

Bushfire Hazard Assessment Report

Proposed:
**Seniors Living
Development**

At:
Mills Rd, Glenhaven

Reference Number: 140385B

Prepared For:
Glenhaven Gardens
C/- NBRS + Partners

5th May 2017

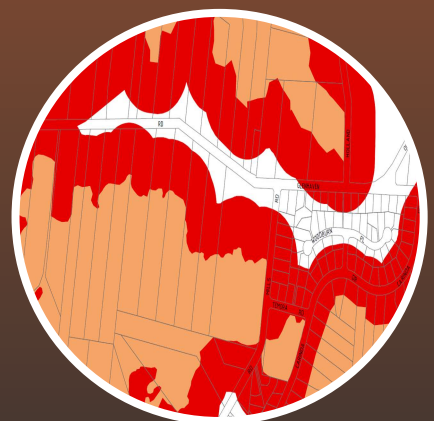


Prepared By:
**Building Code & Bushfire
Hazard Solutions Pty Limited**

Tel: (02) 9457 6530
Fax: (02) 9457 6532

PO Box 124
Berowra NSW 2081
ABN 19 057 337 774

www.bushfirehazardsolutions.com.au



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List of Abbreviations:

APZ	Asset Protection Zone
AS3959	Australian Standard 3959 – 2009 as amended.
BAL	Bushfire Attack Level
BCA	Building Code of Australia
BPMS	Bushfire Protection Measures
BPLM	Bushfire Prone Land Map
Council	The Hills Shire Council
DA	Development Application
EP&A Act	<i>Environmental Planning and Assessment Act - 1979</i>
ESD	Ecologically Sustainable Development
FRNSW	Fire and Rescue NSW
IPA	Inner Protection Area
OPA	Outer Protection Area
NCC	National Construction Codes
NP	National Park
NSP	Neighbourhood Safer Place
PBP	<i>Planning for Bush Fire Protection – 2006</i>
ROW	Right of Way
RF Act	<i>Rural Fires Act - 1997</i>
RFS	NSW Rural Fire Service
SCC	Site Compatibility Certificate
SEPP	State Environmental Planning Policy
SFPP	Special Fire Protection Purpose
SWS	Static Water Supply

1.0 Introduction

The development proposal relates to the subdivision of one (1) large allotment into two (2) for the purpose of the extension of an existing Special Fire Protection Purpose (SFPP). The development site is known as Glenhaven Gardens, 146 Glenhaven Road Glenhaven (Lot 102 DP 1205322). The subdivision will allow for the extension of Glenhaven Gardens (12 new Seniors Living Units) and the retention of an existing sole occupancy residential dwelling within the second new allotment.

The vegetation identified as being a potential bushfire hazard is retained native vegetation located within the rear (southern) portion of the subject site and adjoining allotments.

The Hills Shire Council's Bushfire Prone Land Map identifies that the subject site as being bushfire prone land and therefore the application of *Planning for Bush Fire Protection 2006* (PBP) is required for any future development of the subject site.

2.0 Purpose of Report

The purpose of this Bushfire Assessment Report is to provide an independent bushfire hazard determination of the subject site and surrounding area and to determine if the site is suitable for the proposed development and subsequently if the future development applications can comply with the requirements of *Planning for Bush Fire Protection 2006*.

3.0 Scope of this Report

The scope of this report is limited to providing a bushfire hazard assessment and recommendations for the subject site. Where reference has been made to the surrounding lands, this report does not purport to directly assess those lands; rather it may discuss bushfire impact and/or progression through those lands and possible bushfire impact to the subject site.

Where Council considers a bushfire risk is associated with surrounding private lands or lands owned by an authority, Council could seek to issue notice under Section 66 of the *Rural Fires Act* on any or all surrounding properties for the purposes of reducing and maintaining safe levels of vegetation and thus reducing the possibility of bushfire impact to existing assets within the subject site and any adjoining properties.

4.0 Referenced Documents and Persons

Comments provided are based on the requirements of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act), the *Rural Fires Act 1997*, the *Rural Fires Regulation 2013*, the RFS document known as '*Planning for Bush Fire Protection 2006*' for the purposes of bushfire hazard determination and Australian Standard 3959 2009 titled 'Construction of buildings in bushfire-prone areas' as amended for building/structural provisions.

A company representative has made an inspection of the site and the surrounding area. The proposed Site Plans by NBRS Architecture, Drawing Ref. 13253-DA-02, Revision 7, 18/04/2017 have been relied upon for this report.

