Fernhill Estate

Mayfair Road

Bushfire Assessment

July 2015

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1. Introduction

1.1 Purpose of this report

This is a bushfire assessment report for the following five individual and existing building lots located on Mayfair Road Mulgoa NSW (see Figure 1).

Lot Details	4//DP260373	3//DP260373	2//DP260373	1//DP260373	12//DP610186
Indicative Address	145-156 Mayfair Road	132-144 Mayfair Road	119-131 Mayfair Road	106-118 Mayfair Road	44A Mayfair Road
	West	<	*Mayfair Road*	>	*East*

This report has been prepared in accordance Section 79BA of the *Environmental Planning and Assessment Act* (EP&A Act) to determine if the development of each lot can meet the aims and objectives of *Planning for Bushfire Protection 2006* (NSWRFS 2006) (PBP). This report is to support two development applications for:

a. The construction of a dwelling on Lot 12 DP610186; and

b. The construction of dwellings on Lots 1, 2, 3 and 4 DP260373.

This is not an assessment of a subdivision but an assessment of the five individual lots and the associated proposed dwellings.

The assessment and the bushfire attack level calculated for each lot are based on a preferred residential dwelling footprint. The location of each dwelling footprint has carefully considered both biodiversity considerations and bushfire constraints. Any adjustment to the nominated dwelling locations may require updating of this report.

1.2 Bushfire Prone Land

The subject land is designated as bushfire prone (See Figure 1) due to the presence of bushfire prone land adjoining the site. A site-based hazard assessment was used to confirm bushfire prone vegetation adjoining the subject land (See Section 2).

1.3 Description of the property

The location of the subject land is provided in Figure 1, with the subject land bounded to the:

- East and south by an area designated as a biobank; and
- Immediately west and north by developed rural residential lots

Access to the subject land is via Mayfair Road with each lot having direct access to Mayfair Road.

1.3.1 Environmental Features

The vegetation adjoining the subject land consists of:

- Narrow-leaved Ironbark – Broadleaved Ironbark - Grey Gum open forest (HN556)
- Grey Box - Forest Red Gum grassy woodland on hills (HN529);
- Forest Red Gum - Grey Box shrubby woodland (HN524); and

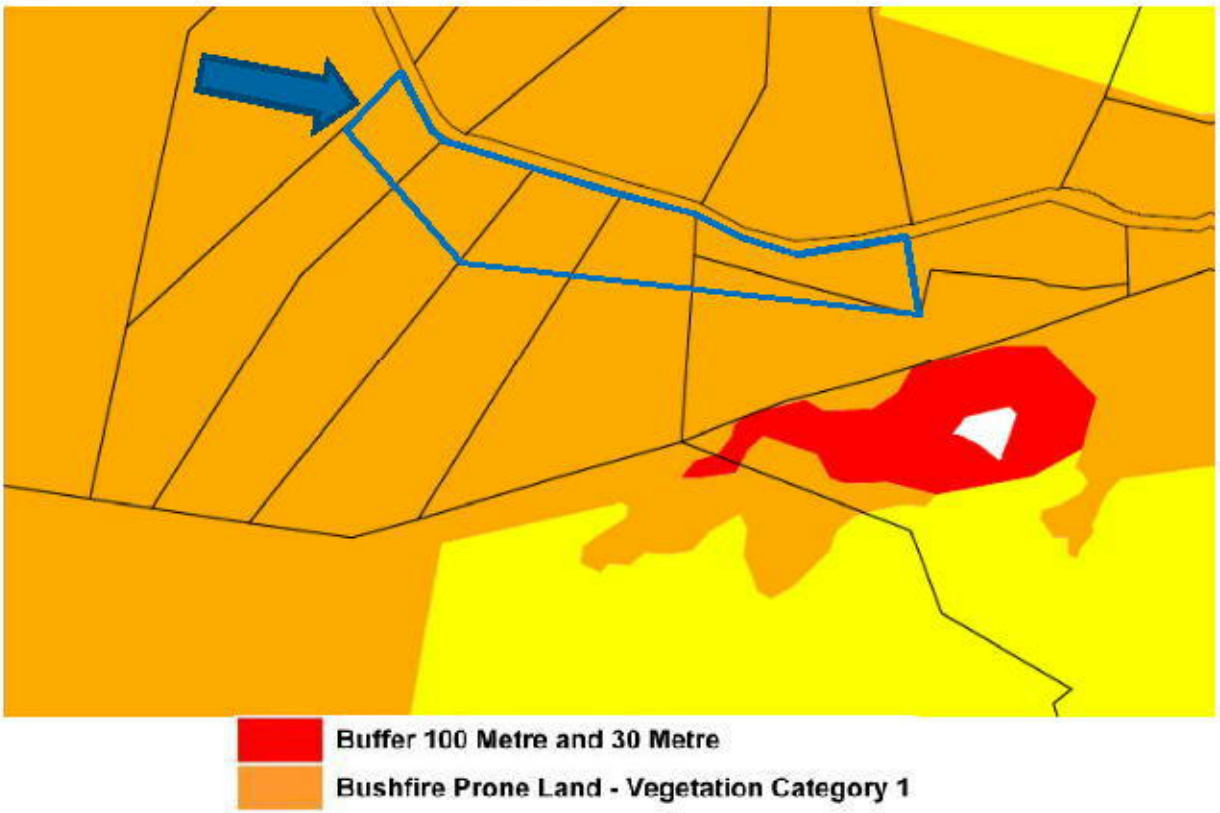
The vegetation within each lot generally comprises a eucalypt overstorey and a managed (slashed and lantana heaped) understorey – falling into the *cleared land / exotic grassland* category.

