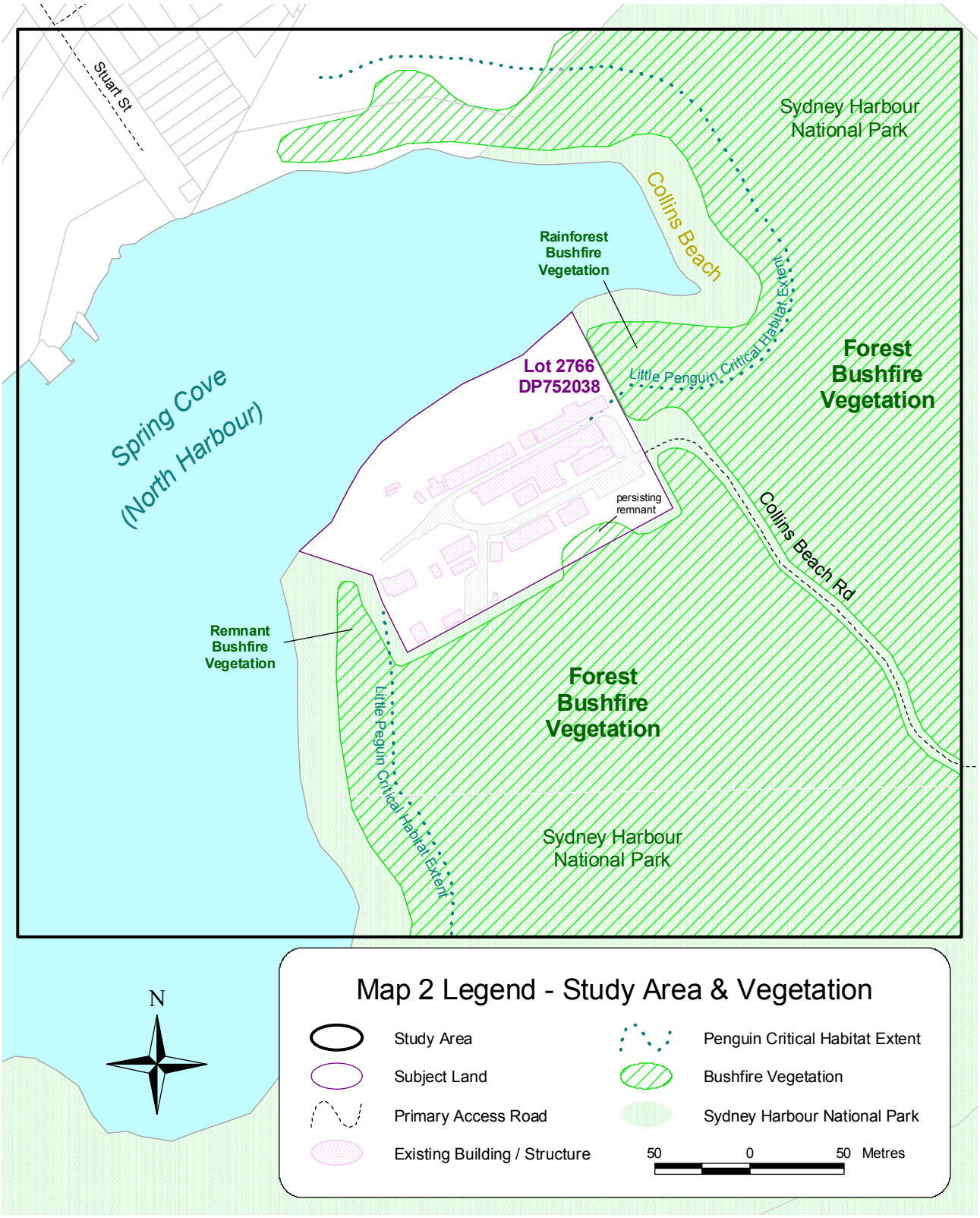
Map 2 – Study Area & Bushfire Vegetation



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Map 3a – Proposed Development Plan (November 2008)

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Map 3b – Proposed Development

Map 3b Legend - Proposed Development (AIPM SITE PLAN, Nov 08)

Proposed New or Refurbished Building
- footprint
- balcony
- deck
- roof

- Permissable APZ Area
- Proposed Vehcile Access / Parking
- Existing Masonry Wall (approx. 2m high)
- Existing Hydrant Connection (Pillar)