5.0 Site Zoning

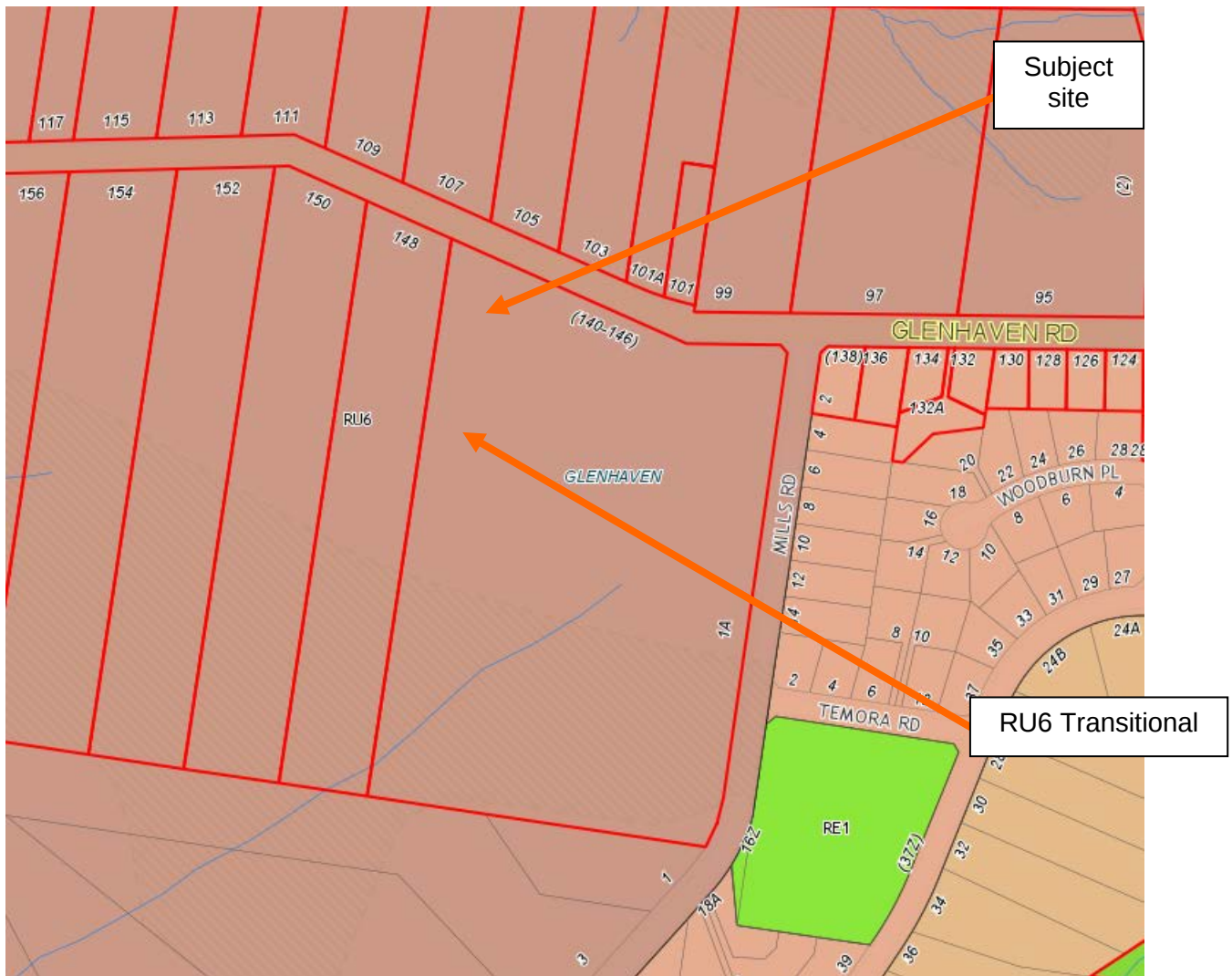


Image 01: Zoning plan extract from The Hills Shire Council Mapping database

6.0 Aerial view of the subject allotment



Image 02: Aerial view of the subject area, extract from Nearmap.

7.0 Compliance Tables & Notes

The following table sets out the projects compliance with *Planning for Bush Fire Protection – 2006*.

	South	Southwest
Vegetation Structure	Forest	Forest
Vegetation Width	100 metres	100 metres
Slope	10 - 15 degrees down	6 degrees down
Required Asset Protection Zone	100 metres	75 metres *
Proposed/Existing Asset Protection Zone	100 metres	88 metres
Significant Environmental Features	Existing residential dwelling and mown lawns	Existing residential dwelling / some weed invasion
Threatened Species	APZ Existing	APZ Existing
Aboriginal Relics	APZ Existing	APZ Existing
Bushfire Attack Level	BAL 12.5	BAL 12.5
Required Construction Level	BAL 12.5	BAL 12.5

* Determined by design fire modelling – detailed report attached

Asset Protection Zones Compliance

The subject site will have maintained lawns and gardens around the proposed independent living units. The separation from the hazard interface includes maintained land within the subject site and land “*equivalent to an Asset Protection Zone*” being the existing maintained land with within neighbouring residential allotments.

The grounds within the neighbouring property immediately to the west (behind the existing residence) have recently become unkempt and weedy. This area may be considered a remnant hazard however the highest hazard and larger Asset Protection Zones requirements were determined to be from the vegetation beyond this unkempt area.

The proposed APZs do not rely on any vegetation removal occurring within the subject site or neighbouring allotments.

Construction Level Compliance

The highest Bushfire Attack Level to the proposed independent living units was determined to be ‘BAL 12.5’. The proposed units will be required to comply with section 3 and BAL 12.5 under section 5 of AS 3959 – 2009 and Appendix 3 under PBP 2006.

Retrofitting recommendations may be necessary to be made to prevent the entry of smoke and embers on the existing dwelling within the subject site.

