Advanced
Bushfire Performance Solutions

Bushfire Assessment Report

s.100B 'Special Fire Protection Purpose'

Lot 2 & 4 DP 1151638
Lindfield Learning Village
Eton Road, Lindfield NSW

Prepared for
Dept of Education

March 2017

Prepared by Terence O'Toole
B.App.Sc Environmental Health
Grad.Dip Design in Bushfire Prone Areas

BPAD Bushfire Planning & Design Accredited Practitioner Level 3

Advanced Bushfire Performance Solutions P/L
1.01 Building T2A Warawara Circuit, Quakers Hill, NSW 2763
T: (02) 9853 3266 M: 0417 483 438
terryo@advancedbps.com.au www.advancedbps.com.au

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Document Control

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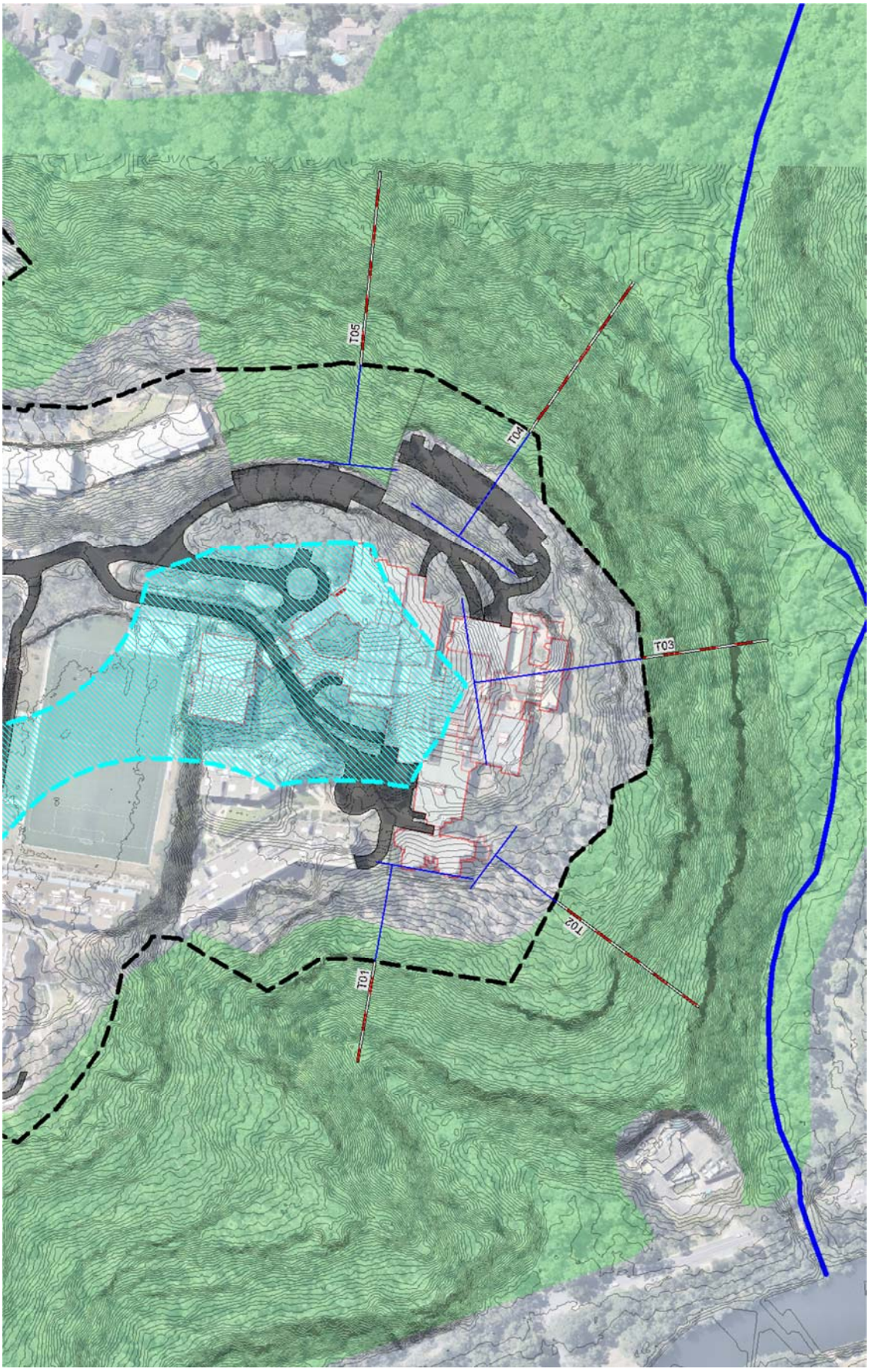
20170119DESI BAR 1.2	20170119DESI	11-Apl-17	TO	Draft Version 3

1 Proposed Development

Is the proposal on bush fire prone land	The site is within the bushfire prone land on the **Ku ring gai LGA** Bush Fire Prone Land Map.
Does the proposal require a Bush Fire Safety Authority and referral to the RFS	YES ☑ Proposal is subject to section.100B of the *Rural Fires Act 1997* NO
Does the proposal rely on alternative solutions	YES ☑ Compliance with AS3959-2009 Method 2 NO
Description	Change of use from University (UTS) to Primary, Secondary Schools and Child Care Centre. Alterations and additions to the existing buildings and access.
Plan	
Plan Reference	

2 Assessment Details

Bushfire Assessment Plan



Legend and Comments		
	Green shaded polygon	Existing bushfire hazard vegetation
	Thick black dashed line	Extent of proposed APZ
	Red/white dashed line	Slope transect
	Thin grey line	0.5m contour
	Red dashed line	Modelled flame length
	Blue dashed line	Modelled 29kW setback
	Light Blue dashed line	PBP SFPP setback
	Grey shaded zone	Access
	Red polygons	Buildings

Asset Protection Zones

Complies

APZ determined in accordance with Appendix 2
APZ located wholly within the development
APZ managed to RFS standards
APZ are easily manageable and do not compromise soil stability or support crown fires