N

50 0 50 100 Metres

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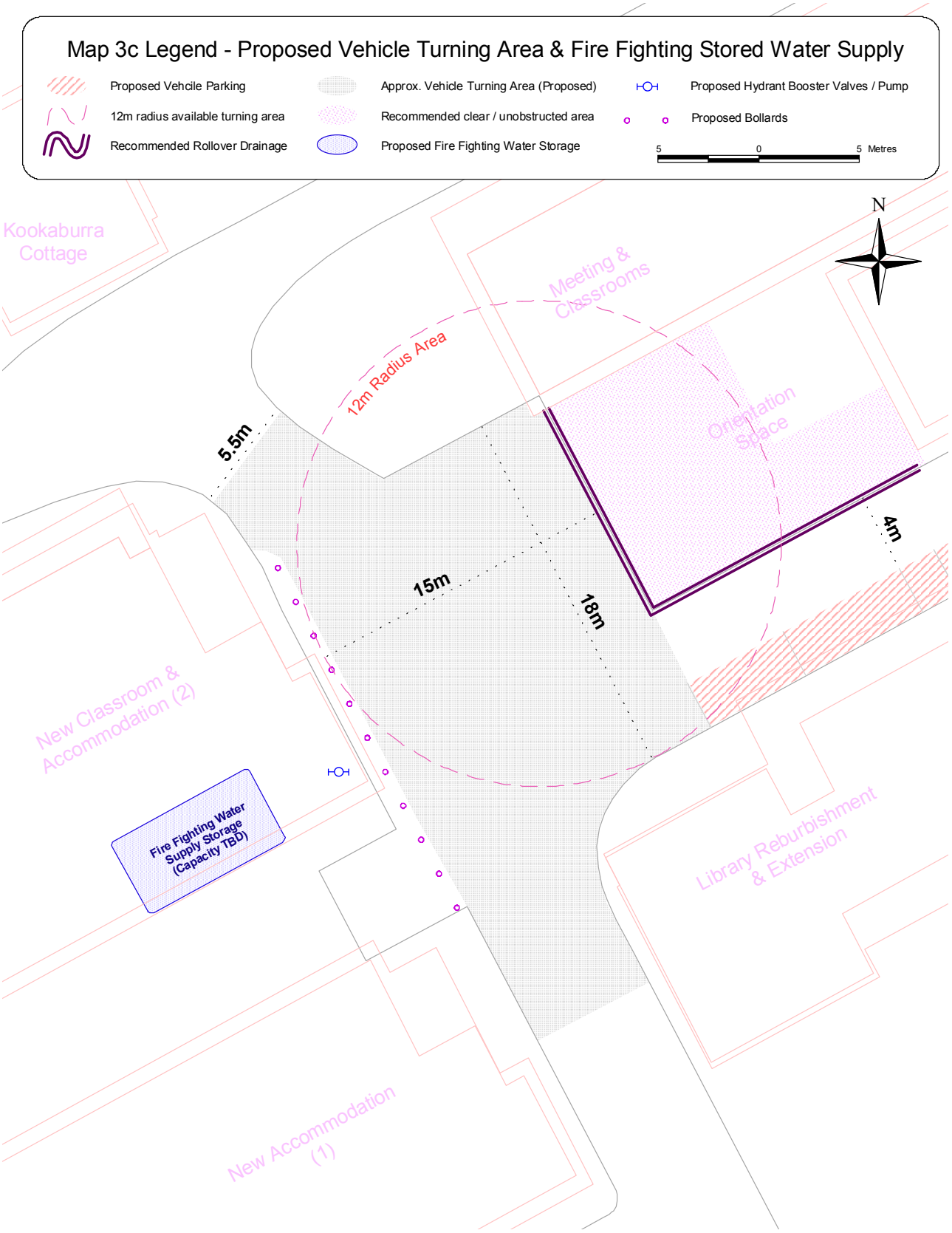
Map 3c – Heavy Vehicle Turning & Fire Fighting Stored Water Supply