Access and Services

Guideline Ref.	Proposed Development Determinations under Planning for Bush Fire Protection 2006
Property Access (Driveway)	The most distant external point of the proposed units are greater than 70 metres of a public road supporting a hydrant network and therefore the Property Access requirements detailed in section 4.2.7 of PBP are applicable. The subdivision must also apply property access under 4.1.3 (2) to the existing dwelling. These requirements have been included within the proposed layout.
Water Supply	The most distant external point of the building footprint will be greater than 70 metres from a public road supporting a hydrant network. The water supply requirements under section 4.2.7 of Planning for Bush Fire Protection 2006 are applicable for any new development and can be achieved in two ways, being: 1. The installation of a fire hydrants system with the sizing, spacing and pressures complying with AS2419.1-2005 Or 2. The provision of a 10,000 litre static water supply (e.g. tank) per occupied building. And 3. The provision of a 20,000 litre static water supply (e.g. tank) near the existing residence being retained as part of the subdivision.
Evacuation	Evacuation is possible by utilising existing road infrastructure. It will be recommended that Glenhaven Gardens updated their Bushfire Emergency Management Plan to include this new development and that the plan is consistent with the NSW Rural Fire Service Guidelines for the <i>Preparation of Emergency / Evacuation Plan</i>.

8.0 Bushfire Hazard Assessment

8.01 Preface

Properties considered to be affected by possible bushfire impact are determined from the local Bushfire Prone Land Map as prepared by Council and or the Rural Fire Service. All property development within affected areas is subject to the conditions detailed in the document '*Planning for Bush Fire Protection 2006*' (PBP). Set back distances for the purpose of creating Asset Protection Zones (APZ's) must be applied and any buildings must then conform to corresponding regulations detailed in Australian Standard 3959 'Construction of buildings in bushfire prone areas' 2009.

Planning for Bush Fire Protection 2006, (PBP) formally adopted on the 1st March 2007 and amended May 2010 (Appendix 3) provides for the protection of property and life (including fire-fighters and emergency service personnel) from bushfire impact.

The thrust of the document is to ensure that developers of new properties or sub-divisions include the constraints associated with the construction of buildings in bushfire prone areas within their proposed development sites. PBP is applicable to proposed development inside determined Category 1 or 2 areas and also inside a buffer zone radius of 100m from a Category 1 bushfire area or 30m from a Category 2 bushfire area.

The document also acknowledges 'infill' developments associated with re-development of existing properties and allows some higher levels of building safety where the increased 'set backs' (APZ's) may not be achievable.

The subject development relates to the redevelopment and extension of an existing Special Fire Protection Purpose (SFPP) site.

To accord with PBP the development is classified as Special Fire Protection Purpose development and assessed as a section 100b application under the Rural Fires Act 1997.

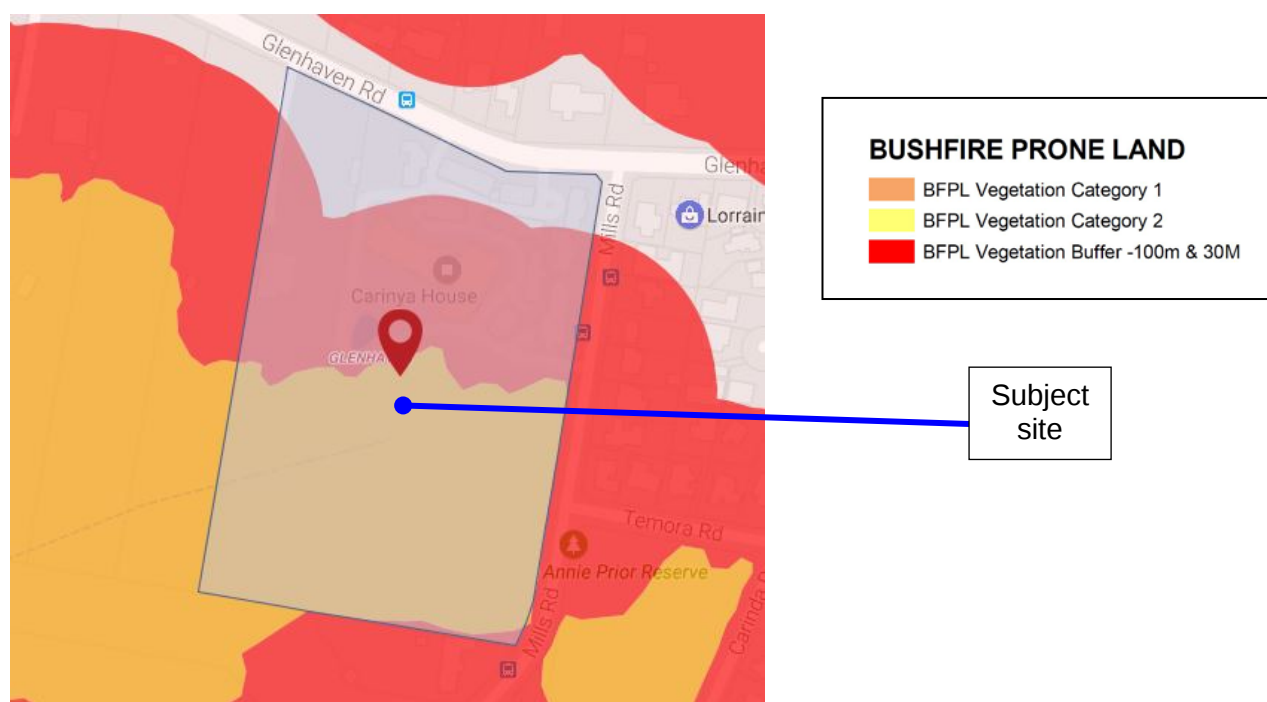


Image 03: Excerpt from The Hills Council's Bushfire Prone Land Map

8.02 Location

The subject site is located on Glenhaven Road and is in a rural residential area comprising of a mix of small and large lot properties with Glenhaven Gardens (an existing Seniors Living and Assisted Care development) located within the subject property. The subject site is known as 146 Glenhaven Road, Glenhaven (Lot 102 DP 1205322) which is an existing rural allotment (zone RU6 Transitional under The Hills Shire LEP 2012). An existing sole occupancy residential dwelling is also located within the allotment and will be subdivided off as part of this development.