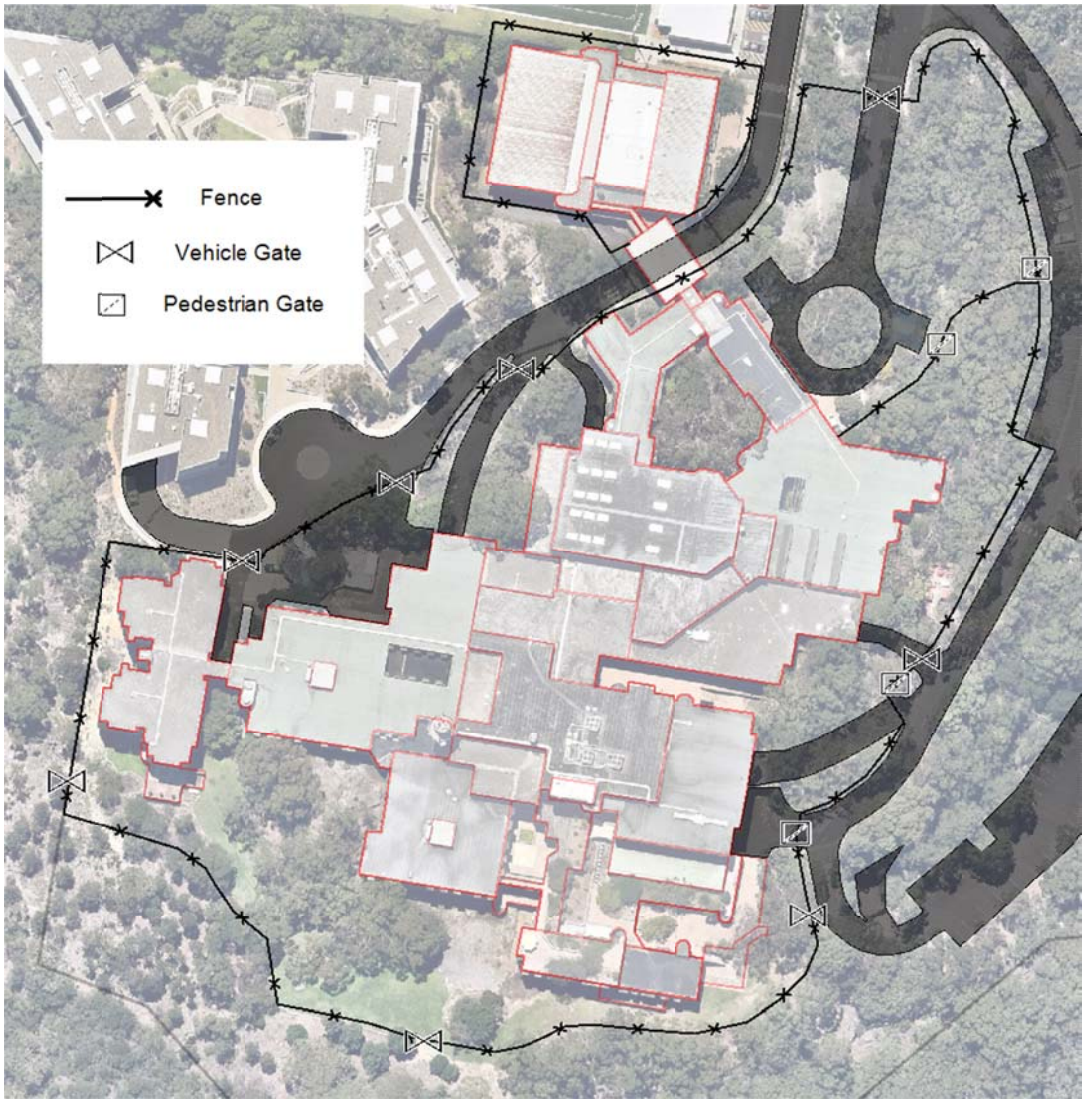
Vegetation

	• Vegetation assessed from onsite inspection (07/03/2017). • The site is located on a plateau with unmanaged bushland to the east, south and west • The vegetation is a complex of vegetation communities transitioning from woodland on the upper slopes through forest to rainforest in the lower gully to the east. These communities are mapped based on the SydneyMetroArea v3 vegetation dataset from Dept of Planning. The accuracy of the vegetation classification and mapping has not been validated by an Ecologist for this project. • The woodland community is predominantly managed as an asset protection zone to the south and west • All the vegetation within the site is managed as an asset protection zone with the exception of the forest beyond lower carpark and forest to the south. Both of these areas present difficult terrain to maintain APZs due to the steepness. • The APZ to the west is on adjoining land and outside the control of the Dept of Education. It is not known what existing management arrangements are applied to maintain the APZ. The vegetation is coarsely underscrubbed with an open canopy. • The APZ to south west is an extension of the western APZ but it is contained within the site. Isolated clusters of trees have been permitted within proximity to the building and some are very close to windows. • Vegetation to the east is underscrubbed between the access road and lower carpark. Vegetation below the carpark is unmanaged. Vegetation near the building partially overhangs and supports a managed native understorey. This area is substantially fragmented by access paths. • Vegetation to the northeast managed native gardens adjacent to the building and unmanaged bushland beyond the upper carpark (external to the site). This area is also managed about the new buildings northeast of the site. • Vegetation to the north is fragmented by access roads and urban development. • The site also contains pockets of vegetation with courtyards and in rooftop gardens
Slope	• The slope analysis for this development was undertaken using contours derived from 1m LiDAR DEM sourced from Dept of Planning – Land Property Information (LPI). • This elevation data has been processed to achieve 'Category 1' DEM products as described by the ICSM (Intergovernmental committee on Surveying & Mapping) Guidelines for Digital Elevation Data which specifies accuracies not exceeding 30cm with 2 sigma or 95% confidence. This data has been validated by independent Register Surveyors as being accurate for the purposes of bushfire assessments. • The slopes are represented by 5 transects (T01-T05) • Transects perpendicular to the site boundaries are assessed as these will generally describe the greatest impact on the site. • The site is located on a plateau with deep gullies to the east, south and west. • The terrain to the south east and south is a series of rock escarpments forming a very steep rocky slope down to the broad shallow gully floor to the south. • The gullies to the east and west present more regular slopes with fewer escarpments.
Environmental Features	• None
Bushfire Behaviour modelling	• This assessment applies alternative bushfire behaviour modelling as described in AS3959-2009, detailed method (Method 2) to determine the extent of flame contact and setbacks for compliance with residential building performance criterion in Planning for Bush Fire Protection 2006. This criterion specifically addresses limits of 29kWm^{-2} RHF on the existing building.This is not addressing the SFPP performance target of 10kWm^{-2}. • Modelling was conducted using the NBC Bushfire Attack Assessor Tool. The associated report is attached in Appendix C of this report. • Fuel loads for the dry sclerophyll forest were sourced from *Planning for Bush Fire Protection* 2006. The fuel loads were sourced from PBP to reflect the lower fuel loads in the vegetation community compared with a natural wet sclerophyll forest structured community as reflected by AS3959 fuel loads. • Woodland communities were not modelled as they do not represent a substantial portion of the unmanaged bushland. • Flame temperature was modelled at 1090K for Residential buildings. The modelling reflects the risk to the buildings rather than the risk to fire-fighters.
Setback	• Minimum setbacks specified in *Planning for Bush Fire Protection* 2006 Table A2.6 are 100m to all aspects. This is shown in the Bushfire Assessment Plan as a light blue hatched zone. The existing buildings are not supported by complying PBP setbacks. Only a half of the buildings are greater than 100m from unmanaged bushland. • Method 2 setbacks demonstrate the level of impact on the structures and shows that only buildings to the west and south are likely to be impacted by flame contact or high radiant heat loads.