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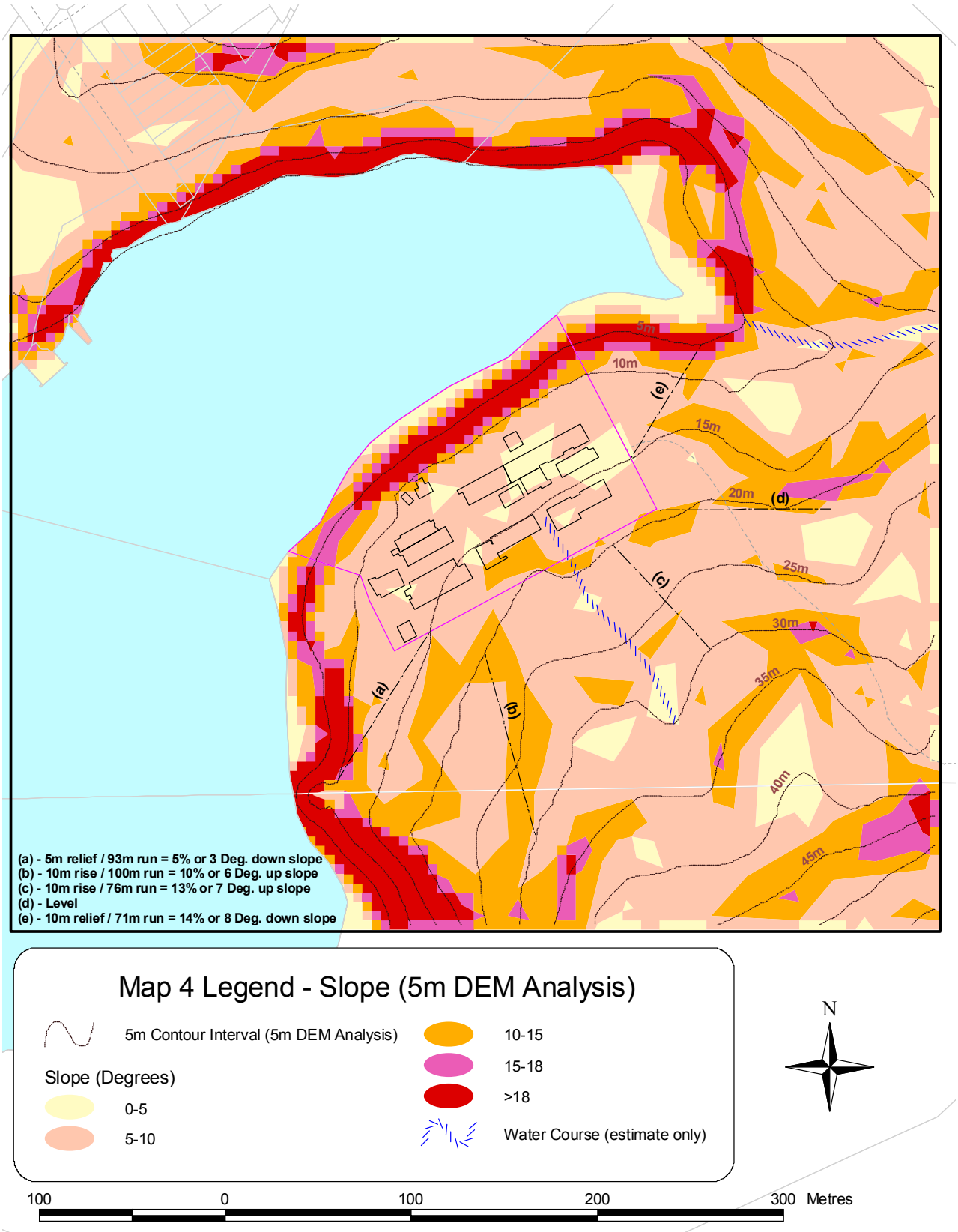
Map 4 – Slope (5m DEM Analysis)



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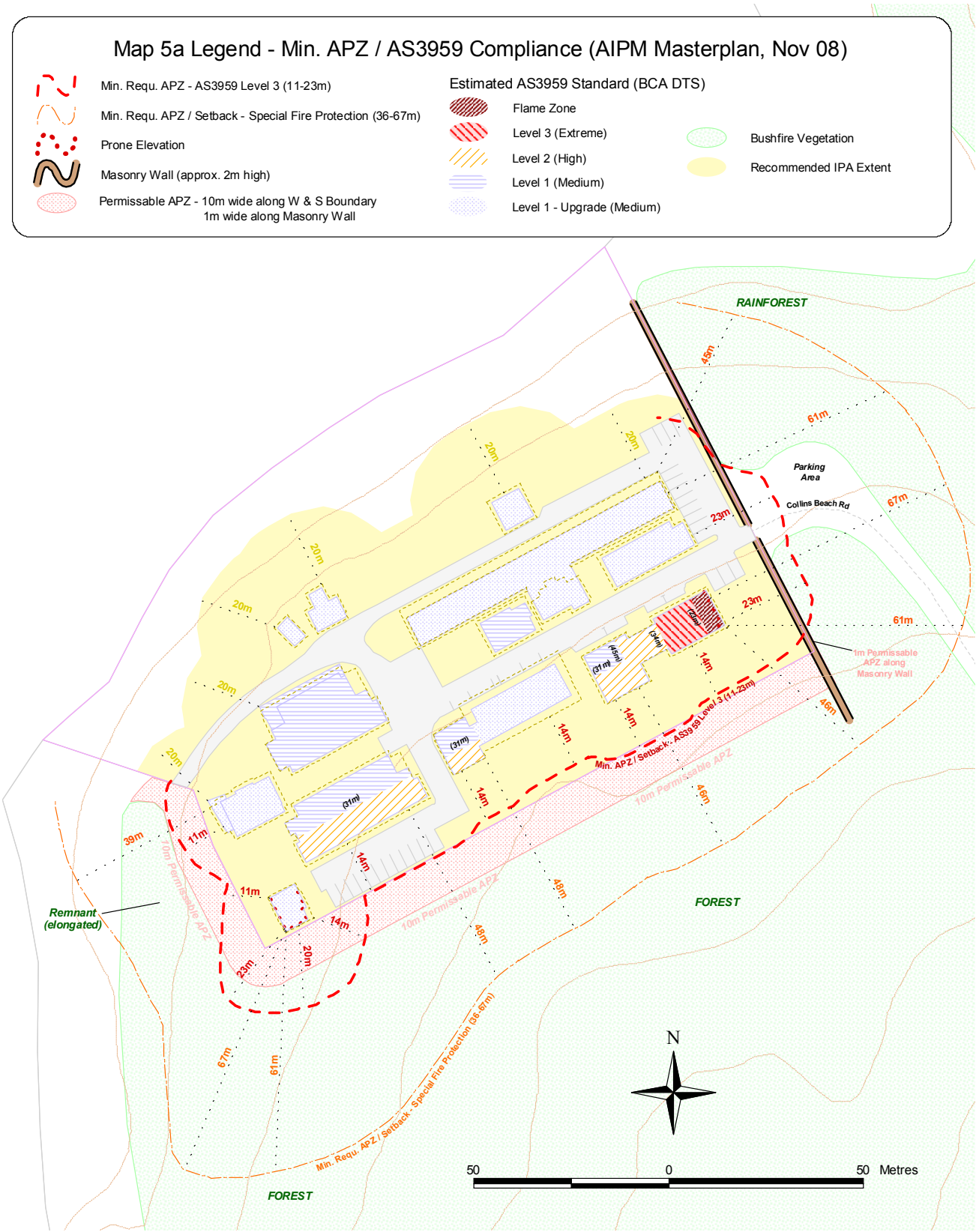
Map 5a – Min. APZ / AS3959 Compliance (Bushfire Attack Assessment)