The vegetation identified as being a potential bushfire hazard is retained native vegetation located within the rear (southern) portion of the subject site and adjoining allotments.



Photograph 01: View south from Glenhaven Road into the subject site



Image 04: Extract from street-directory.com.au

8.03 Vegetation

The northern half of the subject site was found to be developed with maintained lawns and gardens surrounding the existing dwelling and retirement village. The southern half of the subject site was found to comprise of native bushland.

The vegetation posing a hazard to the development within the northern portion of the subject property was found to be located to the south within the subject site itself and southwest within neighbouring private allotments.

The vegetation posing a hazard to the south was found to consist of trees 10-20 metres in height with a 30-70% canopy foliage cover and an understorey of low trees, shrubs and grasses. For the purpose of assessment against Planning for Bush Fire Protection 2006 and Australian Standard 3959 'Construction of buildings in bushfire-prone areas' 2009 the vegetation posing a hazard to the south was determined to be Forest.

To the southwest the hazard was determined to be located within a private allotment two allotments west of the subject property. Access into this area for a detailed assessment was granted by the property owner and a site inspection was undertaken in Nov 2014. The vegetation was found to consist of weeds and shrubby understorey below a mature canopy of approximately 30%. There was evidence that this site had been previously cleared and the area is mapped as being possibly Shale Sandstone Transitional Forest (which is classified as a 'grassy woodland' under Keith 2010). While we will describe this area to the southwest as a forest structure due to the heavy influence of woody weeds this is considered to be a very conservative assessment of the potential bushfire impact from this aspect.

The Asset Protection Zone to the southwest includes land within neighbouring private allotments that is considered to be 'equivalent to an APZ'. Planning for Bush Fire Protection 2006 defines *"Equivalent to an APZ - is when the building will be separated from the bush fire hazard by other development (including roads, other buildings and managed properties) with a setback distance greater than or equal to the distance which would have been occupied by an APZ, if the development had been established having regard to the provisions of Appendix 3 of this document."*

In this regard the apparent ongoing management practices of the land within the adjacent private allotments to the west (southwest) is considered suitable for assessment as land 'equivalent to an APZ' and therefore in our opinion does not require the establishment of an easement.

It also appears that the grounds within the neighbouring property immediately to the west (behind the existing residence) have recently become unkempt and weedy. This area may be considered a remnant hazard however the highest hazard and larger Asset Protection Zones requirements were determined to be from the vegetation beyond this unkempt area.

Nika Fomin from NSW Rural Fire Service Glendenning office also inspected the property to the west and reported the following:

Proposed Extension to existing Seniors Living Development -144 Glenhaven Road Glenhaven

I refer to your request for the NSW Rural Fire Service to provide comment on the proposed extension to the existing aged care facility located at 144 Glenhaven Road Glenhaven, and in particular whether the adjoining property to the West can be considered managed to the standard of an asset protection zone.

You are advised that based on the information provided and a site inspection carried out, the current level of vegetation management of the adjoining property will enable future development of the site for aged care subject to further details being provided.

It is considered that the area of weeds at the rear of the adjoining site will not develop into a more significant bush fire hazard in the near future. There is concern however that the areas of the site currently being managed may also become neglected.



Photograph 02: View west from within the southern portion of the subject site



Photograph 03: View southwest within the neighbouring allotment two sites to the west of the subject property (150 Glenhaven Road)



Photograph 04: View south within the neighbouring allotment two sites to the west of the subject property (150 Glenhaven Road)

8.04 Slope and Topography

The slope that would most significantly affect bushfire behaviour must be assessed for at least 100 metres from the proposed building footprints.

The most significant bushfire impact from within the hazard to the south and southwest is expected to be a bushfire burning up slope towards the future buildings.

The slope that would **most significantly** influence bushfire impact was determined to be:

- 10 - 15 degrees down slope within the hazard to the south
- 6 degrees down slope within the hazard to the southwest