The vegetation adjoining the southern and eastern boundary of the lots is subject to a formal biobanking agreement. Further details of vegetation including a map are provided in Section 2.1.

There are no threatened species recorded from the Mayfair Road lots.

No Aboriginal heritage items are known by the applicant to occur on the subject land.

Figure 1 Bushfire Prone Lands Mapping



Source: Penrith City Council Website[1]

1.4 Scope and limitations

This report has been prepared by GHD and may only be used and relied on by for the purpose agreed as set out in Section 1.1 of this report.

GHD otherwise disclaims responsibility to any person arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.
Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

1 http://www.penrithcity.nsw.gov.au/uploadedFiles/Content/Website/Our_Services/Planning_and_Development/Building__Development/Fact_Sheet/BushFireProneLandMap.pdf

2. Hazard Assessment

2.1 Vegetation

Survey transects of 140 m in length were completed on 11 May 2015 to confirm the "Predominant Vegetation Class Formation" in accordance with *Planning for Bushfire Protection*. The vegetation classes correspond with the vegetation types shown in Figure 2 and Table 1.

Table 1 Vegetation Type, Formation and Classification

Vegetation Type	Vegetation Formation (Keith 2004[2])	AS3959:2009[3] Classification
Grey Box - Forest Red Gum grassy woodland	Grassy woodland	Woodland
Narrow-leaved Ironbark – Broadleaved Ironbark - Grey Gum open forest	Dry sclerophyll shrubby	Forest
Forest Red Gum - Grey Box shrubby woodland	Grassy Woodland	Woodland
Cleared land / exotic grassland (within each lot area grasses are slashed and lantana sprayed and heaped)	*Reduced vegetation area*	Low threat vegetation and non-vegetated areas

The woodland vegetation above (Table 1) in the adjoining biobank matches the description of Grassy Woodland vegetation formation (NSWRFS 2006) for the following reasons:

- Open to sparse layer of eucalypts with crowns rarely touching;
- Foliage cover of approximately 30%; and
- Groundcover of grasses, tussocks and herbs with a sparse distribution of shrubs.

It should be noted that parts of the understorey have a heavy infestation of lantana.

The adjoining forest vegetation above (Table 1) matches the description of Dry sclerophyll forest (shrubby) formation vegetation formation (NSWRFS 2006) for the following reasons:

- Open crown cover of eucalypts 10-30 metres tall;
- Foliage cover between 20-50%; and
- Groundcover dominated by shrubs (with a heavy infestation of lantana).