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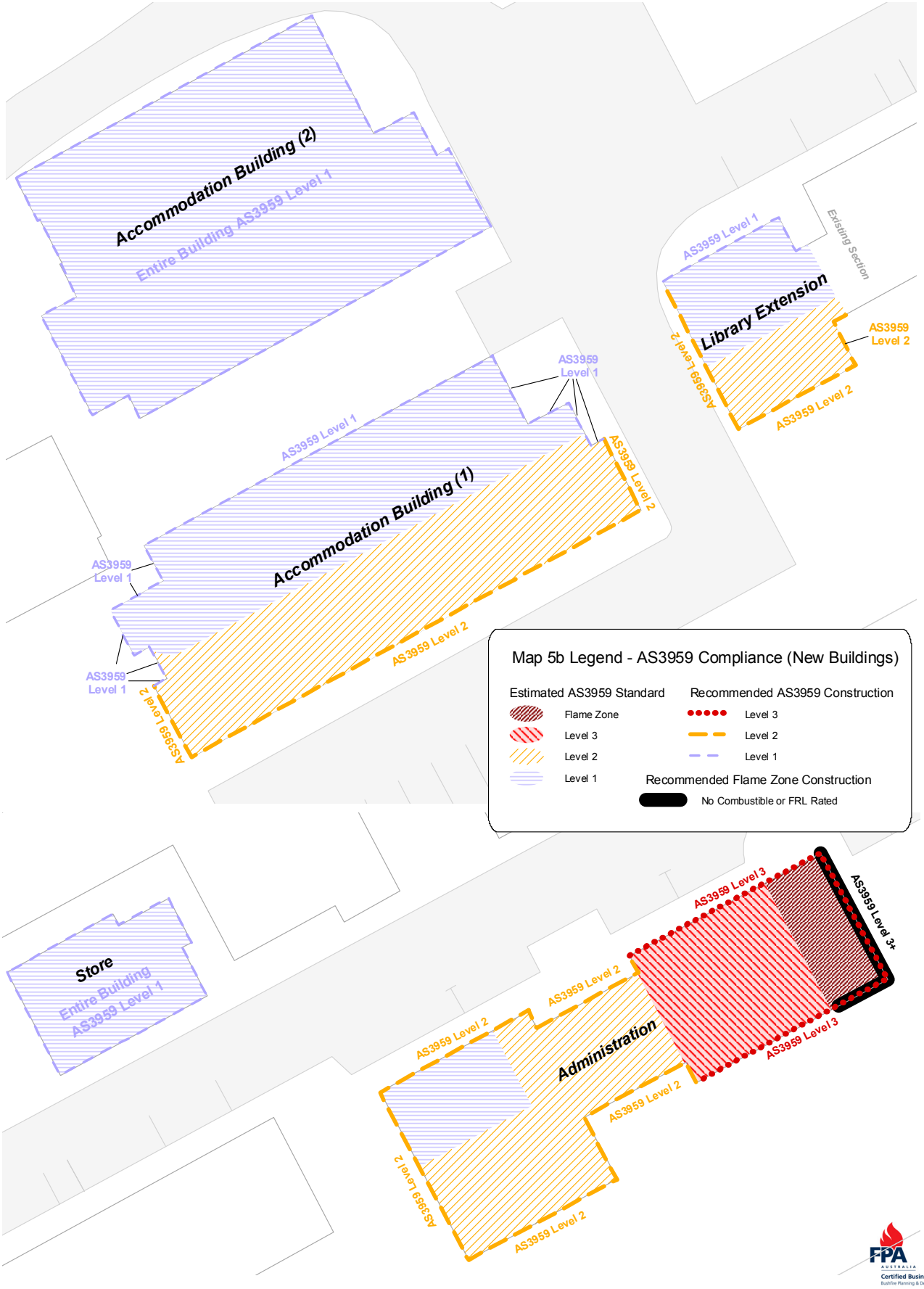
Map 5b –AS3959 Compliance (New Buildings)