	• Setbacks are based on management to APZ standards as described in the NSW Rural Fire Service documents *Planning for Bush Fire Protection* 2006 and *Standards for Asset Protection Zones* (see Appendix B). The expectation will be management to inner protection area (IPA) standards although this may be modified to incorporate an outer protection area (OPA) if any tree removal is no acceptable. • Setbacks in Planning for Bush Fire Protection 2006 are designed to ensure that firefighters are not exposed to radiant heat levels in excess of $10kWm^{-2}$ during an evacuation of the building. • All existing APZs should be practical, not compromise soil stability and negate potential crown fires within the APZ. The current state of the APZs does not comply with suitable APZ design. More extensive management is required. • No APZs are proposed beyond the boundaries of the development; however existing managed lands will be relied upon for APZs. No new or additional APZ burden will be placed on adjoining land owners.
Construction	• No new buildings are proposed by this development application. • The existing buildings will remain on the site. • The existing buildings will exceed the minimum standards for BAL-29 in AS3959-2009. Bushfire behaviour modelling shows that the building will may be impacted by flamer contact and/or high RHF in the western and southern buildings. Both of the sections can be isolated /compartmentalized by internal fire doors. • The existing buildings are of concrete construction with flat roofs, boxed gutters and toughened glass windows. • Asbestos has been found in the existing window caulking and will necessitate the replacement of external windows. The replacement windows will be toughened glass (min 6mm) within metal frames. • Rooms used for refuges will generally be air-conditioned and will not require openable windows. Where possible exclude openable windows. Where required, ensure that openable windows can be screened externally with metal mesh screening with an aperture no greater than 2mm. • Be aware that laminated glazing may turn opaque from the impacts of bushfires including the more common moderate fires also. • A survey of the building has noted the following: • Wire mesh screens in the plant rooms is larger than the maximum 2mm. • Many vents and all weepholes are not screened. • External timber doors are perishing • External doors do not have draught excluders • Openable awning windows are not screened on the inside. • Some window screens are fiberglass mesh • Roller doors are not fully sealed • Combustible rubbish is stored under a deck • Timber deck chairs are stored on balconies
Management	• The site is currently partially cleared but does not extend to the required APZs. The proposed development will remove all the bushfire hazard vegetation on the site excluding the forest to the east of the lower carpark and improve the quality of the APZ to meet inner protection area standards • All asset protection zones provided within the proposed residential lots and residual lot will be the responsibility of the Dept of Education. • Further investigations should be conducted to determine the management regime of the lot to the west of the site. This lot is currently providing a substantial APZ to the site.
SFPP Infill	• The proposed SFPP development is a reuse of an existing education facility (UTS Campus) which supported 3000 university students. • The proposed use will incorporate high school, primary school and a child care centre totaling 2100 students and 200 staff. • PBP addresses change of use in section 4.3.6 of the guidelines; however, this relates to changes of use that involve increased occupancy or increased risk or vulnerability. This development is a decrease in occupancy, but an increase in risk and vulnerability. This will be addressed primarily by a comprehensive Bushfire Emergency Evacuation Plan. The site exceeds the typical construction standards for SFPP developments. • The development is classified as 'infill' and as such it is recognised that full compliance with the acceptable solutions for each Bushfire Protection Measure may not be possible. The development does not increase the size or footprint of the buildings. All works are internal with exception of replacing windows and glass doors • This development balances the lack of a complying asset protection zone with more resilient construction, an extensive water supply network and comprehensive Bushfire Emergency Evacuation Plan. o Where relevant the building will be upgraded consistent with the RFS Building Best Practice Guidelines – Upgrading of Existing Buildings (see Appendix A)

- The building is constructed from concrete
- Windows and doors are made from toughened glass or grade A safety glass with metal frames.
- Section of the building can be isolate by existing internal fire doors.
- With the exception of the western façade of Building 5 and the southern façade of Building 2B, Building 2C and the Library, all windows comply with BAL-29 setbacks based on 1090K flame temperatures
- All openable windows will be screened with metal mesh screens with an aperture no greater than 2mm
- No external timber
- Hydrants are spaced approx. 30m apart
- Exits provide multiple egress opportunities
- Exits for evacuation are generally located more than 100m from the facades most likely to be impacted by bushfires
- APZ management will be improved to maximise protection and setbacks
- A comprehensive Emergency Evacuation Plan will be prepared to facilitate a timely and efficient evacuation of the site if required. This plan will comply with the RFS guidelines for Bush Fire Emergency Management and Evacuation Plan.

Fencing



- A new perimeter fence (1800mm) is proposed for security and safety on the site.
- A shorter fence (1200mm) will be provided to protect children from vehicles at the main entry loop.
- All fencing will be coated tubular security fencing to allow for suppression activities through the fence if required.
- Gates will be provided to ensure access to all roads, pedestrian walkways and to provide access into the APZ for management and fire suppression activities.
- Gates may be locked with approved locks

Bushfire Assessment Summary Table

Transect	T01	T02	T03	T04	T05
Vegetation Type	Dry Sclerophyll Forest	Dry Sclerophyll Forest	Dry Sclerophyll Forest	Dry Sclerophyll Forest	Dry Sclerophyll Forest
Table 2.4.2 Vegetation code	A	A	A	A	A
Proposed Setback	56m	44m	152m	71m	57m
Near Elevation	36.50m	47.50m	42.50m	42.00m	44.50m
Far Elevation	18.50m	23.00m	2.50m	2.50m	9.50m
Fall	18.00m	24.50m	40.00m	39.50m	35.00m
Run	56.85m	100.00m	70.64m	102.00m	108.30m
Hazard Slope	17.57°	13.77°	29.52°	21.17°	17.91°
Up/Down	DS	DS	DS	DS	DS
Table 2.4.2 Slope Range	>15-20°	>15-20°	>15-20°	>15-20°	>15-20°
Target Table A2.4 Setback	100m	100m	100m	100m	100m
Table A2.4 compliance	No	No	No	No	Yes
Target Table 2.4.2 Setback Range					
Actual Table 2.4.2 Setback Range					
Actual Table 2.4.2 BAL					
Table 2.4.2 BAL-29 compliance					
Site Slope Near Elevation	49.00m	50.00m	61.50m	58.50m	59.00m
Site Slope Far Elevation	36.50m	47.50m	42.50m	42.00m	44.50m
Site Slope Length	55.44m	43.34m	151.90m	70.22m	56.68m
Site Slope	12.71°	3.30°	7.13°	13.22°	14.35°
Up/Down	DS	DS	DS	DS	DS
Modelled Setback	55.44m	43.34m	151.90m	70.22m	56.68m
Flame Width	100.00m	100.00m	100.00m	100.00m	100.00m
Surface Fuel Load	NA	NA	NA	NA	NA
Elevation of Receiver	Default	Default	Default	Default	Default
Radiant Heat Flux	22.95 kW/m²	27.23 kW/m²	20.22 kW/m²	20.46 kW/m²	22.43 kW/m²
Flame Length	55.44m	43.34m	94.00m	70.22m	56.68m
Flame Angle	64°	57°	46°	61°	64°
Method 2 BAL	BAL-29	BAL-29	BAL-29	BAL-29	BAL-29

Method 2 modelling based on 1090K flame addressing existing structures resilience

Access Compliance with s.4.1.3(1)		**Complies**
Public access road	**Perimeter Roads (interfacing with the bushland)** • The site provides a perimeter road to the eastern side of the site • A shared access road to the north western side of the site provides access to a small portion of the western hazard. • The existing roads within the site are no less than 6m wide and support two way traffic. • There is no opportunity to practically provide a perimeter through road to the entire site. The existing access road network will facilitate suitable access for fire–fighters to all parts of the buildings and APZs.	Yes
	Non-Perimeter Roads • There are no non-perimeter roads in this site	Yes
	One Way Access Roads • There are no one way access roads within this site	Yes
	Dead Ends • All roads within this site are dead-end roads. • There is no potential for additional road linkages. • Access to the front entry is a short driveway (<100m) with a turning loop • Access to the upper and lower carparks is via a >350m road; however, this road has many 3 point turn opportunities (turning bays) for a Cat 1 Tanker. • Access to the northwest is via a >210m shared access road with a 24m diameter turning loop and a number of turning bays.	Yes
	All Roads • Road surfaces support 2 wheeled drive vehicles and provide all weather access • Road surfaces support 15 tonnes • Traffic management devices do not inhibit access to emergency services vehicles • Cross fall does not exceed 3 degrees • Sealed roads have a maximum grade of 15° with max avg grade of 10° • Minimum vertical clearance should be no less than 4m • Access will be speed limited to <70kph.	Yes
	Hydrants and Parking • No hydrants are located with the road pavement or within parking bays.	Yes
Property access	• No roads within the site fully comply with acceptable solutions in *Planning for Bush Fire Protection* 2006 for Internal Access Roads	Yes
Fire Trails	• No fire trails are proposed by this development application • The APZ to the south and southwest should be accessible by light vehicles to conduct APZ maintenance activities. It is noted that the southern portion of the site has shallow soils on bedrock which would support fire fighting vehicles. A clear practical path should be maintained from the access road to each gate in the APZ.	Yes

s.4.2.7 Internal Roads	Should provide alternative access or egress if road can be cut or >200m from through road	Site access is through existing urban area with multiple connectivity to the urban road network
	Impact of increased traffic and traffic management	Public access road has historically managed larger numbers of vehicles than expected by this development