These vegetation formations can support high intensity bushfires, most likely burning as a faster moving surface fire in open woodland communities without a shrubby understorey, moving into the crown where there are sufficient ladder fuels (shrubs and near-surface fuels). The subject land has been subject to high intensity bushfires in the past as evidenced by bark scorching and stem damage.

Within each lot area the vegetation is managed as a reduced vegetation area with grasses slashed and lantana sprayed and heaped. The western and northern boundaries of each lot adjoin cleared land/exotic grassland.

[2] Keith, D.A. (2004) Ocean Shores to Desert Dunes, the native vegetation of New South Wales and the ACT. NSW Department of Environment and Conservation, Sydney.
[3] Standards Australia 2009. AS3959 – 2009 Construction of Buildings in Bushfire-prone areas. Standards Australia, Sydney.

2.2 Effective Slope

Survey transects, 140 m in length were utilised to confirm the "Effective Slope" in accordance with *Planning for Bushfire Protection*. Overall slope class within the vegetation hazard at the boundary where hazard is located) is as follows:

Lot Details	4//DP260373	3//DP260373	2//DP260373	1//DP260373	12//DP610186
Slope class (boundary)	5-10 degrees (southern)	5-10 degrees (southern)	10-15 degrees (southern)	10-15 degrees (southern)	10-15 degrees (southern) 5-10 degrees (eastern)

Slope classes for the subject land are shown in Figure 3.

2.3 Fire Weather

Penrith City Council being within the 'Greater Sydney Region' has a corresponding FDI rating of 100 (NSWRFS 2006).

281,500

MAYFAIR ROAD

Lot 4
DP260373

Lot 3
DP260373

Lot 2
DP260373

Lot 1
DP260373

Lot 2
DP211795

Lot 12
DP610186

Lot 11
DP615085

35m

25m

25m

25m

6,255,500

6,255,500

281,500

Vegetation Zones

- 2, Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest (HN556 good)
- 5, Grey Box - Forest Red Gum grassy woodland on hills (HN529 good)
- 5a, Grey Box - Forest Red Gum grassy woodland on hills (HN529 poor)
- 6, Forest Red Gum - Grey Box shrubby woodland (HN524 good)
- 6a, Forest Red Gum - Grey Box shrubby woodland (HN524 poor)
- 6b, Forest Red Gum - Grey Box shrubby woodland (HN524 low)

1:2,000 (at A3)

0 10 20 40 60 80 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

- Mayfair Subject Site
- Fernhill East Biobank Site Boundary
- Road Corridor
- Indicative Dwelling Footprint
- Asset Protection Zones
- E2 boundary (survey)
- Cadastre

GHD

Angas Securities Limited
Fernhill
Mayfair Ecological Impact Assessment

Job Number 22-16709
Revision 0
Date 29 Jun 2015

Location & Vegetation

Figure 2

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

281,500

MAYFAIR ROAD

25m
35m
25m
25m

170
160
150
140
130
120
110
100
90
80
70
70
80
90
100
130

6,255,500

281,500

1:2,000 (at A3)

0 10 20 40 60 80 100

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

N

LEGEND

- Mayfair residential site
- Fernhill East biobank Site Boundary
- Indicative Dwelling Footprint
- Asset Protection Zones
- Contour
- waterways
- Roads

Slope Degrees

- 0°
- 0° - 5°
- 5° - 10°
- 10° - 15°
- 15° - 20°

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Fernhill
Mayfair Vegetation Assessment

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Slope map

Figure 3

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

3. Bushfire Protection Measures for the Proposal

A range of bushfire mitigation measures are to be incorporated in the development of the subject land including provision of Asset Protection Zones (Figure 1) and sealed road access. These bushfire protection measures meet the aims and objectives of *PBP* (NSW RFS 2006) and are described in the following sections.