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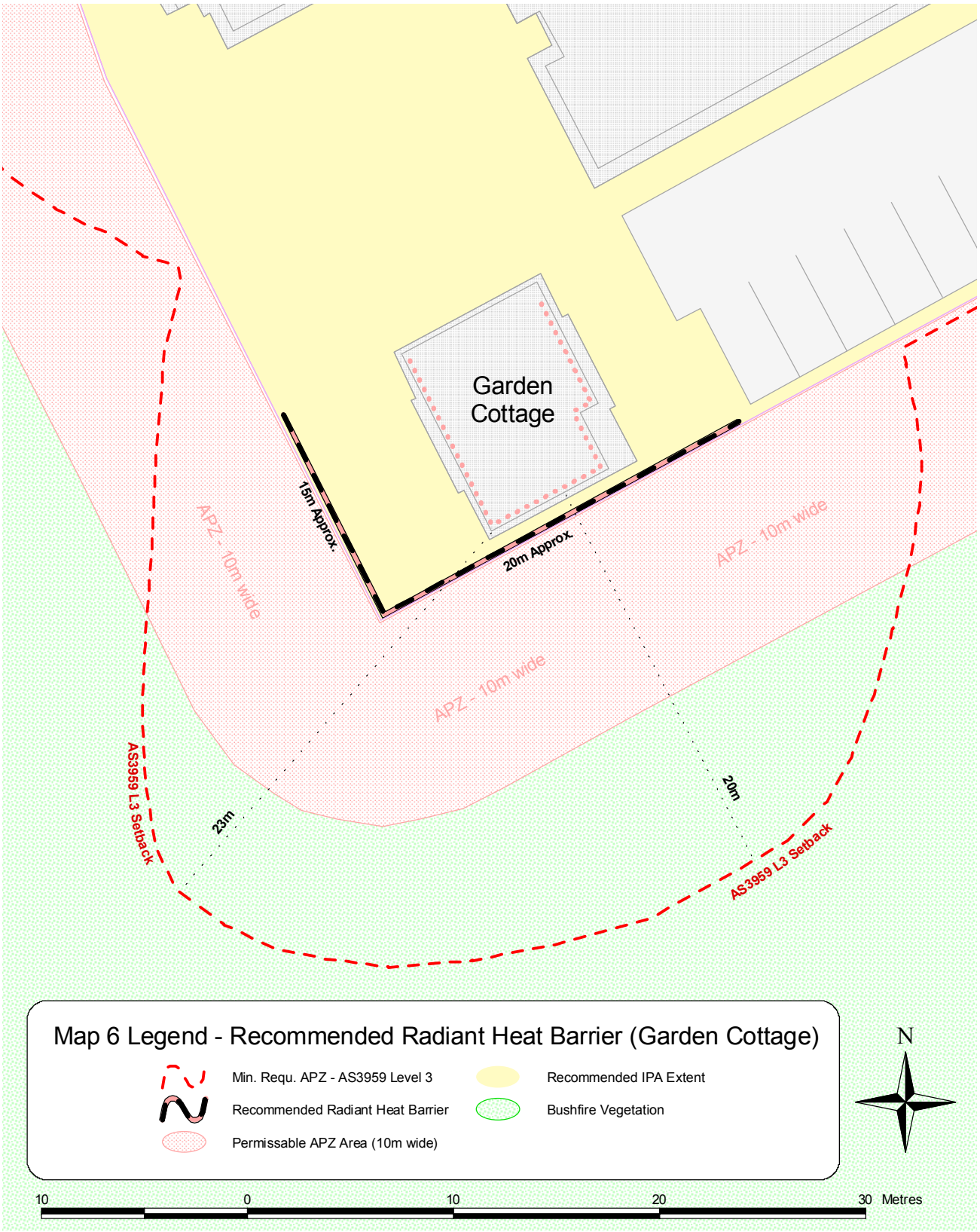
Map 6 – Recommended Radiant Heat Barrier (Garden Cottage)