	Buildings sited close to through roads	The buildings and roads within the site are existing. There is no opportunity to site the development any closer to the urban through road network.		
	Internal road widths and design enable safe access for emergency services and allow crews to work with equipment about the vehicle	Roads are two-wheel drive, sealed, all weather	All roads are existing, two-wheeled drive all weather sealed carriageway with kerb and guttering	Complies
		Perimeter roads are two trafficable lanes, 8m kerb to kerb with shoulders allowing traffic to pass in opposite directions	Roads are approx. 6.5m wide with two trafficable lanes. Parking areas each side provide >8m width for much of the road	Does not comply
		Roads are through roads	Property access roads are dead-ends	Does not comply
		Dead-ends are not more than 100m in length	Dead-ends are greater than 100m in length	Does not comply
		Dead-ends incorporate 12m outer radius turning circle	Dead-ends provide suitable 24m diameter turning circles/space	Complies
		Dead-ends clearly sign posted as dead-end	No signs noted	
		Traffic management devices are constructed to facilitate access by emergency services vehicles	No traffic devices impede RFS access	Complies
		Min vertical clearance 4m above road	Clearance maintenance will be included within the VMP	Complies
		Curves are min 6m inner radius		Complies
		Distance between inner and outer curves is 6m		Complies
		Max grade for sealed roads is 15° and an average of 10°		Complies
		Cross-fall does not exceed 10°		Complies
		Roads do not traverse wetlands or land subject to inundation		Complies
		Roads are clearly sign-posted		Complies
		Bridges clearly indicate load rating	NA	
		Road surface/bridge can support 15 tonnes		Complies
s.4.2.7 Standards for BPM for SFPP APZs	Radiant heat levels >10kWm^{-2} will not be experienced by occupants or emergency services workers entering or exiting a building	APZ provided as per Table A2.6 of PBP2006	No bushfire hazard vegetation is within 125m of the primary entry to the building	Complies
		Exits are located away from the hazard side of the building	The primary access is located at the north east of the building complex The entry and exit for the site is to the north into the urban development	Complies
		APZs are wholly within the boundaries of the development site. Exceptional circumstances may apply	App proposed APZs are wholly within the sot or on adjacent lots subject to covenants on title	Complies
	Issues related to slope are addressed: maintenance is practical, soil stability is not compromised and the potential for crown fires is negated	Mechanisms are in place for the maintenance of APZ over the life of the development	Covenants on the title to Part Lot 1 DP 270770 secure the ongoing maintenance on the adjoining lots A VMP will be prepared outlining the APZ requirements and ongoing maintenance	Complies
		APZ is not located on lands with slope >18°	Slopes of greater than 18 degrees occur across the APZs. These are shown on the plan attached (Appendix F)	Complies with performance criterion
	APZs are managed and maintained to prevent the spread of a fire towards the building	Manage and maintain in accordance with Standards for Asset Protection Zones (RFS 2005) Prepare a monitoring and fuel management program	APZ will be managed as per the standards and detailed in the VMP	Complies

	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 PBP2005 Appendix 5	APZ will be managed as per the standards and detailed in the VMP. This will comply with design and management principles in Appendix 5	Complies