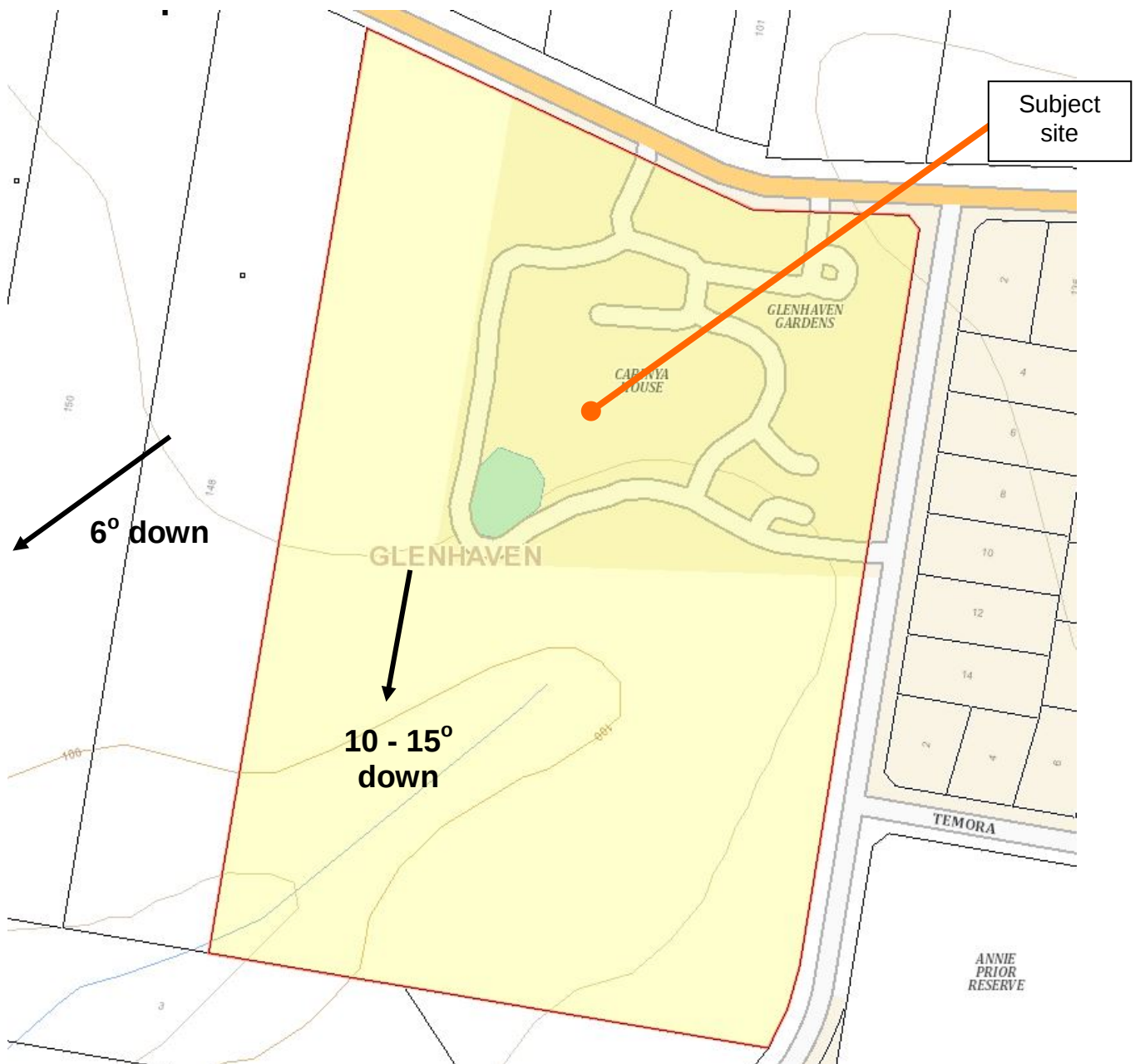


Image 05: Topographic image of the subject area from the Dept. of Lands SixViewer database

8.05 Asset Protection Zones

Asset Protection Zones for SFPP development are determined from Table A2.6 of PBP or bushfire design modelling achieving a radiant heat impact of no more than 10 kW/m² at the building footprint

The required APZ's were determined to be;

- 75 metres from the hazard to the southwest (determined by design fire modelling – detail report attached)
- 100 metres from the hazard to the south

Within the APZ's roads, swimming pools, play areas, and non habitable structures such as detached garages and work sheds are permitted.

All grounds within the subject site from the northern boundary and for a distance of 100 metres to the south of any new building footprint will be maintained in accordance with the requirements for an Asset Protection Zone as described in the NSW Rural Fire Service's document 'Standards for Asset Protection Zones'.

There are no minimum APZ required from the existing residence being retained as part of the future subdivision, however by providing a 100 metre APZ from the new Independent Living Dwellings a 45 metre APZ is provided for by default south of the existing residence.

An easement must be registered over the title of the residential allotment at the time of the subdivision to ensure that a 100 metre APZ is maintained southward from the new SFPP component.

8.06 Fire Fighting Water Supply

The subject development can be connected to the existing reticulated water mains along Glenhaven Road or Mills Road for its domestic needs. Existing hydrants are available throughout Glenhaven Gardens and along Glenhaven Road and surrounding streets for the replenishment of attending fire services.

The water supply requirements under section 4.2.7 of Planning for Bush Fire Protection 2006 are applicable for any new development and can be achieved in two ways, being:

- The installation of a fire hydrants system with the sizing, spacing and pressures complying with AS2419.1-2005
or
- The provision of a 10,000 litre static water supply (e.g. tank) per occupied building.

The existing developed portion of the neighbouring site Glenhaven Gardens was found to have a hydrant system throughout the site. It would therefore be considered reasonable that this system will be extended to service the new development.

A 20,000 litre static water supply (e.g. tank) will be required near the existing residence being retained as part of the subdivision.