3.1 Asset Protection Zones

Asset Protection Zones (APZ) can be accommodated on within each lot based on the boundary for which they apply (Table 2) based on the dwelling location (refer to Figure 1) and the distances as shown in the table below.

Table 2 APZ dimensions

Lot (from west to east)	Vegetation	Slope Class	APZ	Inner	Boundary for which APZ applies
4//DP260373	Forest	5-10 degrees	35	20	Southern boundary only
3//DP260373	Forest	5-10 degrees	35	20	Southern boundary only
2//DP260373	Woodland	10-15 degrees	25	20*	Southern boundary only
1//DP260373	Woodland	10-15 degrees	25	20*	Southern boundary only
12//DP610186	Woodland	10-15 degrees (southern	25	20*	Southern boundary
	Woodland	5-10 degrees (eastern)	20	20*	Eastern boundary

(*) Inner protection areas (see Section 3.1.1) are not mandatory in Woodland vegetation types.

Any Class 10b buildings (such as fences, retaining walls, walls and swimming pools) within the APZ need to be constructed of non-combustible materials. Where an above ground pool is erected it should not adjoin or be attached directly to the wall of the dwelling (NSWRFS 2006).

Any Class 10a buildings (such as a garage, carport, shed or other non-habitable buildings) need to be located greater than 10 m away from the dwelling. If the building is located within 10 m of the dwelling, the 10a building must meet the construction standard specified for the dwelling (NSWRFS 2006).

3.1.1 Inner Protection Area (IPA)

The IPA will extend from the building line for those dwellings adjoining Forest vegetation. IPAs are not mandatory for dwellings adjoining Woodland vegetation types with the area treated as an OPA (see below). . It is contained within the residential allotments and is maintained in accordance with *PBP* (NSWRFS 2006):

An IPA should provide a tree canopy cover of less than 15% and should be located greater than 2 m from any part of the roofline of a dwelling. Garden beds of flammable shrubs are not to be located under trees and should be no closer than 10 m from an exposed window or door. Trees should have lower limbs removed up to a height of 2 metres above ground.

The property owner is responsible for the maintenance of the IPA.

3.1.2 Outer Protection Area (OPA)

The OPA will extend from the IPA (*i.e.* from the building line) towards the hazard. Where dwellings adjoin Woodland vegetation hazard IPAs are not mandatory and the entire APZ can be treated to the OPA standard. The landholder is responsible for the OPA contained within the subject land. Parts of the OPA may comprise a sealed access road or fire trail managed. The OPA within the residential allotments is maintained in accordance with *PBP* (NSWRFS 2006) as a minimum requirement:

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 (usually September).

3.1.3 Maintenance of bushfire fuel

Within the IPA and OPA fuels are to be managed in accordance with the *Standards for Asset Protection Zones* (NSWRFS 2005), this requires;

1. Raking or manual removal of fine fuels:

Ground fuels such as fallen leaves, twigs (less than 6 mm in diameter), and bark should be removed on a regular basis.

2. Mowing of grass:

Grass needs to be kept short and where possible, green.

3. Removal or pruning of trees, shrubs and understorey:

Prune or remove trees so that there is discontinuous canopy leading from the hazard to the asset. Separate tree crowns by at least two to five metres. A canopy should not overhang within two to five metres of any building. On the western APZ high prune the large eucalypts being retained for habitat.

Native shrubs and trees should be retained as clumps or islands and should maintain a covering of no more than 20% of the area.

3.2 Heat Shielding

Colorbond fences may be used for additional bushfire mitigation within the subject land, where permitted by council. The CSIRO has identified (Leonard et al 2006[4]) that a Colorbond steel fence reduces the radiation levels within the fencing boundary to below 5 kw/m ^{2} immediately behind the fencing system during all radiation exposures, and reduces the radiant heat exposure on a structure 9 metres from the fencing by at least a factor of two. The research showed even at directly exposed peak heat flux on the front face of the fencing at 63 kW/m^2, the back face was 4 kW/m^2. .