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Map 7 – Recommended Glazing Protection

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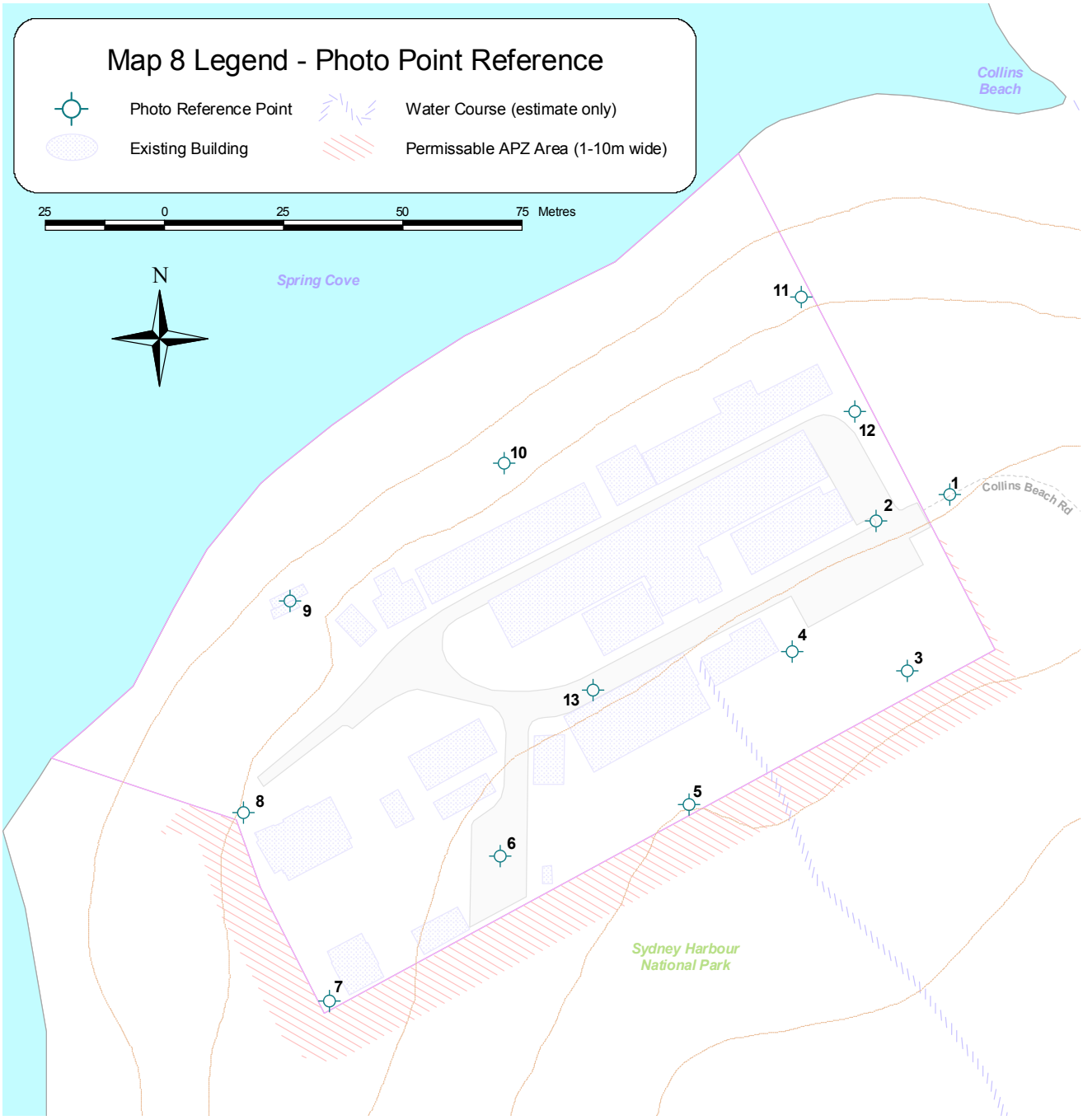
Map 8 – Photo Reference Point Location (Appendix 2)



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Appendix 1 –Determination of Bushfire Attack & SFPP APZ

Calculated Bushfire Attack (based on NSW Rural Fire Service on-line Bush Fire Attack Assessor [2006] October 2008)