Landscaping

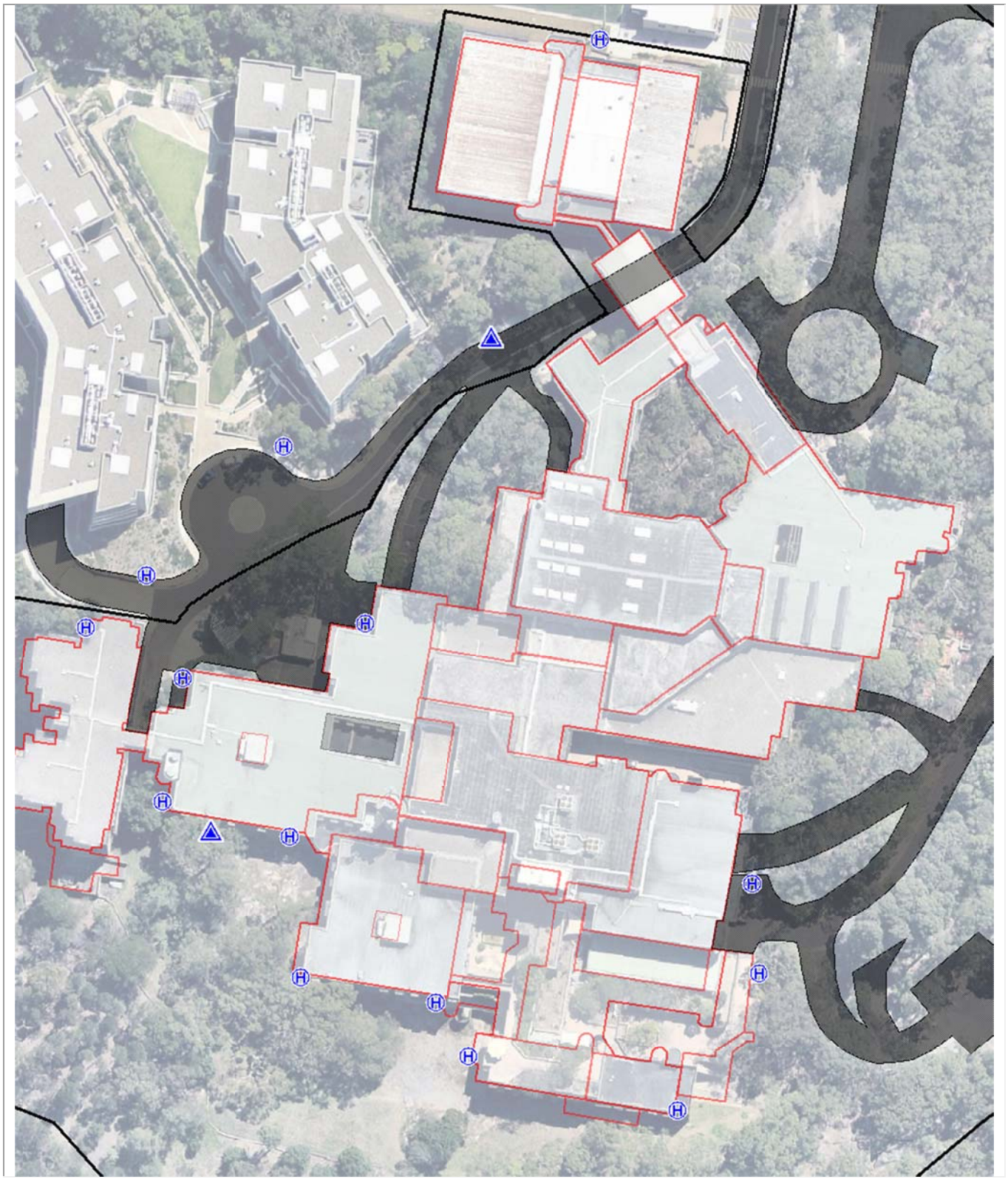
Complies

Compliance with Appendix 5

Landscaping

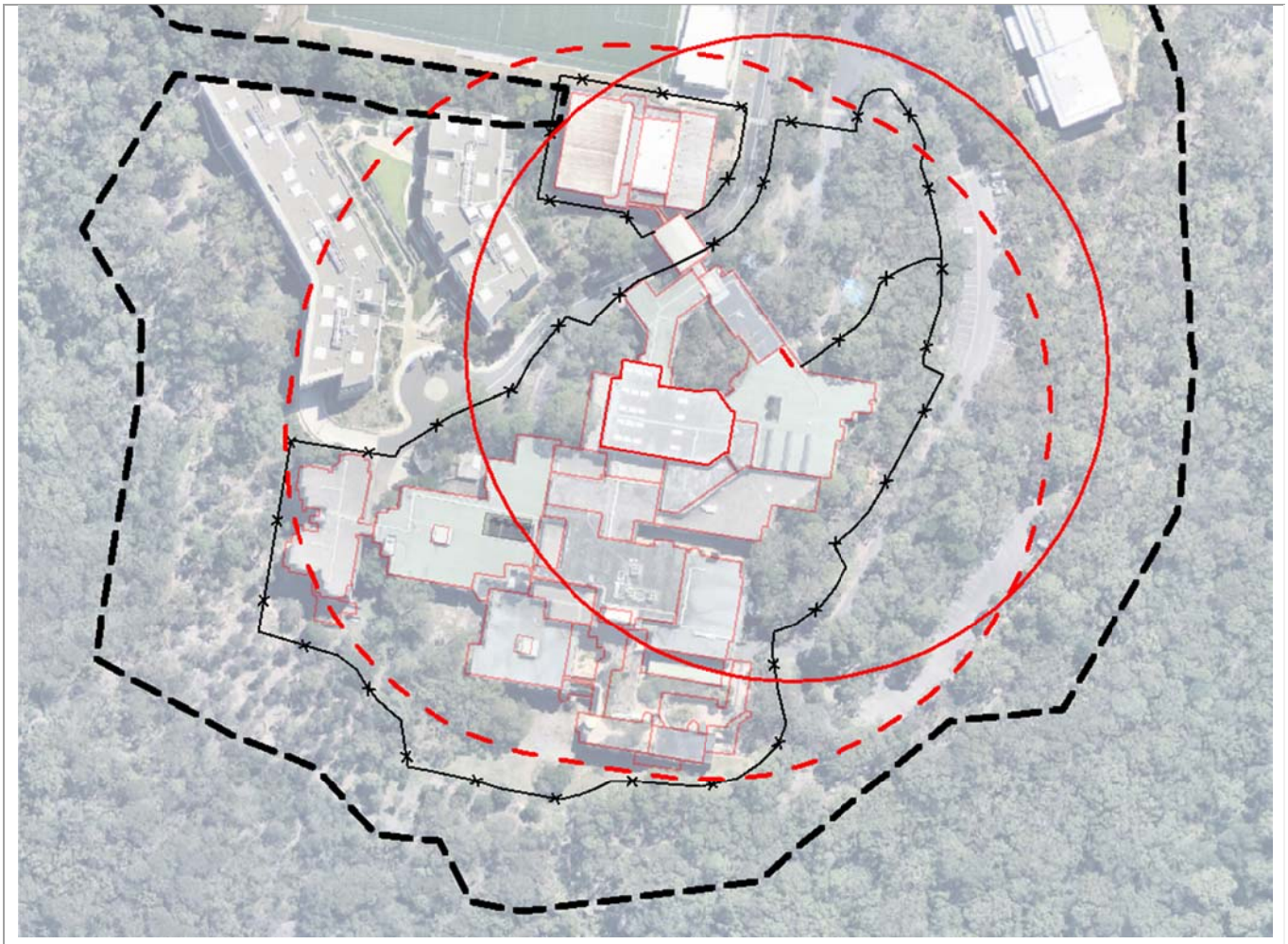
- No landscape plan has been reviewed for this report.
- The site landscaping has a historical context as it was designed by Bruce McKenzie and has recognised cultural values that may conflict with bushfire protection strategies.
- Any new landscaping within the development should adopt (where practical) the following principles:
  - Moisture content of leaves should be high (250-400% of dry oven weight)
  - Volatile oil content of leaves should be low
  - Mineral content of leaves should be high
  - Leaves should be thick (broad) with low area to volume ratio
  - Density of foliage should be high and less permeable to air flow
  - Continuity of plant form should be broken or separated
  - Height of lowest foliage above ground should be maximised
  - Size of plant should be wide spread rather than tall and narrow
  - Dead foliage on the plant should be minimal
  - Bark texture should be tight and smooth
  - Quantity of ground fuels should be minimised
  - Fineness of ground fuels should be minimised
  - Compaction ability of ground fuels should be maximised
  - Mineral content of ground fuel should be maximised

Other



Services – Water, gas and electricity Reticulated water supplies	Water supplies are easily accessible and located at regular intervals	Access points for reticulated water supply incorporates ring main system for all internal roads	A ring mains system is provided Hydrants are located about the perimeter of the building	Complies
		Fire hydrant spacing, size and pressure complies with AS 2419-2005	Hydrants are space at frequent intervals less than the max distances in the Standard	Complies
		Water pressure test required	NA	
		Parking should comply with s4.1.3(1)	Parking is within designated parking areas	Complies

Non-reticulated water supplies	Water supply reserve installed and maintained	10,000 litres min water supply required for each building	NA	
		65mm Storz outlet with gate or ball valve provided (metal)	NA	
Electricity	Location of electricity services will not lead to ignition of bushland, buildings or risk life	Electricity transmission lines are located underground	Existing power transmission lines are located underground No new lines are proposed by the development	Complies
Gas	Location of gas services will not lead to ignition of bushland or buildings	Reticulated or bottled gas is installed and maintained as per AS1596-2002 and use metal pipes	Two external gas facilities were noted (blue triangles in plan above) All pipes and fittings are metal	Complies
		All fixed LPG tanks are kept clear of all flammable materials and located on non-hazard side of the development	NA	
		Gas cylinders kept near buildings must direct release valves away from combustible material	NA	
		Polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not to be used	NA	



- Black dashed line is the extent of the APZ
- Red solid line is a 100m buffer about the primary exit
- Red dashed line is a 100m buffer about the auditorium/refuge

- The main auditorium will be nominated as the onsite refuge. It is large enough to support the students and is more than 100m from any bushfire impacts. It is also located directly adjacent to the primary exit. It has A/C to facilitate positive air pressure to keep smoke out.

- The western buildings can be isolated by a series of existing internal fire doors. These will compartmentalise any fire that enter the building from the west. The western buildings are the most vulnerable to significant bushfire imapcts and are within the flame zone.