8.07 Property Access – Fire Services & Evacuation

Planning for Bush Fire Protection addresses design considerations for internal roads for properties determined to be bushfire prone. The proposed internal roads must comply with the requirements for Internal Roads as detailed in section 4.2.7 of PBP. The proposed property access to the existing dwelling retained within the proposed rear allotment must comply with s4.1.3 (2) of PBP 2006.

The following are the relevant requirements for Internal Roads as detailed in section 4.2.7 of PBP which must be applied to the proposed road:

- Internal roads are two-wheel drive, sealed, all-weather roads;
- 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;
- 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;
- Traffic management devices are constructed to facilitate access by emergency services vehicles.
- A minimum vertical clearance of four metres to any overhanging obstructions, including tree branches, is provided.
- Curves have a minimum inner radius of six metres and are minimal in number to allow for rapid access and egress.
- The minimum distance between inner and outer curves is six metres.
- Maximum grades do not exceed 15 degrees and average grades are not more than 10 degrees.
- Crossfall of the pavement is not more than 10 degrees.
- Roads do not traverse through a wetland or other land potentially subject to periodic inundation (other than flood or storm surge).
- Roads are clearly sign-posted and bridges clearly indicate load ratings.
- The internal road surfaces and bridges have a capacity to carry fully-loaded firefighting vehicles (15 tonnes).

Image 07: 'Table 4.1 – Road widths for Category 1 Tanker' from PBP 2006

Curve radius (inside edge) (metres)	Swept Path (metres width)	Single lane (metres width)	Two way (metres width)
<40	3.5	4.5	8.0
40-69	3.0	3.9	7.5
70-100	2.7	3.6	6.9
>100	2.5	3.5	6.5

The following are the relevant requirements for Property Access as detailed in section 4.1.3 (2) of PBP which must be applied to the future access to the existing dwelling being retained as part of the future subdivision.

- A minimum carriageway width of four metres for rural- residential areas, rural landholdings or urban areas.
- A minimum vertical clearance of four metres to any overhanging obstructions, including tree branches.
- Internal roads for rural properties provide a loop road around any dwelling or incorporate a turning circle with a minimum 12 metre outer radius.
- Curves have a minimum inner radius of six metres and are minimal in number to allow for rapid access and egress.
- The minimum distance between inner and outer curves is six metres.

In review of the proposed Site Plan by NBRS Architecture, Drawing Ref. 13253-DA-02, Revision 7, 18/04/2017 the proposed access arrangements are considered adequate and no additional specific recommendations are considered necessary.

9.0 Site & Bushfire Hazard Determination

9.01 Planning for Bush Fire Protection - 2006

'Planning for Bush Fire Protection – 2006' (PBP) is applicable to those lands determined as being within a 'bushfire prone area' in accordance with a local Bushfire Prone Land Map as provided by the Rural Fire Service and Council.

The most appropriate method of determining site bushfire hazard under the terms of PBP is to consider the site in a singular form.

Bushfire prone areas are defined as those areas;

- *within or within 100m of high or medium bushfire hazards; or*
- *within or within 30m of low bushfire hazards.*

In this instance the subject site has been identified as being bushfire prone land therefore it is appropriate to apply PBP and AS3959 – 2009.

9.02 Australian Standard AS 3959 – 2009 'Construction of buildings in bushfire –prone areas'

Australian Standard 3959 – 2009 'Construction of buildings in bushfire-prone areas' provides for six (6) levels of building construction these being BAL - Low, BAL - 12.5, BAL - 19, BAL - 29, BAL - 40 and BAL - FZ. The Australian Standard 3959 specifies construction standards for buildings within various Bushfire Attack Levels as determined by the *Planning for Bush Fire Protection – 2006* document. The NSW Rural Fire Service will not accept deemed to satisfy provisions for BAL Flame Zone and therefore have a NSW variation to the listed standard provisions of BAL FZ under AS3959 - 2009.

9.03 Correlation between bushfire impact and AS3959

Bushfire Attack Level	Maximum radiant heat impact (kW/m ²)	Level of construction under AS3959-2009
Low		No special construction requirements
12.5	≤12.5	BAL - 12.5
19	12.6 to 19.0	BAL - 19
29	19.1 to 29.0	BAL - 29
40	29.1 to 40.0	BAL - 40
Flame Zone	>40.0	BAL FZ No deemed to satisfy provisions

9.04 Site Specific Bushfire Hazard Determination

All property development must be assessed on an individual basis as broad-brush approaches of documents such as PBP may not be applicable in every instance. The proposed development located at 146 Glenhaven Road Glenhaven was assessed against the requirements of *Planning for Bush Fire Protection* 2006 noting the following:

- The building footprints can meet or exceed the minimum required Asset Protection Zones.
- Recommendations to maintain the Asset Protection Zones within the subject property can be included in future development consent.
- Future water supply can satisfy the requirements for Services as detailed in section 4.1.3 of PBP.
- The proposed access roads can satisfy the requirements for internal as detailed in section 4.2.7 of PBP.

9.05 Viable Construction Method

The objectives of *Planning for Bush Fire Protection* – 2006 are for the protection of life including fire fighters. Provided these objectives can be met the construction of buildings is feasible and both the Rural Fire Service and Council should be in a position to consider such applications.

The highest Bushfire Attack Level to the proposed independent living units was determined to be 'BAL 12.5'. The proposed units will be required to comply with section 3 and BAL 12.5 under section 5 of AS 3959 – 2009 and Appendix 3 under PBP 2006.