Fire Danger Index of 100 used in all calculations

Building	Elevation	Veg. Category	Direct.	ES (deg)	Min. DTS Dis. (m) L3***	Min. DTS Dis. (m) L2**	Min. DTS Dis. (m) L1*	Avail. Dis. (m)	Pot. Rad. Heat Flux (kW/m2)	Attack	AS3959 Level	
accom 1	west	remnant (rf)	WSW	-5	11	17	24	28.5	10	Med	Level 1	
accom 1	south	forest	SSW	-3	23	34	45	33	19	High	Level 2	
accom 1	south	forest	SSE	6	14	21	31	23.5	17	High	Level 2	
accom 2	west	remnant (rf)	WSW	-5	11	17	24	31	9	Med	Level 1	
accom 2	south	forest	SSE	6	14	21	31	45	7	Med	Level 1	
library	south	forest	SSE	6	14	21	31	26 / 27.5	15/14	High	Level 2	
admin	south	forest	SSE	7	13.5	20	28	23 / 26	16/14	High	Level 2	
admin	S/E corner	forest	E	0	20	29	40	20	**29.5**	**FZ**	beyond	*Note 1*
admin	east	forest	ENE	-3	23	34	45	18	**39**	**FZ**	beyond	*Note 2*
store	east	forest	E	0	20	29	40	63	6	Med	Level 1	
store	south	forest	SSE	6	14	21	31	48	7	Med	Level 1	
common	east	rainforest	NE	-8	13	20	28	19	19	High	Level 2	

rf: rainforest *ES: Effective Slope*

** min. distance required to achieve ≈12.5kW/m2 or less radiant heat flux as required for AS3959 L1*

*** min. distance required to achieve ≈19kW/m2 or less radiant heat flux as required for AS3959 L2*

**** min. distance required to achieve ≈29kW/m2 or less radiant heat flux as required for AS3959 L3*

Avialable Distance (or separation distance): measured from most external building line (footprint or roof) to outermost boundary of National Park APZ

Note 1: *Potential radiant heat flux calculated to be 28.5 kW/m2 at the wall (not roof line) - 'Extreme' bushfire attack, AS3959 Level 3 required. Available distance between the eastern wall of the Administration building estimated to be 20.5m*

Note 2: *Potential radiant heat flux calculated to be 38 kW/m2 at the wall (not roof line) - 'Flame Zone' bushfire attack, beyond AS3959 scope. Available distance between the eastern wall of the Administration building estimated to be 18.5m*

Calculated APZ Requirement for SFPP Development (based on NSW RFS on-line APZ Calculator October 2008)

Building	Elevation	Veg. Category	Direct.	ES (deg)	Min. APZ (m)	*Min. IPA (m)*	*Min. OPA (m)*	Avail. Dis. (m)
accom 1	west	remnant (rf)	WSW	-5	39	*39*	*0*	28.5
accom 1	south	forest	SSW	-3	67	*43*	*24*	33
accom 1	south	forest	SSE	6	48	*30*	*18*	23.5
accom 2	west	remnant (rf)	WSW	-5	39	*39*	*0*	31
accom 2	south	forest	SSE	6	48	*30*	*18*	45
library	south	forest	SSE	6	48	*30*	*18*	26 / 27.5
admin	south	forest	SSE	7	46	*28*	*18*	23 / 26
admin	S/E corner	forest	E	0	61	38	23	20
admin	East	forest	ENE	-3	67	*43*	*24*	18
common	East	rainforest	NE	-8	45	*45*	*0*	19

IPA: Inner Protection Area *OPA: Outer Protection Area*

Appendix 2 – Site Photos (17/10/08)

Photo 1

Photo Point Reference: 1

Looking WSW towards subject property access point / security gate.

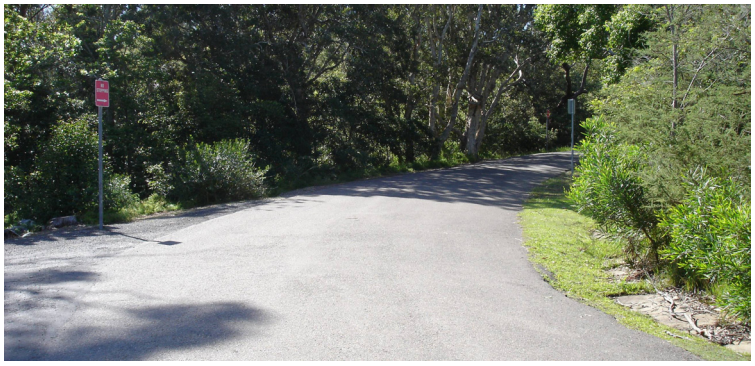

Photo 2

Photo Point Reference: 1

Looking E along Collins Beach Road.

Photo 3

Photo Point Reference: 2

Looking WNW towards E elevation of syndicate building (to be retained).

Photo 4

Photo Point Reference: 2

Looking NNW towards lounge / common room building (to be retained).

Accommodation building in background to be demolished and removed.