Emergency and Evacuation Planning	An Emergency and Evacuation Management Plan is approved by the RFS	An emergency/evacuation plan is prepared consistent with the RFS guidelines for the Preparation of Emergency/Evacuation Plan		Complies
		Compliance with AS3745-2002 Emergency control organisation and procedures for buildings, structures and workplace for residential accommodation		Complies
		Compliance with AS4083-1997 Planning for emergencies – for health care facilities	NA	

		Copy of plan is provided to local Bush Fire Management Committee	A finalized copy will be provided to the BFMC	Complies
	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.	A committee will be formed as required	Complies
		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.	Detailed plans will be prepared prior to occupation	Complies
	Exits	The site is accessed from the north off Eton road. This provides the only access route to the site. The existing buildings provide for a primary entry/exit in the northeast of the site adjacent to the driveway loop. During an evacuation of the site this would be the preferred exit as it is the nearest to the main vehicular access, the assembly point, the upper carpark and it is predominantly shielded from direct bushfire impacts from the northwest/west. It is directly exposed to bushfires from the east although there is 125m separation. These eastern fire paths are not typically associated with major bushfires in Sydney. Secondary exits are available along the northwestern access road. Should a bushfire impact the main exit then these would be shielded and allow vehicles to collect occupants. Secondary exits to the south western portions of the building are not typically used to access the building and do not provide direct access to familiar exit route. It is unlikely that any occupants would utilise these exits in a bushfire event. Secondary exists to the eastern portion of the site present a risk in that these directly access the parking areas. Occupants would be familiar with this exit route and might utilise it even when directly impacted by bushfire. Strategies to limit access to these exits are critical during any bushfire event.		
	Emergency strategy	A Bush Fire Emergency Management and Evacuation Plan will be prepared based on the RFS guidelines. An Emergency Planning Committee will be formed prior to commencing operational use of the site. As a school there are a number of consideration to aware of when developing a plan • The large number of occupants • The age of the students • The high level of supervision required Bushfires originating from a distant location would allow time to close the school and implement an orderly evacuation without significant assistance from emergency services. The site is surrounded on three sides by bushfire hazard vegetation. Although the hazard is greater than 100m in depth in each direction, to the east and south it is limited to the gullies and to the west it is fragmented by roads, development and rivers. The threat and risk to the site most significant from local fires that impact the site within short notice. The building is a robust structure designed to fit into the landscape with a high resilience to bushfire impacts. It covers a large area and affords ample space within the structure to support a large population. In this respect it is a suitable refuge during a bushfire. Evacuation of a large student population is inherently difficult. This is made more complex by parents attempting to retrieve their children. Schools have developed comprehensive and efficient lockdown/emergency procedures that revolve around retaining students on the campus. The schools provide phone apps to communicate information to parents. The local area does not provide any facilities suitable to support this population. Local open space is too close to the bushfire impacts to provide a safe environment for children. The proposed strategy will be to lockdown the building when a bushfire may impact the site or surrounding area. Students will be assembled within the auditorium.		

		Parents will be informed of the situation and asked to remain away for the site to avoid traffic congestion Sections of the building to the west and south will be isolated by fire doors. If fire authorities believe an offsite evacuation is warranted, pre-arranged buses will transport the students via the main entry to a prearranged venue in a safe remote location.

Environmental Impact	• None noted
Other BPMs	• No additional measures
Deviations	• The assessment does not deviate from the standards, specific objectives and performance criteria of Planning for Bush Fire Protection 2006

3 Bushfire Protection Measures - recommendations

Performance Criteria	Recommendation	Compliance
APZ	1. The subject lots shall be managed to inner protection area standards as described in the RFS documents *Planning for Bush Fire Protection* 2006 and *Standards for Asset Protection Zones*. 2. Trees and shrubs within 2m of windows should be removed or pruned 3. APZs on adjoining Part Lot1 shall be managed to inner protection area standards as described in the RFS documents *Planning for Bush Fire Protection* 2006 and *Standards for Asset Protection Zones*.	Yes
Construction	4. The existing building shall be upgraded, where relevant, as described in the RFS Building Best Practice Guideline – Upgrading Existing Buildings 5. Existing windows and glass doors shall be replaced with toughened glass (min 6mm) or grade A safety glass in metal frames with metal fittings and draught excluders/seals 6. All external vents and weepholes shall be screened with metal mesh screening with an aperture no greater than 2mm 7. External timber doors shall be repaired or replaced to comply with AS3959-2009 BAL-29 8. Roller doors and external doors shall be provided with brush seals or draught excluders to ensure no openings greater than 3mm.	Yes
Access	9. Gates shall be provided in the proposed fence to permit access for emergency service vehicles to the southern and western APZs	Yes
Services	10. None	Yes
Landscaping	11. None	Yes
Emergency	12. Prepare a Bush Fire Emergency Management and Evacuation Plan as described in the RFS guide to developing the plan	NA

Appendix A – Extract from Building Best Practice Guidelines – Upgrading of Existing Buildings

BUILDING ELEMENT	MINIMAL PROTECTION MEASURES	ADDITIONAL PROTECTION MEASURES
GENERAL	Seal all gaps (>3mm) around the house (excluding subfloor) with: • appropriate joining strips; • flexible silicon based sealant; or • mesh with a maximum aperture of 2mm, made from corrosion resistant steel, bronze or aluminium.	• Install a bush fire sprayer system. (Please contact a bush fire consultant or relevant industry expert to discuss options) Seal all gaps (>3mm) around the house (excluding subfloor) with: • appropriate joining strips • flexible silicon based sealant; or mesh with a maximum aperture of 2mm, made from corrosion resistant steel, bronze or aluminium.
WALLS	Install sarking with a flammability index of not more than 5 behind weatherboards or other external cladding when they are being replaced for maintenance or other reasons.	• Replace wall materials with non-combustible materials • Install sarking with a flammability index of not more than 5 behind weatherboards or other external cladding.
SUBFLOOR	Removal of combustible materials and keeping areas clear and accessible.	• Enclose subfloor with non-combustible material.
DOORS	Install weather strips, draught excluders or draught seals at the base of side-hung doors.	• Replace external doors with non-combustible or solid timber doors with minimum thickness of 35mm. • Replace or over-clad parts of door frames less than 400mm above the ground, decks and similar elements or fittings with non-combustible material. • Install weather strips, draught excluders or draught seals at the base of side-hung doors.
VENTS & WEEPHOLES	Seal vents and weepholes in external walls with mesh (with an aperture size of 2 mm) of corrosion resistant steel, bronze or aluminium.	• Seal vents and weepholes in external walls with mesh (with an aperture size of 2 mm) of corrosion resistant steel, bronze or aluminium.
ROOFS	Seal around roofing and roof penetrations with a non-combustible material. Install sarking with a flammability index of not more than 5 beneath existing roofing when it is being replaced for maintenance or other reasons. If installed, gutter and valley leaf guards shall be non-combustible.	• Replace fascia and roof materials with non-combustible materials. • Seal around roofing and roof penetrations with a non-combustible material. • Install sarking with a flammability index of not more than 5 beneath existing roofing. • If installed, gutter and valley leaf guards shall be non-combustible.
WINDOWS	Install mesh with a maximum aperture of 2mm, made from corrosion resistant steel, bronze or aluminium to all external doors and openable windows	• Installing appropriately tested shutters to doors and windows • Install mesh with a maximum aperture of 2mm, made from corrosion resistant steel, bronze or aluminium to all external doors and windows • Replacing glass with toughened or laminated safety glass • Replace overhead glazing with 'grade a' safety glass
EXTERNAL STRUCTURES		• External structures to be located >10 metres from the main dwelling.
DECKING		• Replace decking with non-combustible material