Retrofitting recommendations will be recommended to prevent the entry of smoke and embers on the existing dwelling within the subject site.

9.06 Risk Rating

In assessing the bushfire threat to the site and its structures it is important to have a holistic approach and assess the risk of a bushfire occurring and impacting the subject site. It is also important to include the risk the site poses to neighbouring properties.

Image 08 is an overview of risk to the proposed future use. This model takes a holistic approach and assesses the risk of a bushfire occurring and impacting the site. This risk level can be reduced by either an increase in preparedness by the owners/occupants of the dwellings (e.g. good house keeping, maintained lawns & bushfire awareness) and/or hazard reduction activities by local fire agencies. Alternatively this risk level can increase if the preparedness level decreases and/or hazard reduction activities are neglected for the area.

The below matrix is for risk only, it does not reflect the Bushfire Attack Level determined within PBP 2006.

Consequence Likelihood	Minor	Moderate	Major	Catastrophic
Almost certain	Medium	High	Extreme	Extreme
Likely	Low	Medium	High	Extreme
Possible	Insignificant	Low	Medium	High
Unlikely	Insignificant	Insignificant	Low	Medium

Image 08: Risk Matrix

10.0 Recommendations

The following recommendations are provided as the minimum necessary for compliance with *Planning for Bush Fire Protection* 2006 and Australian Standard 3959 'Construction of buildings in bushfire-prone areas' 2009. Additional recommendations are provided to supplement these minimum requirements where considered necessary.

General

1. That the proposed development complies with the Site Plan by NBRIS Architecture, Drawing Ref. 13253-DA-02, Revision 7, 18/04/2017

Asset Protection Zones

2. That all grounds within the subject property for 100 metres to the south of the proposed independent living units are to be maintained as an Asset Protection Zone (Inner Protection Area) as detailed in the NSW Rural Fire Service's document 'Standards for Asset Protection Zones'. This requirement should be enforced by an 88b easement for the subdivision application.
3. That all landscaping is to comply with Appendix 5 'Landscaping and Property Maintenance' under *Planning for Bush Fire Protection* 2006. Any landscape plans should be certified by a suitably qualified bushfire consultant that they comply with the NSW Rural Fire Service requirements.

Construction – existing dwelling

4. That all openable windows on the existing dwelling be screened with aluminium, steel or bronze metal mesh having an aperture size of ≤ 2.0 mm in such a way that the entire opening remains screened when in the opened position.
5. That all vents and weepholes on the existing dwelling be screened with aluminium, steel or bronze metal mesh having an aperture size of ≤ 2.0 mm in such a way that the entire opening is screened.
6. That all external hinged doors on the existing dwelling have a draught excluder fitted having a flammability index of not more than 5.
7. That the existing garage doors have brush seals or similar fitted to the top and sides and a rubber seal fitted to the bottom panel or threshold.

Construction - units

8. That the proposed units be constructed to that of section 3 and BAL 12.5 under section 5 of AS3959 – 2009.
9. That the proposed units be constructed to that of the 'Additional Construction Requirements' detailed in A3.7 of the Addendum to Appendix 3 of *Planning for Bush Fire Protection* 2006 and NSW Rural Fire Service Fast Facts, Development Control Notes and Practice Notes.

New Fencing

10. Where a fence does not connect to a building and has a minimum of 1 metre separation from the residential flat building then the fence may be constructed from hardwood, or non-combustible material.
11. Where a fence connects directly to or has less than 1 metre separation from a building it should be constructed from non-combustible materials only.

12. In all cases where timber fences are proposed, care should be taken in the selection, location and maintenance of landscaping adjoining the fence. Unmanaged landscaping could promote fire activity due to ember, radiant heat and direct flame contact and then further impact timber fencing.

Gas

13. That reticulated or bottled gas is installed and maintained in accordance with AS 1596 and the requirements of relevant authorities. Metal piping is to be used. All fixed gas cylinders are kept clear of all flammable materials to a distance of 10 metres and shielded on the hazard side of the installation. If gas cylinders need to be kept close to the building, the release valves are directed away from the building and at least 2 metres away from any combustible material, so that they do not act as a catalyst to combustion. Connections to and from gas cylinders are metal. Polymer sheathed flexible gas supply lines to gas meters adjacent to buildings are not used.

Water supply

14. The water supply requirements under section 4.2.7 of Planning for Bush Fire Protection 2006

and

15. The provision of a 20,000 litre static water supply near the existing residence being retained as part of the future subdivision.

Emergency Management

16. That a bushfire emergency / evacuation plan is written or updated and is consistent with the NSW Rural Fire Service Guidelines for the *Preparation of Emergency / Evacuation Plan*.

Access

17. That the internal roads shall comply with the requirements as detailed in section 4.2.7 of *Planning for Bush Fire Protection 2006*, in particular:
 - Public roads are two-wheel drive, all weather roads.
 - Non perimeter roads comply with Table 4.1 – Road widths for Category 1 Tanker (medium Rigid Vehicle).
 - Traffic management devices are constructed to facilitate access by emergency services vehicles.
 - Public roads have a cross fall not exceeding 3 degrees.
 - Curves of roads (other than perimeter roads) are a minimum inner radius of six metres and minimal in number, to allow for rapid access and egress.
 - The minimum distance between inner and outer curves is six metres.
 - Maximum grades for sealed roads do not exceed 15 degrees and an average grade of not more than 10 degrees or other gradient specified by road design standards, whichever is the lesser gradient.
 - There is a minimum vertical clearance to a height of four metres above the road at all times.
 - The capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles (approximately 15 tonnes for areas with reticulated water, 28 tonnes or 9 tonnes per axle for all other areas).