3.3 Services

3.3.1 Water supply

Each lot has sufficient room to accommodate at least 10,000 L dedicated non-reticulated water supply for firefighting purposes (per dwelling). Such supplies can include fittings for NSWRFS and Fire and Rescue NSW appliances.

3.3.2 Electricity

All electricity lines within the subject land and servicing the lots can be located underground. Where aerial lines are used these can be located entirely within an area managed as an APZ. Powerlines adjoin the northern boundary of each lot.

3.3.3 Gas

In order to comply with the Rural Fires Regulation, all gas supplies are to be installed and maintained in accordance with AS 1596 – 2002.

3.4 Access

3.4.1 Perimeter Access

Perimeter access in the form of a fire trail to provide suitable access for fire management and suppression purposes is not required but can potentially be located along the southern boundary of each lot adjoining the fenceline to the biobanking area. There is sufficient room for 6 m wide access with a minimum trafficable width of 4 m along the boundary. The gradient and the crossfall of a boundary trail can be constructed at less than 10 degrees. Such a trail can be constructed so that it does not interrupt hydrological or cross intermittent drainage features.

3.4.2 Public Roads

The subject land adjoins Mayfair Road, approximately 1 km west of Mulgoa Road. Mayfair Road is a public two-wheel drive, all weather road, finishing at a dead end and large turning circle approximately 20 metres from the end of the most westerly lot. The width of the road complies with Table 4.1 of *Planning for Bushfire Protection 2006,* as shown below.

[4] Leonard JE, Blanchi R, White N, Bicknell A, Sargeant A, Reisen F, Cheng M, Honavar K. 2006. Research and Investigation into the performance of residential boundary fencing systems in bushfires. CMIT-2006-186 Technical report for the Bushfire CRC and BlueScope Steel Ltd.

Curve radius (inside edge)	Swept Path (metres width)	Single lane (metres width)	Two way (metres width)
<25	3.6	4.5	8.7
25-39	3.3	4.2	8.1
40-69	3.0	3.9	7.5
70-100	2.7	3.6	6.9
>100	2.5	3.5	6.5

Source: AS2890.2 – 2002.

Table 4.1 – Road widths for Category 1 Tanker (Medium Rigid Vehicle)

Traffic management devices are not installed and curves are minimal to allow rapid access and egress. Curves will have a minimum inner radius of six metres and the distance between the inner and outer curves is 6 m.

Maximum grades of the road do not exceed 15 degrees and the capacity is sufficient to carry a fully loaded fire-fighting vehicle (15 tonnes).

Parking bays do not obstruct or reduce the paved width.

3.4.3 Property Access Roads

Fire appliance will generally be operating from the public road and / or the driveway/perimeter boundary (see photos which follow).

Figure 4 Site Photos

3.5 Housing Construction Standards

The Australian Standard AS 3959:2009 (*Construction of buildings in bushfire prone areas*) provides methodologies (*Method 1* (simplified) and *Method 2* (detailed)) to calculate bushfire attack level (BAL).

The simplified procedure methodology (*Method 1*) is based on a worst case scenario bushfire, burning at its highest intensity and rate of spread, with at least 100 metres flame front, under catastrophic weather conditions.

As the BAL classification is based on slope and proximity of vegetation along the boundary of the adjoining biobank. Parts of the site which record the highest BAL ratings are those nearest the forest vegetation.

The approximate BAL ratings for each dwelling location (see Figure 3) are given below. These were calculated for an indicative footprint only and would require recalculation once actual building footprints are known.

Table 3 AS 3959:2009 BAL Calculation for approximate dwelling location

Lot (from west to east)	Vegetation Class	Slope	Flame Zone	BAL 40	BAL 29	BAL 19	BAL 12.5
4//DP260373	Forest	0-5 degrees	✗	✓	✓*	✓*	
3//DP260373	Forest	5-10 degrees	✗	✗	✗	✓	
2//DP260373	Woodland	10-15 degrees	✗	✗	✗	✗	✓
1//DP260373	Woodland	10-15 degrees	✗	✗	✗	✗	✓
12//DP610186	Woodland	10-15 degrees	✗	✗	✗	✓	

✓* = if the dwelling footprint is moved further west then a lower BAL rating can be achieved

4. Summary Assessment of Compliance

The bushfire protection measures proposed for each of the five discrete lots on Mayfair Road (see Figure 1) can comply with the "acceptable solutions" for each "performance measure" within Chapter 4 of *Planning for Bushfire Protection* (PBP) (NSWRFS 2006). As a result, compliance with the objectives of *PBP* can be achieved, as summarised in the table below.