Appendix B – Asset Protection Zone Standards

Planning for Bush Fire Protection 2006

Asset Protection Zone	Inner Protection Area	Outer Protection Area
(p.10)Buffer zone between bush fire hazard and buildings. Managed progressively to minimise fuel loads and reduce bushfire attack.	(p.10) Closest to buildings, incorporating the defendable space and for managing heat intensities at the building surface	(p.10) reducing the potential length of flames by slowing the rate of spread, filtering embers and suppressing crown fire
(p.10) defendable space is a subset of APZ	(p.50) The IPA is critical to providing a defendable space and managing heat intensities at the building surface. The IPA may be increased at the expense of the OPA	(p.50) the OPA serves to reduce the potential length of flames by slowing the ROS, filtering embers and reducing the likelihood of crown fires
(p.12) fuel reduced physical separation. Based on keeping radiant heat levels at buildings below 29kWm^{-2}	(p.51) An IPA should provide a tree canopy cover of less than 15% and should be located >2m from any part of the roofline of a dwelling. Garden beds and flammable shrubs are not to be located under trees and should not be located <10m from an exposed window or door. Lower limbs should be pruned to a height of 2m above the ground	(p.51) An OPA should provide a tree canopy cover of less than 30% and should have understorey managed (mowed) to treat all shrubs and grasses on an annual basis in advance of the fire season
(p.13) Where an APZ easement is established to the benefit of Community Title is shall be maintained in accordance with a PoM		
(p.18) Intent of Measures- to provide sufficient space and maintain reduced fuel load, so as to ensure radiant heat levels at the building are below critical limits and to prevent direct flame contact with a building		
(p.18) APZ is designed to minimise the presence of fuels which could become involved in a fire		
(p.19) APZs are managed and maintained to prevent the spread of fire towards the building. In accordance with the requirements of Standards for		

Asset Protection Zones (RFS,2005)		
Location of APZs on slopes >18 is not supported for new development on wooded vegetation due to environmental constraints and difficulties in management. In addition vegetation could carry a canopy fire without the support of understorey fuel		
(p.71) Retention of taller trees will assist in filtering out embers		
Tree canopy is not contiguous		

Standards for Asset Protection Zones

Asset Protection Zone	**Inner Protection Area**	**Outer Protection Area**
APZ is a fuel reduced area surrounding a built asset or structure		
APZ should be wholly located with your land		
Fallen ground fuels <6mm dia and bark should be removed on a regular basis		
Grasses need to be kept short and where possible green		
Separate tree crowns by 2-5m		
Canopy should not overhang within 2-5m of a dwelling		
Native trees and shrubs should be retained as clumps or islands and should maintain a covering of <20% of the area.		
Ensure there is no contiguous fuel path to the dwelling		
Fire trails, gravel paths, rows of trees, dams, creeks, swimming pools, tennis courts, and vegetable gardens are permitted in an APZ		

Appendix C – AS3959-2009 Method 2 assessment results

NBC Bushfire Attack Assessment Report V2.1

AS3959 (2009) Appendix B - Detailed Method 2

Printed: 11/04/2017 **Assessment Date:** 11/04/2017

Site Street Address: Lindfield Learning Centre Eton Road, Lindfield

Assessor: Mr Admin; admin

Local Government Area: Ku-ring-gai **Alpine Area:** No

Equations Used

Transmissivity: Fuss and Hammins, 2002
Flame Length: RFS PBP, 2001
Rate of Fire Spread: Noble et al., 1980
Radiant Heat: Drysdale, 1985; Sullivan et al., 2003; Tan et al., 2005
Peak Elevation of Receiver: Tan et al., 2005
Peak Flame Angle: Tan et al., 2005

Run Description: T01

Vegetation Information

Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	17.57 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	20	**Overall Fuel Load(t/ha):**	25

Site Information

Site Slope:	12.71 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m):	Default	**APZ/Separation(m):**	55.44

Fire Inputs

Veg./Flame Width(m):	100	**Flame Temp(K)**	1090

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg)	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100

Program Outputs

Category of Attack:	HIGH	**Peak Elevation of Receiver(m):**	12.35
Level of Construction:	BAL 29	**Fire Intensity(kW/m):**	104201
Radiant Heat(kW/m2):	22.95	**Flame Angle (degrees):**	64
Flame Length(m):	55.44	**Maximum View Factor:**	0.388
Rate Of Spread (km/h):	8.07	**Inner Protection Area(m):**	55
Transmissivity:	0.779	**Outer Protection Area(m):**	0

Run Description: T02

Vegetation Information

Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	13.77 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	20	**Overall Fuel Load(t/ha):**	25

Site Information

Site Slope:	3.3 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m):	Default	**APZ/Separation(m):**	43.34

Fire Inputs

Veg./Flame Width(m):	100	**Flame Temp(K)**	1090

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg)	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100

Program Outputs

Category of Attack:	HIGH	**Peak Elevation of Receiver(m):**	15.74
Level of Construction:	BAL 29	**Fire Intensity(kW/m):**	80167
Radiant Heat(kW/m2):	27.23	**Flame Angle (degrees):**	57
Flame Length(m):	43.34	**Maximum View Factor:**	0.447
Rate Of Spread (km/h):	6.21	**Inner Protection Area(m):**	43
Transmissivity:	0.801	**Outer Protection Area(m):**	0

Run Description: T03

Vegetation Information

Vegetation Type:	Forest	**Vegetation Group:**	Forest and Woodland
Vegetation Slope:	29.52 Degrees	**Vegetation Slope Type:**	Downslope
Surface Fuel Load(t/ha):	20	**Overall Fuel Load(t/ha):**	25

Site Information

Site Slope:	0 Degrees	**Site Slope Type:**	Downslope
Elevation of Receiver(m):	Default	**APZ/Separation(m):**	94.01

Fire Inputs

Veg./Flame Width(m):	100	**Flame Temp(K)**	1090

Calculation Parameters

Flame Emissivity:	95	**Relative Humidity(%):**	25
Heat of Combustion(kJ/kg)	18600	**Ambient Temp(K):**	308
Moisture Factor:	5	**FDI:**	100

Program Outputs

Category of Attack:	HIGH	**Peak Elevation of Receiver(m):**	33.81
Level of Construction:	BAL 29	**Fire Intensity(kW/m):**	180833
Radiant Heat(kW/m2):	20.21	**Flame Angle (degrees):**	46
Flame Length(m):	94	**Maximum View Factor:**	0.353
Rate Of Spread (km/h):	14	**Inner Protection Area(m):**	94
Transmissivity:	0.754	**Outer Protection Area(m):**	0

Run Description:	T04		
Vegetation Information			
Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	21.17 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	20	Overall Fuel Load(t/ha):	25
Site Information			
Site Slope:	13.22 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	70.22
Fire Inputs			
Veg./Flame Width(m):	100	Flame Temp(K)	1090
Calculation Parameters			
Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	100
Program Outputs			
Category of Attack:	HIGH	Peak Elevation of Receiver(m):	14.28
Level of Construction:	BAL 29	Fire Intensity(kW/m):	133582
Radiant Heat(kW/m2):	20.46	Flame Angle (degrees):	61
Flame Length(m):	70.22	Maximum View Factor:	0.352
Rate Of Spread (km/h):	10.34	Inner Protection Area(m):	70
Transmissivity:	0.763	Outer Protection Area(m):	0

Run Description:	T05		
Vegetation Information			
Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	17.91 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	20	Overall Fuel Load(t/ha):	25
Site Information			
Site Slope:	14.35 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m):	Default	APZ/Separation(m):	56.68
Fire Inputs			
Veg./Flame Width(m):	100	Flame Temp(K)	1090
Calculation Parameters			
Flame Emissivity:	95	Relative Humidity(%):	25
Heat of Combustion(kJ/kg)	18600	Ambient Temp(K):	308
Moisture Factor:	5	FDI:	100
Program Outputs			
Category of Attack:	HIGH	Peak Elevation of Receiver(m):	11.05
Level of Construction:	BAL 29	Fire Intensity(kW/m):	106674
Radiant Heat(kW/m2):	22.43	Flame Angle (degrees):	64
Flame Length(m):	56.68	Maximum View Factor:	0.38
Rate Of Spread (km/h):	8.26	Inner Protection Area(m):	57
Transmissivity:	0.777	Outer Protection Area(m):	0

Appendix D – Site photos

View to the west looking across the site

View to the northwest looking across the site.