11.0 Conclusion

Given that the property is deemed bushfire prone under The Hills Shire Council's Bushfire Prone Land Map any future development would need to meet the requirements of *Planning for Bush Fire Protection* 2006 and of the construction requirements of Australian Standard 3959 'Construction of buildings in bushfire-prone areas' 2009 if any are applicable. The determination of any bushfire hazard must be made on a site-specific basis that includes an assessment of the local bushland area and its possible impact to the subject site.

The development proposal relates to the subdivision of one (1) large allotment into two (2) for the purpose of the extension of an existing Special Fire Protection Purpose (SFPP). The development site is known as Glenhaven Gardens, 146 Glenhaven Road Glenhaven (Lot 102 DP 1205322). The subdivision will allow for the extension of Glenhaven Gardens (12 new Seniors Living Units) and the retention of an existing sole occupancy residential dwelling within the second new allotment.

The vegetation identified as being a potential bushfire hazard is retained native vegetation located within the rear (southern) portion of the subject site and adjoining allotments.

The required Asset Protection Zones (APZ) for the development were determined from Appendix 2 and design fire modelling (report attached) under the requirements of *Planning for Bush Fire Protection* 2006. The available building footprints shown on the site plans prepared by NBRS Architecture, Drawing Ref. 13253-DA-02, Revision 7, 18/04/2017 can comply with or exceed the minimum requirements of PBP 2006. The proposed access design and the provisions of services (water, gas and electricity) can also meet the requirements of section 4.1.3 of PBP 2006.

The highest Bushfire Attack Level to the proposed independent living units was determined to be 'BAL 12.5'. The proposed units will be required to comply with section 3 and BAL 12.5 under section 5 of AS 3959 – 2009 and Appendix 3 under PBP 2006.

Retrofitting recommendations have been made to improve the resilience of the existing dwelling by including simple measures to prevent the entry of smoke and embers into the existing dwellings.

Recommendations have been made regarding the proposed water supply.

In accordance with the bushfire safety measures contained in this report, and consideration of the site specific bushfire risk assessment it is my opinion that when combined, they will provide a reasonable and satisfactory level of bushfire protection to the subject development and also satisfy both the Rural Fire Service's concerns and those of Council in this area.

I am therefore in support of the development application.

Should you have any enquiries regarding this project please contact me at our office.

Prepared by
Building Code & Bushfire Hazard Solutions



Duncan Armour

Reviewed and endorsed by
Building Code & Bushfire Hazard Solutions



Wayne Tucker

G. D. Design in Bushfire Prone Areas.
Certificate IV Fire Technology
Ass Dip Applied Science
Manager - Bushfire Section
Building Code and Bushfire Hazard Solutions
Fire Protection Association of Australia BPAD – L3 Certified Practitioner
Certification number – BPD – 09399



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12.0 Annexure 01

List of Referenced Documents

- a) *Environmental Planning and Assessment Act 1979*
- b) *Rural Fires Act 1997 as amended*
- c) *'Planning for Bush Fire Protection' 2006* - NSW Rural Fire Services & Planning NSW
- d) *'Construction of buildings in bushfire prone areas'* - AS 3959 – 2009 (as - amended) – Standards Australia
- e) *'The Hills Shire Council's Bushfire Prone Land Map'*
- f) Acknowledgements to:
NSW Department of Lands – SixViewer
Street-directory.com.au
Nearmap
- g) Site Plan by NBRS Architecture, Drawing Ref. 13253-DA-02, Revision 7, 18/04/2017

Attachments

Attachment 01: Design fire modelling report



NBC Bushfire Attack Assessment Report V2.1

AS3959 (2009) Appendix B - Detailed Method 2

Print Date: 24/11/2014

Assessment Date: 24/11/2014

Site Street Address: 146 Glenhaven Road, Glenhaven

Assessor: Wayne Tucker; Building Code & Bushfire Hazard Solutions Pty Ltd

Local Government Area: Baulkham Hills

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: Southwest

Vegetation Information

Vegetation Type:	Forest	Vegetation Group:	Forest and Woodland
Vegetation Slope:	6 Degrees	Vegetation Slope Type:	Downslope
Surface Fuel Load(t/ha):	20	Overall Fuel Load(t/ha):	25

Site Information

Site Slope	5 Degrees	Site Slope Type:	Downslope
Elevation of Receiver(m)	Default	APZ/Separation(m):	75

Fire Inputs

Veg./Flame Width(m):	100	Flame Temp(K)	1200
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Calculation Parameters

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

Program Outputs

Category of Attack:	LOW	Peak Elevation of Receiver(m):	6.5
Level of Construction:	BAL 12.5	Fire Intensity(kW/m):	46899
Radiant Heat(kW/m2):	10	Flame Angle (degrees):	79
Flame Length(m):	26.6	Maximum View Factor:	0.119
Rate Of Spread (km/h):	3.63	Inner Protection Area(m):	75
Transmissivity:	0.754	Outer Protection Area(m):	0