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Photo 5

Photo Point Reference: 2

Looking N towards accommodation building (to be demolished and removed) masonry wall.

Note hydrant pillar.

Photo 6

Photo Point Reference: 3

Looking WSW along S boundary and existing National Park APZ area.

Photo 7

Photo Point Reference: 3

Looking E along S boundary and existing National Park APZ area – masonry wall in background.

Photo 8

Photo Point Reference: 4

Looking E towards remnant scrub and revegetation within the subject property.

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Photo 9

Photo Point Reference: 4

Looking NE towards property access point and existing car parking area (proposed new administration building).

Photo 10

Photo Point Reference: 4

Looking NW towards existing administration building to be demolished and replaced.

Photo 11

Photo Point Reference: 4

Looking WSW towards existing administration building to be demolished and replaced.

Photo 12

Photo Point Reference: 5

Looking W across fuel reduced rock out-crop area within the subject property.

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Photo 13

Photo Point Reference: 5

Looking WSW along S boundary and existing National Park APZ area.

Photo 14

Photo Point Reference: 5

Looking ENE along S boundary, towards riparian / water course area.

Photo 15

Photo Point Reference: 5

Looking E along S boundary and existing National Park APZ area (water course).

Photo 16

Photo Point Reference: 6

Looking NNE towards existing library building (to be demolished and re-built).

Note pillar hydrant.

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Photo 17

Photo Point Reference: 6

Looking N along existing vehicle access roadway.

Note – all foreground buildings to be demolished and removed.

Photo 18

Photo Point Reference: 6

Looking WSW towards storage building and Gargen Cottage (background).

Note – storage building to be demolished and removed.

Photo 19

Photo Point Reference: 6

Looking S towards Sydney Harbour National Park (primary bushfire hazard).

Photo 20

Photo Point Reference: 7

Looking ENE between S boundary and S elevation of Garden Cottage (to be retained).

Note limited defendable space.

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Photo 21

Photo Point Reference: 7

Looking NW towards W elevation of Garden Cottage (to be retained).

Photo 22

Photo Point Reference: 7

Looking NNW along W boundary and existing National Park APZ area.

Photo 23

Photo Point Reference: 8

Looking SW towards existing National Park APZ area.

Photo 24

Photo Point Reference: 8

Looking SSE towards W elevation of Harbour Cottage (to be retained).

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Photo 25

Photo Point Reference: 8

Looking E towards N elevation of Harbour Cottage (to be retained).

Photo 26

Photo Point Reference: 8

Looking NE across cleared and maintained area.

Photo 27

Photo Point Reference: 8

Looking NW towards Sydney Harbour.

Photo 28

Photo Point Reference: 9

Looking SSW across cleared and maintained area (Harbour Cottage background).

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Photo 29

Photo Point Reference: 9

Looking S across cleared and maintained area (Harbour Cottage background).

Photo 30

Photo Point Reference: 9

Looking E across cleared and maintained area, towards Kookaburra Cottage (to be retained).

Photo 31

Photo Point Reference: 10

Looking SW towards existing accommodation building and Kookaburra Cottage.

Note – existing accommodation building to be demolished and removed.

Photo 32

Photo Point Reference: 10

Looking S towards existing accommodation building (to be demolished and removed).

Photo 33

Photo Point Reference: 10

Looking E towards existing accommodation building (to be demolished and removed) & Spring Cove Cottage (to be retained).

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Photo 34

Photo Point Reference: 10

Looking ENE towards
Spring Cove Cottage (foreground) and existing accommodation building (background) to be demolished and removed.

Photo 35

Photo Point Reference: 11

Looking NNW along E boundary and masonry wall.

Photo 36

Photo Point Reference: 11

Looking SW towards existing accommodation building (to be demolished and removed).

Photo 37

Photo Point Reference: 11

Looking SSE between existing accommodation building (to be demolished and removed) and E boundary (masonry wall).

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Photo 38

Photo Point Reference: 12

Looking WSW along existing vehicle access road, between existing accommodation and lounge / common room buildings.

Photo 39

Photo Point Reference: 12

Looking SW towards E elevations of Syndicate & Lounge / Common room buildings.

Photo 40

Photo Point Reference: 12

Looking SSE along E boundary and masonry wall.

Note pillar hydrant.

Photo 41

Photo Point Reference: 13

Looking ENE along main vehicle access road.

Photo 42

Photo Point Reference: 13

Looking W along main vehicle access road.

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Photo 43

Location: Intersection Collins Beach Rd & North Head Scenic Drive

Looking N.

Photo 44

Location: Intersection Collins Beach Rd & North Head Scenic Drive

Looking S.

Photo 45

Location: Intersection Collins Beach Rd & North Head Scenic Drive

Looking SSW – along Collins Beach Road.

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