View to the north looking along the eastern access.

View of the eastern portion of the site

View to south looking along the eastern portion of the site.

View towards the upper carpark and main entry to site.

View to the west along the south eastern APZ.

Appendix E - RFS consultation

NSW RURAL FIRE SERVICE

NSW GOVERNMENT

PRE-DA APPLICATION FORM

Applicant Details			
Name:	Terence O'Toole	Company Name:	Advanced Bushfire performance solutions Pty Ltd
Postal Address:	PO BOX 147 Quakers Hill NSW 2763		
Phone:	9853 3266	Email:	terryo@advancedbps.com.au

Site Details	
Street Address:	UTS Campus- Eton Road Lindfield
Lot & DP No.:	2 // 1151638

Details of the Development Proposal			
Development type:	☐ Subdivision / Dual Occupancy	☑ SFPP	☐ Residential Infill
Description of proposed development / use:	Conversion of old University Campus into Lindfield Learning village incorporating a new school for Kindergarten to Year 12 students.		
Information attached:	Development proposed by Dept of Education Proposed development does not include any new buildings. A new perimeter fence is proposed. Access will be provided to allow firefighters and property maintenance into APZ/bushland. Dept of Education also owns Lot 4 which will be used to maximise APZs Previous use supported 3000 university students. The proposed school will support 2100 students and 200 staff. Proposed upgrading the existing building for improved ember protection and more intensive APZ management. This is a State Significant Development and a consultation with the RFS is required.		

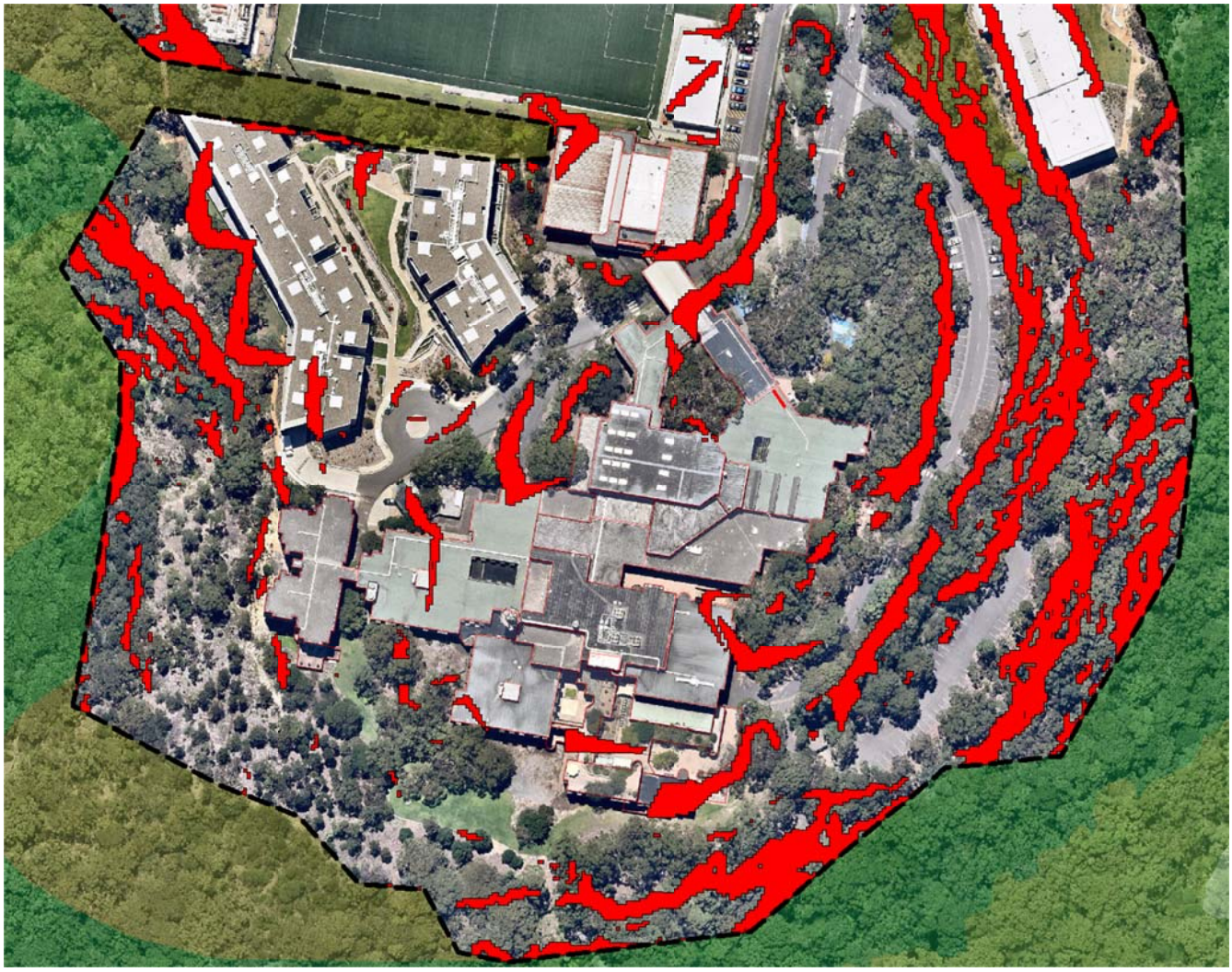
Issues for Discussion	
Summary of particular issues to be discussed / areas of potential non-compliance:	General discussion about additional measures to improve resilience

Declarations	
Are you or any party involved in this pre-DA application: 1. A member of or engaged by the NSW Rural Fire Service? 2. An employee or engaged by the relevant consenting authority?	☐ Yes ☑ No

NSW RURAL FIRE SERVICE – PRE-DA ADVICE SERVICE 1 of 2

Version 1.0 23/10/2014

Appendix F – Plan of steep slopes



- The red zones indicate portions of the APZ that are equal to or exceed 18 degrees. These areas are generally narrow rock escarpments.
- Access to all parts of the APZ are practical for maintenance teams using hand tools. Most rocky areas will require only minor or irregular works to maintain APZ standards.
- A geotechnical report may be required to ensure that APZ management will not have negative impacts on soil stability. Remediation works for soil stability will be incorporated into the VMP.
- Removal or pruning of trees within the APZ should focus on creating a clear break between the hazard and APZ to limit the potential for crowning fires to penetrate into the APZ.