Table 4 Compliance with *Planning for Bushfire Protection 2006*

Measure	Assessment of Compliance
Asset Protection Zones	Each of the five lots can achieved the performance criteria by complying with the acceptable solutions, i.e. • An APZ is provided in accordance with Appendix 2 of Planning for Bushfire Protection 2006 (refer to Section 3.1) • The APZ can be placed wholly within the boundaries of the development site (refer to Section 3.1) • The APZ can be managed in accordance with the requirements of Standards for Asset Protection Zones (RFS 2005) (refer to Section 3.1.3) • The APZ for each lot can be located on lands with slopes less than 18 degrees (refer to Section 3.1)
Public Roads	Each lot can achieve the performance criteria by complying with the acceptable solutions, i.e.; • Public roads are two-wheel drive (refer to Section 3.4.2) • Traffic calming devices are not proposed (refer to Section 3.4.2) • Public roads will have a crossfall not exceeding 3 degrees and grades not exceeding 15 degrees. • While Mayfair Road is a dead end road, it is a sealed road, of dimensions suitable for emergency access and egress, and not passing through extended areas of hazardous vegetation. • Curves are minimal and have the required dimensions. • The capacity of Mayfair Road is greater than 15 tonnes.
Property Access Roads	Not applicable as fire suppression vehicles will operate from the perimeter or the public road. Residential driveways are likely to be utilised by bushfire suppression vehicles, however this specific requirement can be addressed at the lot level development application level.
Fire Trails	Each lot adjoins Mayfair Road and would not require dedicated fire trails. A perimeter boundary trail along the southern boundary fenceline may provide suitable boundary access.
Services – Water, electricity and gas	The proposed development can achieve the performance criteria by complying with the acceptable solutions, i.e.; Non-reticulated water (10,000L+) can be provided within the required specifications. Electricity can be underground or within managed vegetation over-ground. Gas supplies can be installed in accordance with AS 1596.

Therefore development of each lot on Mayfair Road can achieve the bushfire protection measures outlined in Section 3 of this report, and potentially enable the issuance of development approval in accordance with *Planning for Bushfire Protection* (NSWRFS 2006).

5. References

Gould JS, McCaw WL, Cheney NP, Ellis PF, Knight IK, Sullivan AL (2007) Project Vesta – Fire in Dry Eucalypt Forest: Fuel Structure, Fuel Dynamics and Fire Behaviour. Ensis – CSIRO, Canberra ACT

Leonard JE, Blanchi R, White N, Bicknell A, Sargeant A, Reisen F, Cheng M, Honavar K. 2006. Research and Investigation into the performance of residential boundary fencing systems in bushfires. CMIT-2006-186 Technical report for the Bushfire CRC and BlueScope Steel Ltd.

NSWRFS (NSW Rural Fire Service) 2005. *Standards for Asset Protection Zones.*

NSWRFS (NSW Rural Fire Service) 2006. *Planning for Bush Fire Protection: A Guide for Councils, Planners, Fire Authorities and Developers.* Prepared by NSW Rural Fire Service in cooperation with the Department of Planning.

Standards Australia 2009. *AS3959 – 2009 Construction of Buildings in Bushfire-prone areas.* Standards Australia and the Australian Building Codes Board, Sydney.

Standards Australia 2002 *AS/NZS 1596 The Storage and Handling of LP Gas.*

Standards Australia 2005. *AS2419.1 – 2005 Fire Hydrant installations – System design, installation and commissioning*

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